Guiding climate compatible development

User-orientated analysis of planning tools and methodologies

Analytical report

Final report

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This analytical report and an associated web-based user guide (www.climateplanning.org) has been prepared in response to demand from a range of practitioners and government officials in developing countries, including demand expressed through members of the Coordinated Low Emissions Assistance Network (CLEAN).

As a member of CLEAN, the Climate and Development Knowledge Network funded and commissioned this work to help guide decision makers in developing countries to select appropriate tools and methodologies to support climate compatible development.

This report was produced by Ecofys and IDS
Ecofys: Markus Hagemann, Sarah Hendel-Blackford, Niklas Höhne
IDS: Blane Harvey, Lars Otto Naess, Frauke Urban

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Glossary of terms

ALM	Adaptation Learning Mechanism
CCD	Climate Compatible Development
CDKN	Climate and Development Knowledge Network
CDM	Clean Development Mechanism
CCCCC	Caribbean Community Climate Change Centre
CEDRA	Climate change and Environmental Degradation Risk and Adaptation assessment
CLEAN	Coordinated Low Emissions Assistance Network
CLIMPAG	Climate Impact on Agriculture
CO_2	Carbon dioxide
CoP	Conference of Parties
CRD	Climate Resilient Development
CRiSTAL	Community-based Risk Screening Tool – Adaptation and Livelihoods
CVCA	Climate Vulnerability and Capacity Analysis
DFID	Department for International Development
DIY	Do It Yourself
DRR	Disaster Risk Reduction
ECN	Energy research Centre of the Netherlands
ENPEP – BALANCE	Energy and Power Evaluation Program
ESMAP	Energy Sector Management Assistance Program
FAO	Food and Agriculture Organisation
FS	Feasibility Study
GAINS	GHG-Air pollution Interactions and Synergies
GEF	Global Environmental Facility
GHG	Greenhouse Gas
GIS	Geographic Information System
GiZ	Gesellschaft für Internationale Zusammenarbeit
HEDON	Household Energy Network
IGO	Inter-governmental Organisations
LCD	Low Carbon Development
LEAP	Long range Energy Alternatives Planning System
LEDS	Low Emission Development Strategies
IDS	Institute of Development Studies
IEA	International Energy Agency
IPCC	Intergovernmental Panel on Climate Change
MACC	Marginal Abatement Cost Curve
MAGICC	Model for the Assessment of Greenhouse gas Induced Climate Change
M&E	Monitoring and Evaluation

MAPS	Mitigation Action Plans and Scenarios
NAMA	Nationally Appropriate Mitigation Action
NGO	Non-Governmental Organization
NREL	National Renewable Energy Laboratory
OECD	Organisation for Economic Co-operation and Development
PRECIS	Providing Regional Climates for Impacts Studies
PTRT	Pollutant Release and Transfer Register
RCCC	Red Cross/Red Crescent Climate Centre
RETScreen	Renewable Energy Technology Screening Model
SCENGEN	Scenario Generator
SEA	Strategic Environmental Assessments
SG Members	Steering Group Members
SPR	Strategic Programme Review
SWERA RREX	Solar and Wind Energy Resource Assessment Renewable energy Resource EXplorer
T&M	Tools and Methodologies
TIMES	The Integrated MARKAL-EFOM System
TNA	Technology Needs Assessment
TOT	Training of Trainers
UNDP	United Nations Development Programme
UNEP	United Nations Environmental Programme
UNESCO	United Nations Educational, Scientific and Cultural Organization
UNFCCC	United Nations Framework Convention on Climate Change
USD	United States Dollar

Executive Summary

The issue at hand

The focus on climate compatible development (CCD) as an aim for development in a changing climate reflects a growing recognition that mitigation, adaptation and development need to be tackled together, not as separate issues. However, given that CCD is an emergent area of work and study, the availability of guidance resources to assist in bringing the three issues together is limited. This report identifies and analyses the currently available tools and methodologies for adaptation, mitigation and development, in an attempt to guide decision makers towards climate compatible development pathways.

Three main research questions are addressed in this report:

1. What tools and methodologies that address climate compatible development or its related aspects currently exist?
2. To what extent do these tools currently satisfy user needs in delivering climate compatible development?
3. Where are there gaps, and what is needed in order to plan climate compatible development?

This study was commissioned by the Climate and Development Knowledge Network (CDKN), a member of the CLEAN network[1], and takes a largely user oriented approach, taking account of user experiences and needs in order to ultimately help guide decision makers in developing countries in selecting appropriate methodologies for their needs. The report is targeted at three user groups, namely in-country policy makers and civil servants, technical experts, and in-country donor representatives advising on climate change and development.

To respond to the three research questions listed above, a stepwise approach was used for the analysis, moving from an exploration of available tools and methodologies, whereby over 100 tools were identified, via the organisation into different types and categories, to an in-depth analysis of particular sub-sets of tools and methodologies on the basis of descriptive criteria.

In the in-depth analysis, a total of 30 tools within seven categories were analysed, representing a cross-section of the tools identified. The descriptive criteria, used as a basis for this analysis, were derived from a user-survey with input from over 80 users and capture aspects of the tools that are important to the user. These include the extent to which they cover adaptation, mitigation and development, their usage to date, the fit with user needs and demands, geographical coverage and scope, as well as accessibility in terms of cost, training and additional implementation requirements.

The developers of the 30 tools selected were asked to fill in a questionnaire based on these criteria and the results were then used as a basis for analysis by the project team. In the first step, tools within a particular category were compared in order to gain an understanding of the subtle differences between tools with broadly similar aims. In a second step the broader CCD landscape of tools was evaluated in comparing the categories amongst each other.

[1] Coordinated Low Emissions Assistance Network, http://en.openei.org/CLEAN

This report serves as one of three inter-related products for this project. The second is an interactive user guide for decision makers, which is based on this report and will serve as an interface for tool selection (web-based as well as paper-based). The third product is an academic article that will explore key questions and issues which emerged from the process in greater depth.

Landscape of methodologies and tools for climate compatible development

Over 100 tools and methodologies (T&M) were identified. To gain a better overview of such a large number of tools they were grouped along three different lines:

- the extent to which they address mitigation, adaptation or development
- a typology of their key objective (data/information generation; knowledge sharing; process guidance); and
- the stage of the policy cycle they apply to

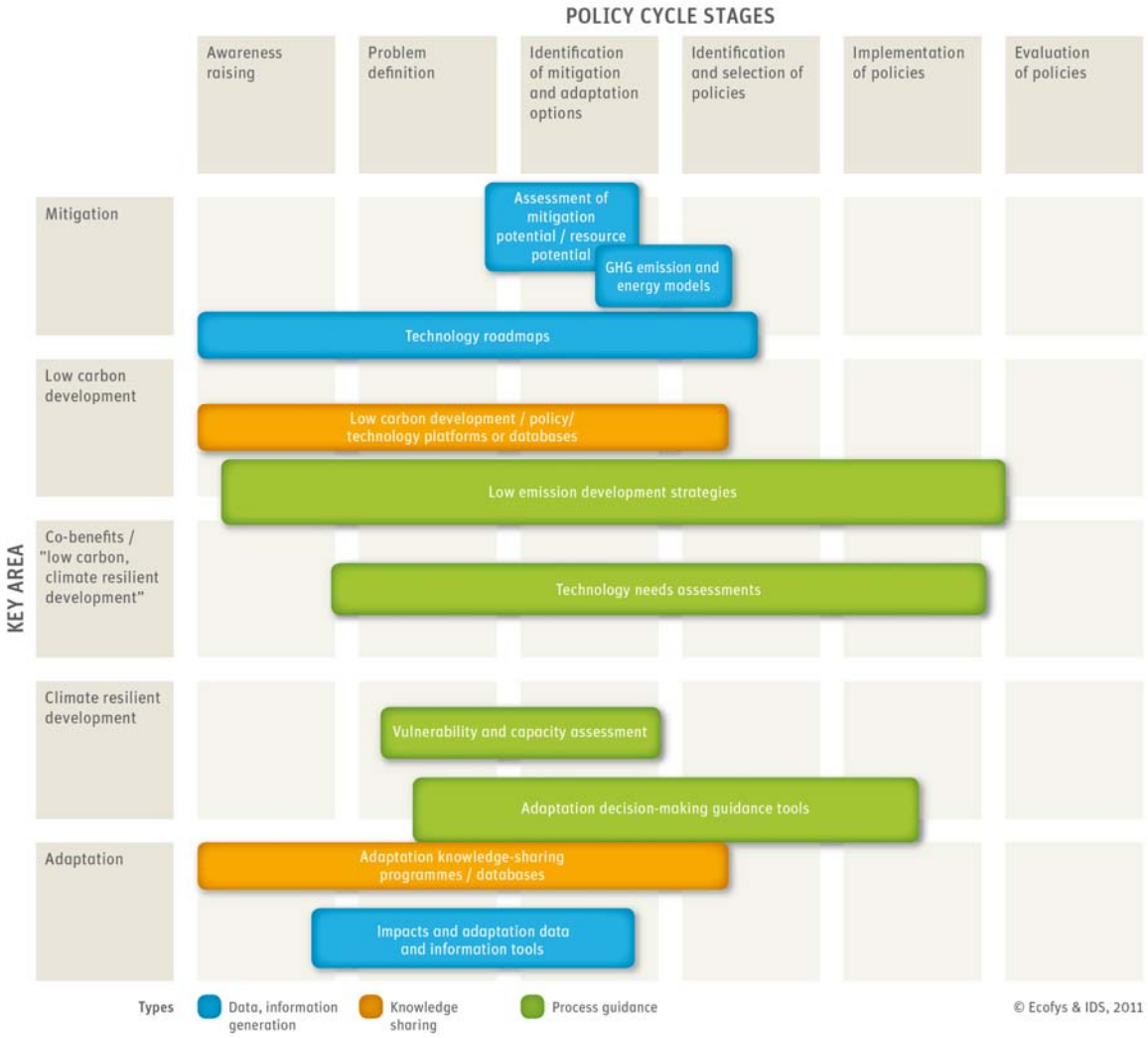

Figure 1. Organisation of categories of tools and methodologies according to typology of key objective (colours), key area, policy cycle stage.

Overall T&M were grouped into 10 categories, that are generally recognised in the mitigation and adaptation communities, and then broadly placed in relation to policy cycle steps and thematic area as depicted in Figure 1. This compact overview allows two important observations. First, while the tool landscape is very diverse, there are only very few tools that cover mitigation, adaptation and development simultaneously. Second, the tools identified for this study primarily focus on the earlier steps in the policy cycle, namely the planning process.

Some major trends emerged from the detailed analysis of a sample of tools and methodologies, represented in Figure 2:

- All tools evaluated can and are currently used in very broad geographical contexts. All but a few tools have been used in more than 10 contexts.
- However, the use of tools for integrated planning covering multiple policy cycle steps and key areas (adaptation, mitigation and development) have been used less and their use has only picked up recently (e.g. the TNA handbook or the LEDS)
- Contrary to what the user survey indicated, a surprisingly large number of low cost and easily accessible tools exist already; however many require in-country expertise and data availability as a pre-requisite as well as availability of human resources during their implementation.
- The extent of stakeholder involvement differs largely from tool type to tool type and process guidance tools are the only type of tools that generally include the involvement of a broad set of societal stakeholders. However there are also exceptions among the data and information generation tools such as LEAP which also include stakeholder involvement processes.
- Traning requirements tend to be on the low side with the exception of the process guidance tools.
- Many tools can be implemented by the users themselves on a “do it yourself” basis, even though some tool developers don’t encourage this as they consider a guided process to be an integral part of the tool.
- Language coverage beyond English tends to be low. However this could be due to the bias introduced into the study by the language restrictions of the authors.

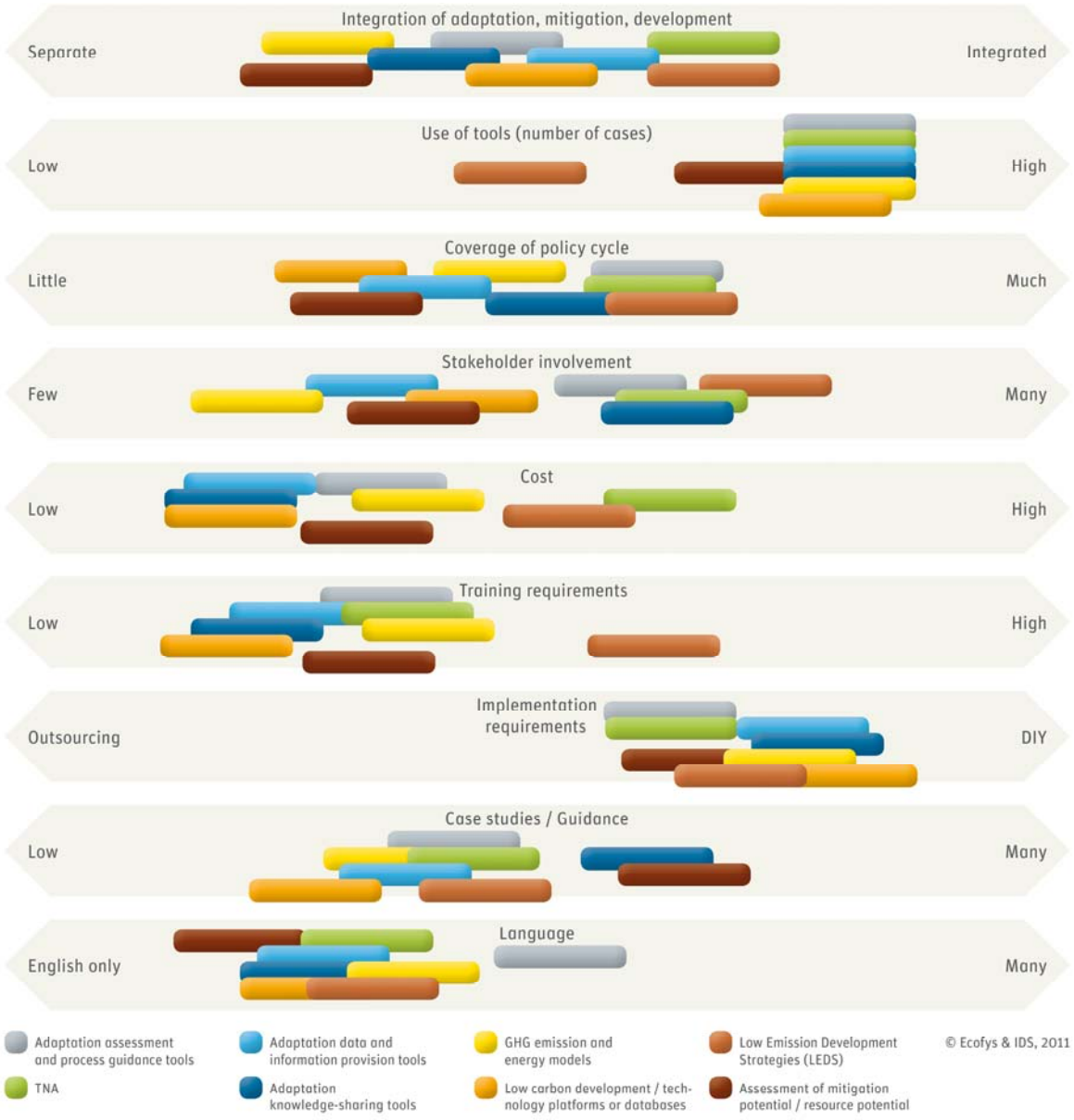

Figure 2. Results from a comparison of T&M categories according to selected characteristics

Conclusions and the way forward

Climate compatible development remains an emerging concept which has yet to be fully articulated and tested in practice. There is a lack of empirical and theoretical evidence to understand how climate compatible development can be planned and implemented across a diverse set of contexts. This comparative study showed that only a few tools and methodologies integrate adaptation, mitigation *and* development. There is however currently no existing tool for climate compatible development, nor is it clear yet whether such a tool would be possible or indeed desirable. The current lack of coordination and the compartmentalised nature of expertise between the adaptation, mitigation and development communities of practice poses an additional challenge to developing and applying a tool which is truly suited for climate compatible development. Finally, the study found that most methodologies identified focus on the early stages of the policy cycle, namely problem identification,

assessment of options and selection of policies. Only a few tools and methodologies also assist in policy implementation and ex-post evaluation.

With regard to user needs and preferences the study found that, in many cases, the *development* of tools and methodologies are supply driven, and their *use* is partly linked to donor funded programmes. Some users are adjusting existing tools to fit their national and local circumstances or developing their own tools if they do not find appropriate tools. Users also highlight the need for:

- stronger consultation with tool users from the early stages of the development process;
- capacity building to enable effective use of tools;
- development of tools in a greater number of languages;
- and attention to policy timescales in developing tools (processes which can be completed within the appropriate timeframes).

In order to advance the uptake of tools and methodologies for climate compatible development, three scenarios were identified:

- "One stop": development of one or a few key tools to cover the whole planning cycle for climate
  compatible development;
- "Gap filling": development of tools and methodologies for purposes not covered so far, e.g. methodologies for all three areas and/or covering the latest stages in the policy cycle;
- "Strategic selection": a user-oriented approach which would develop users' capacity to choose strategically from a range of existing tools and combine them to be fit for purpose

The decision on which future pathway should be pursued in developing tools and methodologies for CCD is dependent on factors such as the development stage of the country, donor and developer coordination, the expected centrality of tools and methodologies in delivering CCD, and the degree of investment into other enabling environments outside of the tools landscape. Hence these recommendations for next steps are preliminary and, based on the current limited understanding and use of CCD approaches, somewhat speculative.

Given the evolution of the landscape of tools and methodologies to date, it is quite possible that the field will continue to develop incrementally and in a somewhat uncoordinated fashion (many different developers working independently in conjunction with different donors and governments), and as such, a step change may be unlikely. Therefore a mix of the three scenarios described above may also occur.

An illustration of a possible evolution of tools and methodologies is presented in Figure 3. The figure does not suggest an 'ideal' pathway towards climate compatible development; as highlighted above, choice of future direction will be highly context-dependent. While it is clear that an integrated *discussion* of mitigation, adaptation and development is necessary at all levels, integration of *tools* may vary at different levels. On the one hand, one could imagine that methodologies in some categories, such as energy modelling or vulnerability assessments, will be further developed to serve their particular purpose. Such tools may benefit from dialogue between users but may remain stand alone tools (upper half of Figure 3). Such a development would be in line with the "gap filling" and

"strategic selection" scenarios. On the other hand, integration into one *tool* could be envisaged at the policy selection stage and beyond (lower end of Figure 3). Methodologies e.g. within the "low emission development strategies" category could be the first that truly integrate mitigation, adaptation and development. Some existing tools in that category already started to integrate adaptation.

As the theory and practice of climate compatible development progresses, more methodologies may be developed that also cover the later elements of the policy cycle, such as policy implementation and ex-post policy evaluation. Tool developers of process guidance tools could also be encouraged to extend the scope of their tools to those steps.

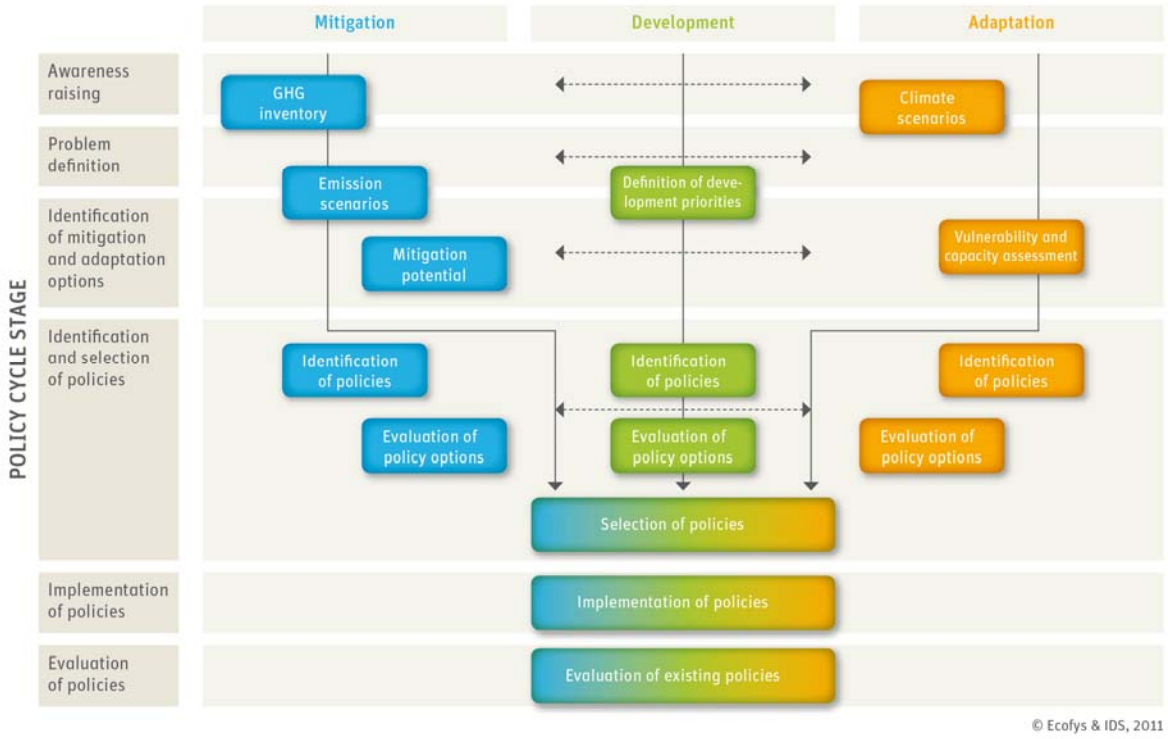

Figure 3. Illustration of an option to integrate tools for decision making on climate compatible development in the future. The figure demonstrates that integrated discussion is necessary at all steps (horizontal arrows).

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1 Introduction

This section provides a background on climate compatible development (CCD). It highlights some of the main challenges arising due to the relative novelty of the concept. The section also describes the key concepts and analytical approach, research questions and methodology.

1.1 Background

The focus on climate compatible development as an aim for development in a changing climate reflects a growing recognition that mitigation, adaptation and development need to be tackled together, not as separate issues. Climate compatible development means minimising the negative impacts of climate change whilst maximising 'triple wins' of low emissions, increased resilience and development benefits (Mitchell and Maxwell 2010). There has been considerable discussion around whether and how mitigation and adaptation can be combined (Klein et al. 2007a), how more integrated development frameworks may be developed (e.g. Halsnaes and Verhagen 2007), and how barriers can be overcome and synergies utilised between the two in a developing country context (Ayers and Huq 2009). At a sectoral level, there is considerable attention paid to the potential for triple wins in agriculture (FAO 2010). However, there is a limited body of evidence of which tools can be used to support such triple wins for climate compatible development in practice.

This report responds to a need felt within the Coordinated Low Emissions Assistance Network (CLEAN) to have a better overview of the tools and methodologies available to plan adaptation, mitigation and development, and to guide decision makers towards climate compatible development pathways. A large number of tools and methodologies exist on adaptation and mitigation, respectively, including platforms and guidance on the use of existing tools. Examples for adaptation are summarised in the reviews by Olhoff and Schaer (2010), Hammill and Tanner (2011), and Traerup and Olhoff (forthcoming). Examples for mitigation include UNFCCC (2008), Clapp et al. (2010), Cox et al. (2010), Ashton et al. (2009), and Condon et al. (2009). However, an important gap exists in guidance for decision making on adaptation and mitigation from a development perspective.

This study is commissioned by the Climate and Development Knowledge Network (CDKN), a member of the CLEAN network, to help close this gap. This can be done by reviewing available guidance in view of user experiences and needs. Ultimately, this will guide decision makers in developing countries in their selection of appropriate methodologies for these needs across these areas.

This analytical report documents the process and findings of the analysis as well as the comparison of tools and methodologies for climate compatible development. It serves as one of three inter-related products for this project. The second is an interactive user guide for decision makers, which is based on this report and will serve as an interface for tool selection. The third product is an academic article that will explore key questions and issues, which emerged from the process, in greater depth.

The report addresses three main research questions:

1. What tools and methodologies that address climate compatible development or its related aspects currently exist?
2. To what extent do these tools currently satisfy user needs in delivering climate compatible development?
3. Where are there gaps and what is needed in order to plan climate compatible development?

The report draws on literature reviews, user surveys, interviews and tool reviews. The report is written for a wide audience, with a focus on in-country policymakers, technical experts, including development practitioners and NGOs, and donor representatives operating in a developing country context. The project has considered a range of donor, private sector, NGO and country-led tools and methodologies used to support decision makers at the national level to deliver climate compatible development planning. Some methodologies respond specifically to mitigation, adaptation or development, while others attempt to combine two or more of these approaches.

The report is organised as follows. The sections below review concepts and methodology. This is followed by an overview of the landscape of tools and methodologies currently available (Chapter 2). Tools and methodologies are then compared and analysed across categories (Chapters 3 and 4). Chapter 5 discusses three options for selecting tools for climate compatible development, before drawing conclusions and recommendations for future work (Chapter 6).

1.2 Key concepts and analytical approach

1.2.1 Climate compatible development (CCD)

Climate compatible development builds on the long established concepts of adaptation and mitigation, as well as the newer concepts of climate resilient development and low carbon development (see Figure 4). Adaptation is defined as “adjustment in natural or human systems in response to actual or expected climatic stimuli or their effects, which moderates harm or exploits beneficial opportunities” (Smit et al. 2001:881). Mitigation is defined as “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” (IPCC 2001:379).

Development can be defined in a variety of ways. Traditionally it has been measured in terms of economic growth, but is now commonly also including a much broader range of factors, such as the concepts of human development and well-being. Chambers (2004:2) argues that the two main components of development are that it is normative and involving change; thus the most basic definition of development would be “good change”.

Low carbon development sits at the interface between mitigation and development, and aims at promoting development while reducing emissions. It can been described simply as “using less carbon for growth”, and may be achieved by four key strategies (DFID 2009):

1. Moving to low carbon energy sources and energy efficiency.
2. Protecting natural resources that store carbon (forests and land).
3. Developing low carbon technologies and business models.
4. Implementing policies and incentives which discourage carbon intensive practices and behaviours.

Similarly, climate resilient development has gained popularity over recent years. Defined as “development processes that safeguard development from climate impacts” (Mitchell and Maxwell

2010:1), it points to the need for ensuring that development is considering the range of potential risks as well as opportunities arising from climate change.

The Fourth Assessment report of the IPCC dedicated a full chapter to linkages between mitigation and adaptation (Klein et al. 2007a). We know with high confidence that “decisions on adaptation and mitigation are taken at different governance levels and inter-relationships exist within and across each of these levels“ (Klein et al. 2007a, p747). Furthermore the executive summary states with medium confidence that “Creating synergies between adaptation and mitigation can increase the cost-effectiveness of actions and make them more attractive to stakeholders, including potential funding agencies” (Klein et al. 2007a). Considering adaptation and mitigation together can thereby, for example, mean climate proofing mitigation investments or screening adaptation options for their contributions to GHG emissions (Klein et al. 2007a).

Climate compatible development brings all these concepts together. CDKN defines climate compatible development as “development that minimises the harm caused by climate impacts, while maximising the many human development opportunities presented by a low emissions, more resilient, future” (Mitchell and Maxwell 2010: 1). It can be illustrated as the space where adaptation, mitigation and development aims overlap, as illustrated in Figure 4:

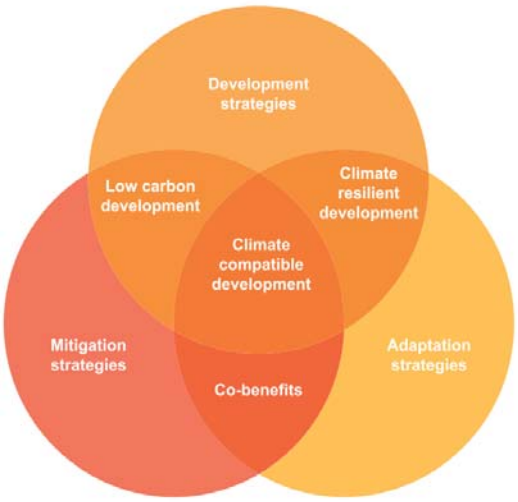

Figure 4. Climate compatible development (CCD) diagram. Source: Mitchell and Maxwell (2010)

The middle section of climate compatible development in the figure illustrates the idea that mitigation, adaptation and development can mutually reinforce each other to produce ‘triple wins’ which can deliver lower emissions whilst enabling and promoting development which is resilient to current and future climate impacts. This illustration is largely conceptual, as CCD is a very young term, and it is as yet unclear what climate compatible development pathways may look like in practice. The next sections will outline the relation between reviewed tools and the concept of climate compatible development.

1.2.2 Tools for climate compatible development: scope of the study

1.2.2.1 Tools and methodologies

A tool is here defined as an instrument which can help users cover one or more steps in a policy development or decision making process. Tools may provide data or guidance, such as PRECIS or CRiSTAL, for example, and may come in computer-based or paper-based formats, such as a decision support tree or computer-based tools such as LEAP. A methodology is a systematic process, which is usually composed of several methodological steps. Methodologies include, for example, low carbon roadmaps and community-based approaches to disaster risk reduction.

For the purpose of this study, however, no strong distinction is made between these two terms. The main reason is that such a distinction is not always applied or considered relevant by end users. Instead, the terms “tools and methodologies” (T&M) or simply tools is used to refer to both interchangeably. Furthermore when referred to the “landscape of tools” then all tools and methodologies reviewed in this study are meant.

This study focuses on tools and methodologies that have a specific focus on climate. Processes that focus only on development were excluded alongside more generic processes, such as the use of surveys or stakeholder consultations. Furthermore, only tools that have been applied at least once in a developing country context are included.

1.2.2.2 Challenges of bridging tools for adaptation, mitigation and development

One of the key assumptions for the study is that tools can be a way of addressing and promoting climate compatible development. Tools can support the planning and implementation of climate compatible development. However, currently most tools refer to one of the three aspects of adaptation, mitigation and development only, rather than offering an integrative approach. Given this, there is a need to bridge the gap between tools for adaptation, mitigation and development. These gaps are not uniform across scales of governance or geographic regions. Planning and implementing climate compatible development therefore requires a holistic perspective to integrate adaptation, mitigation and development at different levels and across geographic regions. Depending on the local development context, the priority concern might vary, such as adaptation to climate change for small island developing states and mitigating emissions for emerging economies such as China. Nevertheless, all three aspects are equally important for climate compatible development and therefore tools need to be able to adapt and respond to all three aspects. Figure 5 below shows how emphasis of priorities – and need for tools – will vary in different parts of the climate compatible development diagram.

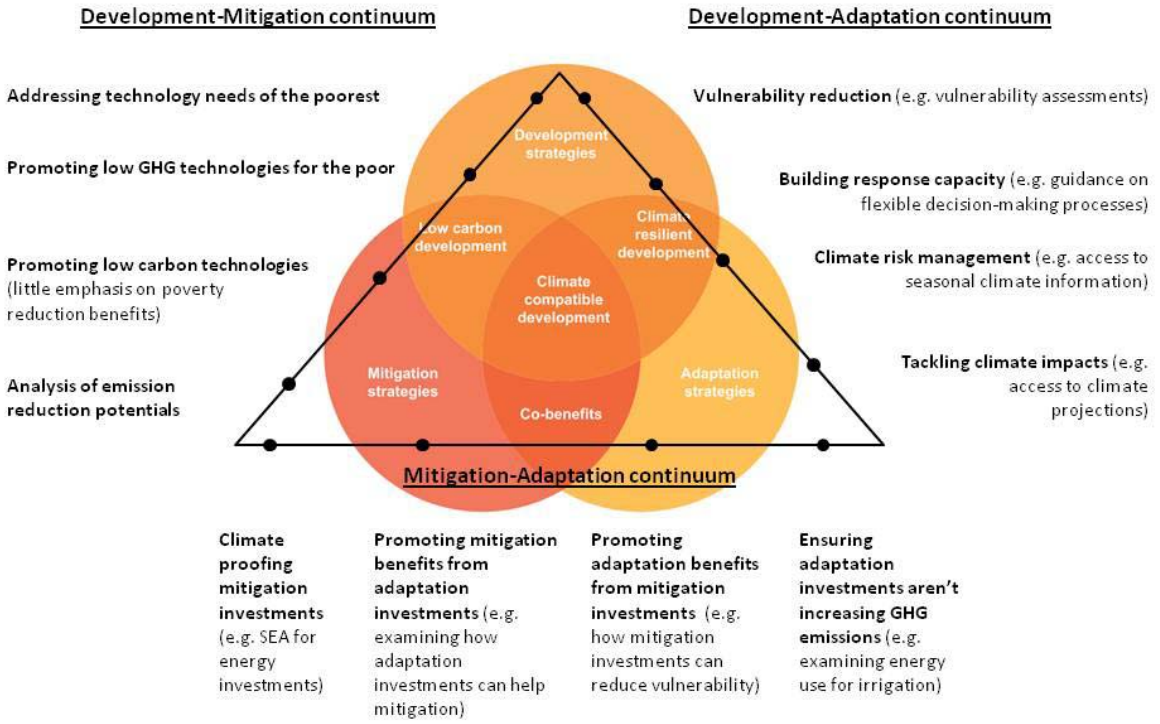

Figure 5. Defining linkages between development, mitigation and adaptation. Adapted from Mitchell and Maxwell (2010) and McGray et al. (2007)

Tools for planning mitigation and development

Planning for mitigation and implementation has been supported in the past by numerous tools and studies aimed at the national and sub-national levels supporting decision makers in the various stages of the policy cycle. A number of studies have reviewed such tools. Existing reviews have, for instance, supported national governments in creating their national communication (UNFCCC 2008), developing strategies for low carbon development (Clapp et al. 2010) and supporting these with modelling tools (Cox et al. 2010).

The majority of tools identified here in the mitigation realm have a primary focus on mitigation, including development to a varying degree, and adaptation to a limited extent or not at all. Tools that combine mitigation and adaptation include the UNDP TNA handbook (UNDP and UNFCCC 2010) and UNDP Green, Low-Emission and Climate-Resilient Development Strategies (UNDP 2011). Furthermore, whilst integrated assessment models provide a high level analysis of the economic trade-off between adaptation and mitigation actions, this is often not useful in the national context due to the high level of aggregation (Klein et al. 2007a), meaning that the results of the tools would be not detailed enough to be useful at a national or local level.

Tools for planning adaptation and development

Guidance for adaptation decision making has a history in tools and methodologies for assessing impacts and for supporting adaptation based national and sub-national scenarios (e.g. Carter et al. 1994; Feenstra et al. 1998). This is followed by an increasingly clearly articulated linkage between

adaptation and development objectives (Klein et al. 2007a). A number of reviews have been undertaken over recent years to take stock of available tools and methodologies as well as key challenges for future research and tool development to help adaptation in the context of development (Hammill and Tanner 2011; Olhoff and Schaer 2010; Traerup and Olhoff forthcoming; UNFCCC 2008b; Klein et al. 2007a).

None of the adaptation tools or reviews pay any significant attention to mitigation tools, although some discuss linkages to mitigation objectives. Some mention mitigation as a motivation for developing guidelines, in that a better knowledge of the impacts would highlight the level of urgency for mitigation efforts (Hammill and Tanner 2011; UNFCCC 2008b). Only a few tools are found to combine mitigation and adaptation. These include the Danida risk management tool and DFID Strategic Programme Review (SPR) as well as Strategic Environmental Assessments (SEA) (Hammill and Tanner 2011; OECD 2008:6).

Tools for bridging adaptation, mitigation and development

The lack of focus on integrative approaches may have many causes. OECD (2008:6) states "the notable differences between adaptation and mitigation in terms of temporal and spatial scales of intervention, key stakeholders and decision processes". Key differences between adaptation and mitigation are outlined in Table 1.

Table 1 Comparing adaptation and mitigation. Source: Naess and Urban 2011.

	Adaptation	Mitigation
Scale	Local to national	Global
Benefit	Local to national	Global
Actors	Cross-sectoral	Sectoral (energy, transport, forestry)
Outcomes	Difficult to measure	Easier to measure
Priority	The most vulnerable	The largest emitters
Approaches	Broad: From vulnerability to impacts perspective	Narrow: Technical approach / techno-centric
Timescale for effects of measures	Short to medium term	Longer term

However, if the comparison is made between low carbon development and climate resilient development instead, the differences are less pronounced (See Table 2). Halsnaes and Verhagen (2007) note that definitions for adaptive and mitigative capacity overlap to a significant degree, whereas there are differences in terms of technical focus and policy instruments. Drawing on previous studies (Yohe and Moss 2000; Yohe and Tol 2002), the authors find key similarities in social and human capitals, ability of decision makers to manage information, and structure of critical institutions. The authors suggest a well-being indicator to assess and guide policies and pathways. Ayers and Huq (2009) present a similar argument, suggesting that mitigation and adaptation priorities should be integrated in a focus on broader sustainable development goals. At the same time they should highlight the importance of raising awareness of mitigation challenges to promote efforts on

adaptation, and vice versa. Another important reason for addressing CCD in an integrated manner is the fact that synergies can improve cost effectiveness (Klein et al. 2007a, Ayers and Huq 2009). The fact that there are limited financial resources that are currently made available for adaptation and mitigation is a strong argument for such synergies. It can be beneficial from a cost perspective to use only one tool that addresses both adaptation and mitigation, rather than several separate tools. The same is valid when it comes to the expertise and effort which needs to be invested in several separate tools rather than in one integrated tool. The risk with one integrated tool is however that its costs, data requirements and required expertise can go beyond the capacities of most users, particularly users in smaller or less well funded organisations.

Attempts have also been made to merge the two concepts into what is called 'Low Carbon Climate Resilient Development' (LCCRD), which is essentially the same as climate compatible development.

Table 2. Climate Resilient Development and Low Carbon Development: a better fit? Source: Naess and Urban 2011.

	CRD	LCD
Scale	Local and regional	Global and local
Benefit	Local and regional/global?	Global and local
Actors	Cross-sectoral	Cross-sectoral (but still limited to a few approaches)
Outcomes	Difficult to measure	Difficult to measure
Priority	The most vulnerable	Emitters with development needs
Approaches	More narrow: Climate risk management and vulnerability perspectives	More broad: mitigation for achieving development needs (co-benefits)
Timescale for effects of measures	Short to medium	Medium term

1.2.2.3 Scope of study

Climate compatible development assumes an integration of adaptation, mitigation and development concerns. This is an ambitious task which requires a range of different planning and policy instruments and tools. The scope of this study is limited to a small dimension of this goal, namely to map and analyse available tools linking adaptation and mitigation with development concerns, and compare them with user needs and feedback. The study is therefore restricted to the analysis of tools rather than the broader conceptual issues that they raise regarding climate compatible development. Some of the insights on differences/similarities can be used to discuss overlaps between mitigation and adaptation, and hence see where potential for linkages exist.

Given the relatively new terrain that this study is covering, there are some key limitations which must be outlined. Most importantly, there is not yet a strong body of empirical evidence which illustrates concrete examples of climate compatible development put into action, nor is there a set of common indicators for assessing the "climate compatibility" of an initiative. Thus, the theory and evidence available on climate compatible development provides more of a conceptual guidance than a clear description of a set end point. Some early work has been done to identify examples of practice that can be described as "low carbon, climate resilient development" (e.g. Bahadur et al. 2010) but this does not constitute a sufficient body of evidence to provide guidance on what CCD looks like in practice at a range of scales and contexts.

Further, as noted above, given the infancy of the approach, few tools or methodologies have deliberately aimed to span the full range of adaptation/mitigation/development in the guidance they provide. Although, given the differing nature of adaptation and mitigation outlined above, it remains unclear whether this would even be useful. Many tools have been developed along axis such as "adaptation – development" or "mitigation – development," but few, if any, have been found that genuinely seek to tackle all three dimensions of CCD (see also Figure 7).

Thus, the tools are discussed according to key features that can be assumed to help move towards climate compatible development. Attempting to assess their effectiveness for achieving climate compatible development in practice, however, was beyond the scope of this study.

It should also be noted that there is no body of empirical evidence for how tools and methodologies can best be designed, redeveloped or combined to contribute to climate compatible development, or to what extent tools are a key component to enabling CCD. The study has sought to explore this question of broadening tools to fit the breadth of CCD vs. combining tools strategically in Chapter 5, but given the lack of field-based evidence to support our conclusions, we feel this is an area which will require further investigation and validation.

Finally, given the sheer number of tools and methodologies which were identified in the early stages of the project, it is beyond the scope of the study to do a full review of each one. Instead, a sub-set of illustrative tools were selected as examples for more detailed analysis and comparison. This process is outlined in the Methodology section below.

1.2.3 Research questions

In undertaking this project, the following research questions are posed:

Research question	Justification	Sources of evidence
1. What tools and methodologies that address climate compatible development or its related aspects currently exist?	- Understand what resources are currently available, and in what format and quantity. - Gain a better description of the functions and characteristics of a representative sampling of the tools themselves	-User survey and desk review -Mapping of tools by typology, policy input and location in CCD spectrum -Analysis of tools -Survey of tool developers on detailed characteristics of a selection of tools

2. To what extent do these tools currently satisfy user needs in delivering climate compatible development?	- Understand user needs and demands, and how these are currently met by existing tools in terms of scope, design and accessibility	-Analysis of the landscape to identify gaps and areas of concentration (supply-side analysis) -Survey and interviews with users (demand-side analysis)
3. Where are there gaps, and what is needed for planning climate compatible development?	- Linking existing supply to current and projected demand (assuming CCD becomes a policy objective) - Informing future development or re-development tools for CCD	-Comparative analysis of tools and methodologies - Review of observations with expert groups

In identifying gaps and needs for planning climate compatible development (Research question 3), T&M available to date will need to be compared according to a common set of criteria. This comparative analysis is a principal element of this research, as will be explained in the next section.

1.3 Methodology

1.3.1 Overall approach

To respond to the three research questions listed above, a 3-step approach was used for our analysis, moving from an exploration of available tools and methodologies via the organisation and into different types and categories, to an in-depth analysis of particular sub-sets of tools and methodologies on the basis of descriptive criteria:

- Step 1 Inventory and exclusion of T&M and user needs
- Step 2 Organisation of T&M
- Step 3 Criteria development and in-depth analysis

In step 1, relevant tools and methodologies were compiled in a list, restricted to T&M applied in a developing country, with a climate change focus and with the potential to support national level decision making. In total 106 tools were identified in this process. Additional exclusion criteria were used to further reduce the number of T&M to 49. In this step, an inventory is made of user needs concerning T&M for climate compatible development as well.

In step 2 the T&M were organised in different ways, namely according to:

- key area (mitigation, adaptation, development)
- a typology of their key objective (data/information generation; knowledge sharing; process guidance);
- the stage of the policy cycle the T&M is applied in;
- a grouping into 12 categories, generally recognised in the mitigation and adaptation communities.

In step 3 descriptive criteria were formulated to characterise the T&M. Next, an in-depth analysis was carried out among a cross- section of a total of 30 tools in two parts, namely:

- An *intra-category* analysis, analysing selected tools within a limited number of T&M categories (Chapter 3);
- An *inter-category* comparison, comparing T&M categories covering different key areas, typologies, and stages of the policy cycle (Chapter 4).

An overview of the approach is provided in Figure 6 below.

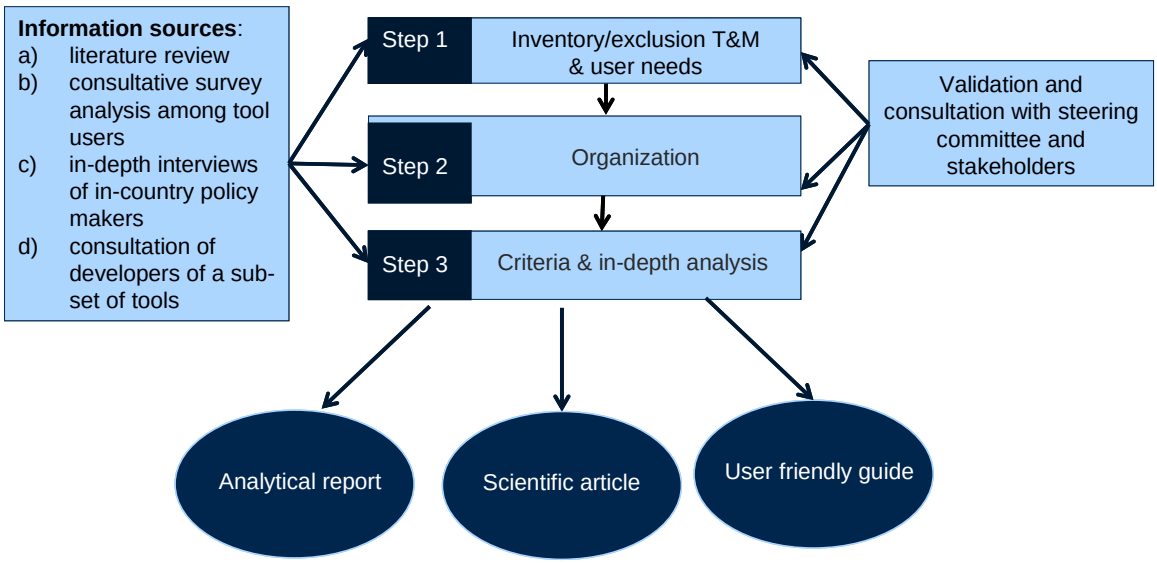

Figure 6. Methodological steps in the project

The inputs to this project come from a range of information sources and engagement processes. Aside from a literature review, the project team engaged extensively with relevant networks, communities and stakeholders in both the climate change and development areas. This included structured input as depicted in Figure 6, alongside regular informal interaction with stakeholders.

Throughout the project, the team regularly interacted with a steering group comprising 12 members (see Appendix A). This consultative approach process enabled the project findings to be based on independent research through the use of theoretical and empirical methods and user-led research.

The methodological approach is described in greater detail in Appendix B.

2 Landscape of tools and methodologies

This section provides an overview of the "landscape" of tools identified in the project. The first part of this section organises the tools and methodologies into categories for a better overview, then highlights some observations from our analysis so far, providing insights from the user analysis. The last part of the section describes the process for selecting a subset of tools for in-depth analysis.

2.1 The landscape of identified tools

2.1.1 Organisation of tools and methodologies

The project identified a total of 112 tools. The list was expanded and amended throughout the project. The final list contained 55 tools that have mitigation as a primary aim, and 57 tools with adaptation as a primary aim. While this may not represent an exhaustive list of all available tools, it is believed that it provides a good picture of the current population of tools.

The tools were organised into groups. In the first instance this was done according to a **typology** of tools that has been used in earlier studies (e.g., Hammill and Tanner 2011), namely:

1. **Data and information generation**: generating new information
2. **Knowledge sharing**: information resources, such as websites and networks.
3. **Process guidance**: helping planners (actors) to go through various steps and to complete these steps

Many tools have elements of more than one typology and can therefore fall under more than one typology. In these cases they were classified on the typology corresponding to the tool's primary output, whilst recognising that they can fall under multiple typologies.

The project team then grouped the tools into **categories**, using widely recognised groupings in the adaptation and mitigation communities. For adaptation, the categorisation is based, in particular, on recent reviews of Hammill and Tanner (2011) and Olhoff and Schaer (2010). For mitigation, broadly accepted categories in the international community were used. The following categories of tools were identified:

1. Assessment of mitigation potential / resource potential

This category consists of tools that assess renewable energy resource potentials, as well as tools that focus on broad mitigation options such as energy efficiency, renewable energy but also other potentials (e.g. in the forestry sector). Tools in this group fall under the ***'data and information generation'*** typology and are often used in the early stages of the policy cycle to identify areas for potential policy intervention.

2. GHG emissions and energy models

This group of tools contains all types of models in the energy and emission realm that can support national level policy making. The definition of the category is based on the definition used by the UNFCCC in its resource guide ("modelling tools for mitigation assessment", UNFCCC 2008, p22). The group includes a range of models from bottom-up models with a focus on the energy sector which is represented in detail, to top-down models that focus on the whole economy where the economic environment is represented in detail. This category covers simple models that can be understood and applied without prior knowledge to more complex tools that need an in-depth understanding of the

topic. All models in this category can be used in a flexible manner to evaluate options, whether these are mitigation measures or policy options. Tools in this group are mainly ***'data and information generation'*** tools, and provide support in selecting mitigation options by outlining the implications of different choices.

3. Technology roadmaps

The term 'technology roadmaps' has been used in a variety of contexts at company as well as sector level (Phaal 2001). Road mapping is a flexible approach that can support various aims but ultimately intends to lay out possible future pathways including necessary steps to get there. With respect to low carbon technologies, the IEA has published a number of global technology roadmaps for a range of technologies that were developed together with industry and governments (IEA 2010). Roadmaps are mainly ***'process guidance tools'*** that help decision makers prioritise mitigation options and policies.

4. Technology Needs Assessments (TNAs)

Technology Needs Assessments were set up as a concept by UNFCCC to enhance the implementation of Article 4.5 of the Convention (technology transfer from North to South). Since then UNEP, UNDP and UNFCCC developed various handbooks and the GEF financed some 92 TNAs in non-Annex I countries[2]. The TNA is primarily a ***'process guidance tool'*** that helps developing countries in identifying and prioritising mitigation and adaptation options.

5. Low carbon development / technology platforms or databases

This category includes knowledge sharing initiatives around low carbon development and low carbon technologies. These initiatives are part of the ***'knowledge sharing'*** typology and provide easy access to information for the users in various stages of the policy cycle.

6. Low Emission Development Strategies (LEDS)

Low Emission Development Strategies is a concept that was developed under the UNFCCC. It was first mentioned in the UNFCCC negotiation in April 2008 and picked up under the Copenhagen Accord (UNFCCC 2009) and the outcomes of Cancun. Since then the concept has evolved and numerous initiatives have started to support countries in developing such strategies. However, there is no formal definition of the term yet and it is currently a voluntary exercise for countries. For the purpose of this paper a rather broad definition is applied therefore. This definition covers all tools that provide "integrated planning to advance national economic development and climate change policies" (Clapp 2010: 11). In essence, it is not the attempt here to redefine or contribute to the definition of LEDS but to provide an overview of tools currently available that are broadly covered by this concept. LEDS are primarily **'process guidance'** tools that support the country in a number of steps in the policy cycle, from identification of policy options to identification and selection of policies.

7. Vulnerability and capacity assessment

The origin of this tool category lies in the assumption that adaptation processes need to start from an assessment of current vulnerabilities and capacities to climate related risks (Dessai and Hulme 2003; O'Brien et al. 2007). The tools typically focus on a local or community scale, and involve participatory exercises or risk assessment tools, modified from livelihoods analysis or other types of approaches

[2] http://unfccc.int/ttclear/jsp/TNA.jsp

that are familiar to development practitioners. The tools typically have an element of information and data generation (developing vulnerability baselines) as well as process guidance (involving step by step guides for how the data can be used in decision making processes), and tools can, therefore, be seen to belong in both groups.

8. Adaptation decision making guidance tools

Many of the tools in this category were developed for NGOs and development agencies wanting to "climate-proof" their activities (Klein et al. 2007b). They typically involve guidance on organisational change to tackle challenges posed by climate change, as well as having elements of vulnerability assessment through mapping what data are needed to make decisions, when and in what form. Their focus ranges from project to programme and policy planning.

9. Adaptation data and information provision tools

Tools in this category emphasise information about climate risks, including climate scenario projections at global, regional and local scales as well as analysis of impacts used for decision making in various sectors. The tools range from advanced modelling, requiring a high level of specialisation and time investment, to web interfaces that can be used with less prior knowledge or experience.

10. Adaptation knowledge sharing tools

Tools in this typology are "increasingly reliant on Web 2.0 functionality and user-generated content. They can be important for validation of [process guidance and data and information] tools, as these platforms can offer a space for user feedback and offer some sort of quality control mechanism. They also help to build a community of practice around climate change adaptation." (Hammill and Tanner 2011: 14) Broadly speaking, adaptation knowledge sharing tools contribute to establishing a shared evidence base upon which future adaptation planning and action (at a range of scales) can draw. As such, they provide users with a less direct and context-specific guidance to a specific decision making process than the other types of tools, but can offer a sense of potential options and outcomes, based on others' experiences, as well as space to document their own experiences.

Aside from the categories listed above, a number of other categories were identified that are not included here because the project team could not identify T&M as defined for this report. This includes a group of studies/tools that deals with the financial aspects of climate change such as cost-benefit analysis and, furthermore, a group of studies/ tools that deals with the evaluation of policies.

Figure 7 below provides an overview of the categories and their relative location in relation to thematic focus as well as policy cycle coverage. The figure is based on a qualitative assessment of the range of identified tools. On the horizontal axis, the figure depicts the policy cycle steps. On the vertical axis, the figure depicts the key areas regarding their relative location on a scale moving from adaptation to mitigation, via climate resilient development, co-benefits or "low carbon, climate resilient development"[3], and low carbon development. Note that due to the setup of the graph, the middle of the vertical axis represents climate compatible development as well as co-benefits. Hence categories located in this section do not necessarily address climate compatible development *per se*, but could

[3] See Section 1.2.2 for a discussion on the origins of how these terms relate to climate compatible development.

instead address mitigation and adaptation, hence co-benefits, together. The development linkage is implicit, as it was a criterion for initial inclusion of tools.

Furthermore, categories were located according to the majority of tools within the category. Individual tools might cover more than one category. This is also indicated by the dashed lines. As already mentioned earlier, the UNDP Technology Need Assessment Handbook (UNDP and UNFCCC 2010) now covers adaptation and mitigation in one handbook. The same is true for some of the low emission development strategies, such as the UNDP Green, Low-Emission and Climate-Resilient Development Strategies (UNDP 2011). These relatively new tools represent a first attempt to climate compatible development.

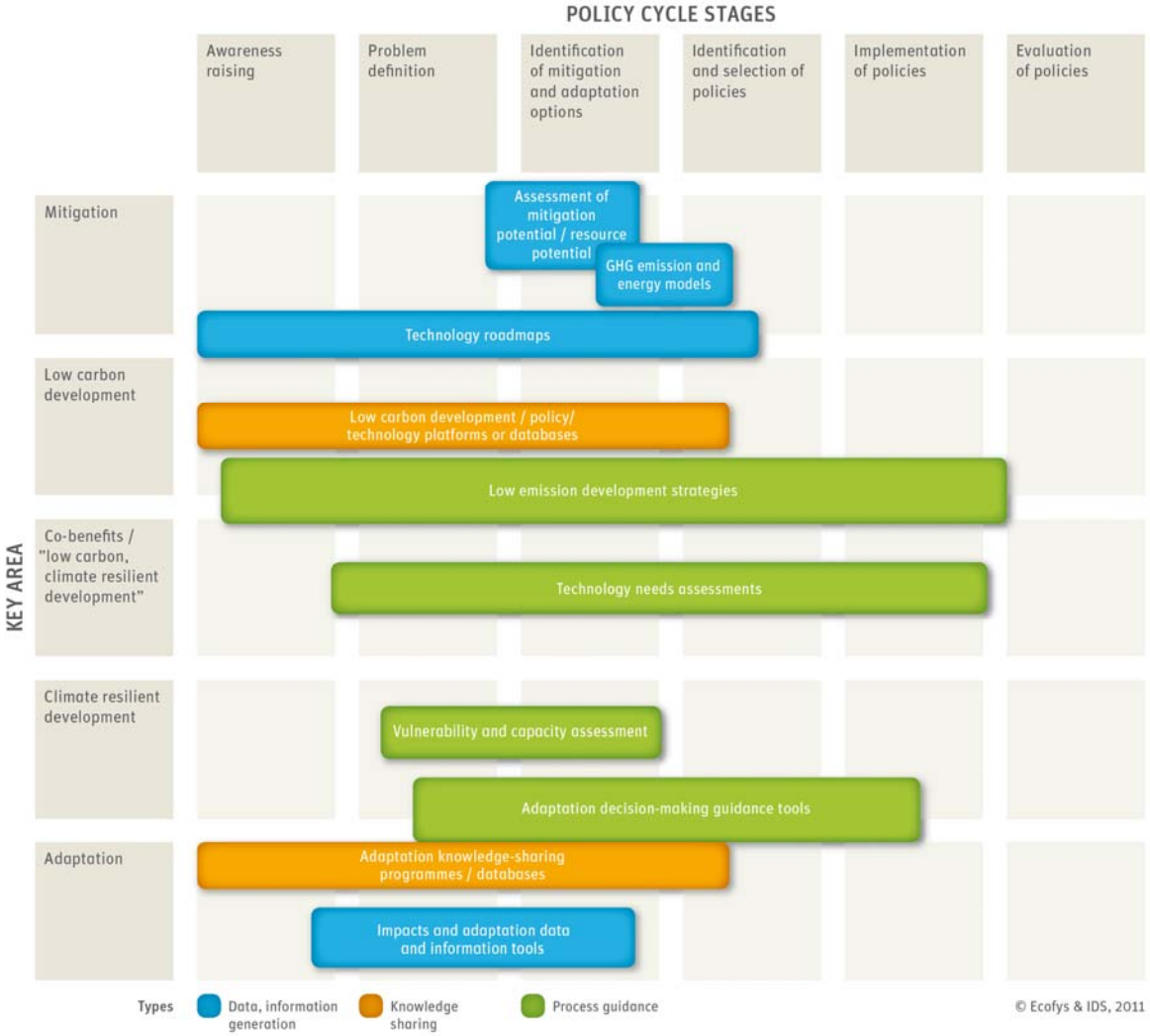

Figure 7. Location of tools within categories: according to climate compatible components and policy step

2.1.2 General observations on the tool categories

The most prominent observation from Figure 7 is that currently there is only one category that covers co-benefits or "low carbon, climate resilient development", namely the Technology Needs Assessments (TNA). Within the UNDP handbook (UNDP and UNFCCC 2010) adaptation and mitigation are regarded separately up until the prioritisation of technologies in light of development objectives. Within the context of potential overlaps discussed in Section 0 this shows, therefore, that the TNA addresses the integration of mitigation, adaptation and development only partially. As we will show in the intra-category analysis, there are other individual tools that address this area to some extent. From the tool developer survey, the full extent to which some of these tools are planning to do so, or are already addressing this area, remains unclear.

Our mapping identified a heavy bias towards early stages of the policy cycle with fewer tools covering the later stages. In particular, the identification and selection of policies are only covered to a limited extent by the tools identified in this study. One of the reasons for this could be that most developing countries have not dealt with the issue of climate compatible development for very long, if at all, and that they are currently, therefore, focusing on the early stages. Another reason might be that the selection, implementation and evaluation of policies is a fairly generic process, which does not require specific tools. These are also not required for climate compatible development.

Furthermore, tools summarised under the ***'data and information generation'*** typology often cover a single step or a couple of steps in the policy cycle, whilst those grouped under the ***'process guidance'*** typology typically span a range of steps. This seems logical, as ***'process guidance'*** tools as defined here aim at achieving the implementation of a policy/ strategy and often use ***'data and information generation'*** tools in the individual steps they cover to achieve their goal. However, there is clearly a lack of 'data and information generation' tools for the latter stages of the process (this could include best practice policy platforms).

Aside from the TNA, which focuses on identifying priority technologies for mitigation and adaptation in light of a developing country's short, medium and long-term (sustainable) development priorities, no other handbook was found to address the central area in the diagram. However a trend can be observed among LEDS towards integrating all three aspects. For instance the "UNDP Low emissions climate resilient development strategy" tool also heavily focuses on adaptation aside from mitigation.

2.1.3 Tool demand: user experiences and needs

The user survey was developed at the beginning of the project to identify the experience had by users of tools and methodologies for climate compatible development. Its aim was to gain a better understanding of what tools and methodologies users work with and what the benefits and challenges of these tools and methodologies are. Below are some key statistics which outline the survey results. The respondents were part of the CDKN roster of experts, the CLEAN network and the UNFCCC focal points for developing countries. The survey was sent out to more than 300 users. In total 82 practitioners responded.

2.1.3.1 Survey findings

The following findings emerged from the survey:

Concerning the background of the respondents:

- About **60% of the respondents work primarily on adaptation**, whereas the remaining respondents work primarily on mitigation. Some respondents worked on both issues.
- Respondents were relatively evenly spread across all regions, though **the majority worked in Africa**, **followed by Asia and Latin America.**
- Most respondents work for NGOs, followed by the private sector, governments (mainly developing country governments) and research organisations. **Survey respondents were mainly technical experts** (including from consultancies and the scientific community). Only about 5% of the respondents referred to themselves as 'policy-makers', despite having a much higher amount of respondents who worked for governments. This might have been due to the fact that another 5% of respondents referred to themselves as 'civil servants' for governments. There was a notable lack of response from in-country donors, therefore other engagement methods were applied to consult this user group. **About 95% of the respondents worked on projects with a development country focus at the time of the survey**.

Concerning the use of tools and methodologies:

- 1/3 **of the respondents mentioned they use rather generic methodologies for planning climate compatible development,** such as modelling, journal articles and interviews. **About 15% of the respondents work with tools and methodologies they developed themselves.** Many different tools were mentioned by the respondents, including both generic methodologies and specific tools. Only a limited number of tools were mentioned more than once (e.g. LEAP). The concepts of tools and methodologies were used interchangeably by the respondents. Most respondents reported that they work with a set of specific tools as well as with a set of specific methodologies (42%).
- **20 methodologies and 17 tools were mentioned by users**. There were slightly more tools/methodologies mentioned for adaptation than mitigation and some tools/methodologies were suggested to address both areas. 15 methodologies and 2 tools were mentioned as least useful; however the 2 tools had been mentioned by other users as being the most useful tools. Most answers were referring to generic methodologies (e.g. interviews, modelling).
- Respondents found that **most adaptation tools and methodologies have a direct link to development, while some mitigation tools and methodologies have a direct link to development** (e.g. LEAP). Users reported that 4 methodologies and 2-3 specific tools respond directly to climate compatible development. However all of these tools were very generic and thus excluded from this study.

Concerning key barriers:

- **Key identified barriers** to the use of tools and methodologies include**:**
  - **costs**,
  - limited **access** to tools / methodologies and data,
  - limited **technical expertise** to enable use of the tools / methodology,
  - the need for **guidance and training**, and,
  - tools and methodologies do not offer enough flexibility for the **local setting**.
- About 50% of the suggested tools had high costs associated with access ($300+) and all suggested tools required at least 3-5 days training. About 50% of the methodologies had no associated costs and less training required, mainly because some of them were generic.
- An additional issue is the access to licences and intellectual property rights needed.

2.1.3.2 Findings from interviews with country stakeholders

Results from the interviews with six in-country policy makers are summarised below. The findings are divided into those for mitigation and adaptation, reflecting the fact that three interviewees were mitigation experts and three were adaptation experts. Note that the findings do not necessarily reflect the country context as a whole, as the findings are derived from in-depth interviews with one individual policy maker from each country.

Findings from the interviews with mitigation experts

Findings discussed below are derived from in-depth interviews with experts from Chile, Israel and Rwanda.

Tools/Methodologies in use

Chile and Israel both committed to preparing their national communications and therefore perform studies analysing mitigation options and policies within the different ministries. For example, Chile used the LEAP and MESSAGE. Additional to these readily available tools they have also developed their own tools. Amongst these are Marginal Cost Curves, STEP and a non-energy sector mitigation analysis tool.

Chile started by developing a Low Emission Development Strategy (LEDS) under the “Mitigation Action Plans and Scenarios” (MAPS). MAPS, a 2-year, multi-stakeholder process supporting Chile’s green growth strategy and Nationally Appropriate Mitigation Actions (NAMAs) should complement the sector level plans that are under development in that context. Rwanda also plans to start a low carbon development strategy focusing on sectors such as transport, energy and waste management. However the expert did not mention the use of a specific methodology for that.

Israel, which is a high income country, took another approach. They have set goals for emission reductions. New projects therefore have to submit detailed plans based on modified CDM methodologies. Furthermore, they voluntarily report on GHG emissions, making use of a tool that they developed themselves and will start making use of PRTR (Pollutant Release and Transfer Register). To analyse mitigation options they applied economic based models to simulate policies and impact.

Both Chile and Rwanda refer to the TNA approach. Chile performed one in 2003, but does not have a follow-up planned. Rwanda is developing a TNA now with help from consultants and various stakeholders.

In summary, LEDS seems to be a focus of the countries interviewed. TNA, green growth studies, NAMAs, and MAPS are in use to achieve low emission development. Both Chile and Israel developed their own tools for mitigation analysis, due to a lack of these, for example, in the non-energy sector. From the predefined tools only Long range Energy Alternatives Planning System (LEAP) (Chile) and the Model for Energy Supply Strategy Alternatives (MESSAGE) were mentioned.

Gaps identified and barriers for take up of tools

Rwanda is setting up their climate strategy and the interviewee did not identify any specific mitigation tools currently being used. In the process of starting their strategy they identify a lack of tools for implementation and planning of projects. They also cite data collection and measurement to be difficult and identify a lack of human resources in the field of climate change impacts.

Chile and Israel both use tools and methodologies that are internationally used. They acknowledge that reinventing the wheel should be avoided for the sake of consensus. However, in addition, both countries developed their own tools; the expert from Israel mentioned that this is done in fields where they are at the cutting-edge of a given area, because international methodologies were not always the best available. Chile developed mitigation analysis tools due to a lack of such tools in the non-energy and transport sectors.

Both Israel and Chile identify a gap in mitigation tools that is able to quantify emission reductions. They see an importance for this in setting up NAMA proposals. With internationally recognised tools/methodologies, countries can justify their proposals and donors can analyse the proposed policies and programmes.

Need for integrated tools

All three country interviewees identified that mainstreaming environmental issues is required across projects of various sectors and ministries which do not have an environment and climate focus. The interviewee from Rwanda suggested that “Key ministries which have activities that may have an impact on the environment have an environmental expert who helps them to mainstream environment and climate change in their strategies”.

Israel states that CCD is being addressed separately in different working groups rather than taking an integrated approach; Chile also uses a separate approach in tackling CCD, though often the same people are involved in the different occasions.

Regarding the need for overarching tools for CCD, the opinions are divided. The Israeli interviewee does not see a need for such integration, and regards mitigation alone as difficult enough. However, the interviewee from Rwanda states a need to integrate climate change in all sectors and to incorporate the private sector as well. He would like to see a forum established, without specifying the type of forum, to discuss how CCD can be applied, with different ministries and other actors involved.

The country context is very important in choosing a methodology. Rwanda takes the in-country needs, capacity and readiness into account. Furthermore, they opt for tools and methodologies that build on existing approaches to reduce poverty. The Israeli interviewee stated that they take the capacity available in their country into account. They select tools from international best practice and when not available they will use their in-country capacity to create their own tool. The Chilean interviewee states that they always strive to have state of the art tools and methodologies, but they also would like their approaches to be comparable with analyses in other countries. Equally important are costs, time for training required and level of detailed information needed.

With respect to transferring national lessons learned to contexts of other countries, the experts from Rwanda and Israel point out that thorough planning and consistent ways of measuring, verifying and reporting are important in dealing with climate change issues. The expert from Rwanda further identifies the importance of a participatory approach.

Findings from the interviews with adaptation experts

Findings discussed below include the interviews with the experts from Senegal, Bangladesh and Belize.

Gaps, needs and barriers identified

Some of the key needs identified from the interviews with in-country stakeholders were:

National level planning tools for adaptation that suit a wide range of government departments, so that it can speak to, for example, departments of agriculture as well as environment and health. One interviewee stated that there is a "tremendous gap in tools that can facilitate rational adaptation decision making".[4] Tools specific to fiscal planning and for integrating disaster risk management into climate change were highlighted as needs. This also meant that tools should not be too specific, but able to be adapted to a wide range of regional and national circumstances.

Tools that are, or can be, adapted to the situation in a country. A weakness of many tools were said to be that they assume a high level of data availability at the national level, in particular climate data, which is an assumption that often does not hold true. Related to this was the call for tools that are user-friendly and that can help translate information that is already available. Tools which are available in languages other than English were also called for so that they can better respond to national contexts.

Costs are not essential, but depend on the context: Costs of acquiring or using a tool were not seen as critical for whether the tool would be used or not, particularly for the private sector. The important thing is whether the tool is seen to help save users' money in the long run. If governments, donors or other actors are convinced it would be useful, they would be willing to invest in it.

Other issues that came up included:

[4] Interview May 2011

- **Training:** to be useful, there will be a need to build capacities and expertise to use the tools. The recommended capacity building approach is through a training of regional trainers who can then roll out the use of tools in their respective regions.
- **User guidance:** there is a great need for user guidance on what tools that have been in use and that are viable, to raise awareness and to adapt them for use in different circumstances.
- **Time requirements:** an important criterion for the appropriateness of tools was also deemed to be the time needed for implementing it.

2.2 Selected tools for the in-depth analysis

As shown in Table 3 below, the number of tools were narrowed to a manageable amount that allows for a sufficient in-depth analysis without losing sight of the coverage within the landscape. The individual tools selected for the chosen categories outlined in Table show an uneven distribution of the tools and methodologies across the categories. For mitigation, the majority of tools can be found in the "energy and emission models" category. This is in line with the actual use of these tools as identified by the user survey, which showed that these were the most frequently used tools among practitioners. Other categories such as the "assessment of mitigation potential/resource potential" are under-represented. The reason for this could be that many of the actual assessments of mitigation potential are done on an individual study basis, and do not use a specific tool, as defined for this study. Yet others, namely the technology roadmaps, are relatively new in this field and may increase in number in the future.

Table 3: Tools identified and selected for consideration in in-depth analysis

Category #	Categories	Number of tools in the long list	Number of tools after applying exclusion criteria
1	Assessment of mitigation potential / resource potential	4	3
2	GHG emissions and energy models	23	16
3	Technology roadmaps	3	1
4	Technology Needs Assessments – Mitigation	1	1
5	Low carbon development / technology platforms or databases	8	7
6	Low Emission Development Strategies	13	7
7	Vulnerability and capacity assessment	5	6*
8	Adaptation process guidance tools	25	
9	Adaptation data and information provision tools	10	4
10	Adaptation knowledge sharing tools	14	4

* These tools fall under the category of Adaptation assessment and process guidance tools, combined from categories 7 and 8

Selection of categories and tools for in-depth analysis

For ***mitigation***, a range of tools were selected from three different categories to ensure each typology was also considered:

1. Assessment of mitigation potential / resource potential (data and information generation typology)
2. GHG emission and energy models (data and information generation typology), and
3. Low carbon development and technology platforms (knowledge sharing typology), and
4. Low Emission Development Strategies (process guidance typology), and
5. Technology Needs Assessment (process guidance typology)

These categories include a sufficient number of tools to be evaluated. The category "technology roadmaps" were excluded as the tools in this category are currently all of a global nature and are therefore less relevant in the context of this study (e.g. IEA Roadmaps IEA 2010).

The range of tools selected for in-depth analysis are outlined in Table 4 and reflect the landscape within a category, from easily accessible tools to tools that were more difficult to access. Accessibility was measured by looking at factors such as cost, user-friendliness, training requirements; in addition other factors were considered such as usage to date, coverage, and degree of stakeholder involvement. Given that the information at this stage was solely based on a literature survey, there is a possibility that certain aspects of tools have been overlooked. Furthermore, due to gaps in the data available at the time of the study, expert judgement of the project team was applied in the selection of shortlisted tools for in-depth analysis.

For adaptation, all four categories were represented. As shown in Table 4, the categories of 'vulnerability and capacity assessment' and 'adaptation process guidance tools' were combined into a new category called 'adaptation assessment and process guidance tools'. The merging was due to the two groups sharing a number of characteristics.

Table 4: Tools analysed

Category	Tool Names
Assessment of mitigation potential / resource potential	Mc Kinsey and Company Marginal Abatement Cost Curves (MACC) ECN NAMAC curve GEOspatial Toolkit SWERA RREX
GHG emissions and energy models	LEAP MARKAL/ TIMES The Energy and Power Evaluation Programme (ENPEP-BALANCE) RETScreen GAINS
Low carbon development / technology platforms or databases	Reegle HEDON Household Energy Network ClimateTech Wiki OpenEI
Low Emission Development Strategies	Mitigation Action Plans and Scenarios (MAPS) ESMAP Low Carbon Growth Country Studies LEDS framework and toolkits
Technology Needs Assessment (TNA)	UNDP Handbook for technology needs assessments
Adaptation assessment and process guidance tools	CARE CVCA Red Cross/Red Crescent Climate Guide CEDRA GiZ Climate Proofing for Development CRiSTAL
Adaptation data and information tools	MAGICC/SCENGEN Climate Wizard PRECIS FAO CLIMPAG
Adaptation knowledge sharing tools	Africa Adapt Adaptation Learning Mechanism (ALM) WeAdapt World Bank Climate Change Knowledge Portal*

*Also classified as adaptation data and information tool

3 Intra-category analysis: Comparative discussion of categories with illustrative examples

This section provides an analysis of the identified tools within the defined categories, based on a questionnaire sent out to the tool developers, some follow-up discussions with the tool developers and the team's own assessment. It includes an intra-category analysis (comparison of tools and methodologies within categories) for the six categories identified. Each subsection describes a different category and includes in the beginning a summary based on developers' assessments.

Introduction

Developing countries are faced with a series of challenges in the light of climate change. One of the key challenges national governments are facing is how to adapt to a changing climate and how to enable development in a changing climate. At the same time, many national governments –particularly in emerging economies- are faced with growing emissions which will need to be reduced in the long-run.

This comparative analysis of tools for climate compatible development can help national policy makers, technical experts and other users to compare the range of existing tools and to identify the tools which are the most suitable for their specific needs. Some users will be interested in tools more related to adaptation, other users will be interested in tools more related to mitigation, another group of users will be interested in tools which relate to both adaptation and mitigation and respond to a combined approach to climate compatible development. Hence, this analysis and the user guide responds to these needs of individual users and national governments in developing countries.

Through the user survey this study identifies a number of barriers to the use of the tools (Section 0). Barriers included the cost of tools, limited access to tools, limited availability of data, limited technical expertise to enable the use of tools, lack of training material and a limited possibility to adjust to local circumstances. From a tool perspective Section 0 provides an overview of existing screening studies of tools. While these existing studies provide a useful overview of the tools they lack two important aspects: they do not regard CCD as a whole and, more importantly, they do not take a strong user perspective in their assessment of the tools.

This section attempts to fill this gap. By taking the barriers identified as a basis, the project team developed a set of indicators that allows a judgement of how fit for the user current tools are (for a full list of the indicators see Appendix B). The study thereby acknowledges that this is not a simple, straight forward matter. For instance cheap tools are not more useful than expensive tools per se, as the latter might address the desired impact much better. Hence it is much more the aim here to shed light on the overall 'landscape' of tools.

The analysis of each category is thereby divided into three sub-sections. The first sub-section (area of focus) provides an overview of how well the tools address the key areas of CCD: adaptation, mitigation and development. The second sub-section (tool design) provides an overview of some of the design aspects of the tool. While highly important, it is nearly impossible to estimate the actual impact a tool will have. On the mitigation side such impacts could broadly include direct or indirect

GHG emission reductions achieved, co-benefits or mitigative capacity. On the adaptation side these are even more diverse (see also Table 1). Therefore this section can only give an indication of the potential impact of the tool. The last section (access usability) attempts to provide an indication of the accessibility of the tool.

It is important to note here that while some of the barriers identified in the user survey are directly connected to the tools, others can only be influenced by them to a limited extent. Two important aspects include data availability in the country and the existence of expertise in the country.

3.1 Adaptation data and information provision tools

Table 5 presents the assessment of tool developers of their own tools and methodologies that are primarily related to the provision of adaptation data and information. Their assessment includes an indication of the policy cycle their T&M can be used in, key areas the T&M are focused on, and additional observations.

Table 5. Summary of 'adaptation data and information provision tools' category analysis

	Policy Cycle						Area			Emphasis / observations
	Awareness raising	Problem definition	Identification of options	Identification & selection of policies	Implementation of policies	Evaluation of policies	Adaptation	Mitigation	Development	
Climate Wizard	✓	✓	✓				✓	✓	✓	• Focus on all user groups but emphasis on technical experts and development practitioners • Internet-based tool • Tool free to acquire
FAO CLIMPAG	✓	✓	✓	✓	✓		✓		✓	• Also available in French and Spanish (part) • Internet and hardcopy/CD Rom • Specific to agriculture, food security and disaster risk management • Tool free to acquire
MAGICC /SCENGEN	✓	✓	✓	✓		✓	✓	✓		• Global in scope • Main audience national policy makers and technical experts • Tool free to acquire
PRECIS	✓	✓	✓				✓	✓	✓	• Main focus on international and national levels, e.g. informing national UNFCCC communications • Available in English (online course soon also in Spanish) • Tool free to developing countries
Shared features										• Most tools focus on international and national level policymakers and technical experts • Except for FAO CLIMPAG, all tools currently available only in English

✓	Some of this is done by the tool
✓	A lot of this is done by the tool
✓	This is the most important aspect of the tool.

3.1.1 Area of focus

Key areas

The focus of tools in this category is primarily to generate data for adaptation planning processes. Tools are generally of two main types: first, tools that provide climate scenario projections (e.g. MAGICC/SCENGEN), and second, tools that combine climate information with biophysical or socio-economic data to make impact assessments for a particular sector or geographic area (e.g. FAO CLIMPAG). The latter role overlaps with knowledge sharing tools, and to a lesser extent, process guidance tools.

Linkages to other areas

Many of the tools in this category are global in scope. The key focus of these tools will be on assessments of risks, vulnerabilities and impacts and thus have a primary emphasis on adaptation. However, mitigation is highlighted by the tool developers, in that both climate change projections and impacts assessments inform mitigation strategies. Linkages to developing country contexts are clearly articulated by some tools (e.g. PRECIS), but less by others.

3.1.2 Tool design

"Most useful" tool based on user survey

The user survey revealed that the adaptation data and information provision tools were recommended as "most useful" tools by about 10% of the users. Nevertheless some users mentioned limitations posed by high costs and limited access due to slow internet connectivity and restricted data availability. One user pointed out that some of the modelling tools pose limitations to developing country governments and organisations due to intellectual property rights issues on top of general access and cost limitations. The users further indicated that this category of tools has the potential to take into account not only adaptation aspects, but also development and mitigation aspects.

Geographic

These tools are typically global in scope, and as earlier mentioned, many of them do not have an exclusive focus on developing countries.

Coverage/policy cycle

Perhaps not surprisingly, these tools tend to cluster around the early stages of policy and strategy development, namely problem definition and awareness-raising. However, some of the tools – especially the "platform-based" ones such as FAO CLIMPAG and the World Bank Climate Change platform, also highlight identification and selection of particular solutions. However, tools have (so far) little or no emphasis on monitoring and evaluation of outcomes as part of the tool. This is because they tend to form discrete inputs to processes implemented by a range of different actors, unlike the process guidance tools which tend to be more tightly linked to organisations' aims for mainstreaming or climate proofing.

Governance level

Governance level of these tools tends to be international to sub-national and, in some cases, at the watershed level. Advances in scenario downscaling (dynamic and statistical) have enabled local level

climate projections, although these are associated with major uncertainties, in particular in countries with limited availability of climate data, such as large parts of Africa. The interest in sub-national climate data can be seen in the case of seasonal climate forecasts, used over the last 15 years in Latin America, Africa and Asia.

Stakeholder involvement

Unlike adaptation process guidance tools, stakeholder involvement in this group of tools tends to be limited to academic communities and, in some cases, national level policy makers and NGOs, the latter helping with defining the need for climate data.

3.1.3 Access / usability

Costs

Like with most other adaptation tools, all of the illustrative tools looked at here (and the data needed to use them) are free to users in developing countries. Costs are incurred through training and implementation, however.

Training requirements

There are no training requirements for the information platforms, while the scenario projection tools (such as PRECIS and MAGICC/SCENGEN) require 1-5 days of training (and assume a level of technical capacity by the implementers). Use of the tools to completion can in some cases take more than 12 weeks spread over a year (PRECIS) while the other illustrative tools take up to about 2 weeks to implement.

Accessibility

Involvement of user groups of climate information is increasing to reflect the need for climate data that are relevant to users' needs and for a format that can be easily used and understood. Seasonal forecasts, as mentioned above, have helped draw attention to the need to build bridges between developers of forecasts and the data needed for decision making at different governance levels and across sectors.

Audience

The audience of these tools are mainly national policy makers and technical experts for the climate scenario-based tools (e.g. MAGICC/SCENGEN and PRECIS), but also development practitioners. The 'platform-based' tools reported the broadest audiences.

Implementation requirements

Unlike many of the adaptation process tools, most tools in this group assume a great deal of independence on the side of the users, but some require links to the developers to gain access to data for scenario projections (such as PRECIS).

Guidance material

Some tools come with downloadable user/guidance manuals (such as MAGICC/SCENGEN and PRECIS), and others provide links to projects or case studies (e.g. World Bank Climate Change Platform).

Languages

With the exception of FAO CLIMPAG, all tools in this category are available in English only (although PRECIS will soon include an online course in Spanish).

3.2 Adaptation knowledge sharing tools

Table 6 presents the assessment of tool developers of their own tools and methodologies that are primarily related to knowledge sharing for adaptation information. Their assessment includes an indication of the policy cycle their T&M can be used in, key areas the T&M are focused on, and additional observations.

Table 6. Summary of 'adaptation knowledge sharing tools' category analysis

	Policy Cycle						Area			Emphasis / observations
	Awareness raising	Problem definition	Identification of options	Identification & selection of policies	Implementation of policies	Evaluation of policies	Adaptation	Mitigation	Development	
ALM	✓		✓	✓	✓		✓	✓	✓	• Strong emphasis on national policy documentation • Global focus • Translation of pages using Google plugin
Africa Adapt	✓	✓	✓		✓		✓		✓	• Strong focus on sub-national/community initiatives • Specific to Africa • Mix of user and host-generated content • Bilingual (French/English) content and navigation
WeAdapt	✓	✓	✓	✓	✓	✓	✓	✓	✓	• Strong focus on sub-national/community content • Global coverage • Mix of user and host-generated content • Some content in French and Spanish
World Bank Portal	✓	✓	✓	✓			✓	✓	✓	• Global coverage • Emphasis on national scale • Content sourced by hosts • No translation
Shared features										• No or low-cost • Minimal training requirements for most users • Primarily web-based

✓ Some of this is done by the tool

✓ A lot of this is done by the tool

✓ This is the most important aspect of the tool.

3.2.1 Area of focus

Key areas

Adaptation knowledge sharing tools contribute to establishing a shared evidence base upon which future adaptation planning and action (at a range of scales) can draw. As such, they provide users with a less direct and context-specific guidance to a specific decision making process than the other

types of tools. However, they can offer a sense of potential options and outcomes, based on others' experiences, as well as space to document their own experiences.

Linkages to other areas

The majority of platforms are focused on adaptation-specific issues, with some integrating a stronger focus on development as well. None of those, reviewed in depth, combine a strong focus on both adaptation and mitigation. However, the nature of these platforms allows for an easy expansion of areas of focus, provided there is an overlap with the communities of current and potential users.

3.2.2 Tool design

"Most useful" tool based on user survey

The user survey revealed that the adaptation knowledge sharing tools play an important role, but have not been indicated as the "most useful" tools by the users. The reason for this might be that the users work with other types of tools for their daily tasks, but are less aware of the opportunity of sharing their knowledge with others. This may point to the already-recognised gaps in the dissemination and the sharing of knowledge about climate change adaptation between users, as well as the fact that many of these initiatives are new and fast-evolving.

Coverage/Policy cycle

Given the nature of knowledge sharing tools, the policy steps that most tools/platforms tend to focus most explicitly on are awareness raising and identification of adaptation options (through the communication of case studies on impacts and implementation of options). Some of the tools have also placed emphasis on problem definition (through guidance on vulnerability assessment, for example) and policy selection/implementation (in the case of the ALM only). It is noteworthy that there is little to no focus on evaluation, though there is potential for communities of practice to bring important lesson-learning to this relatively underdeveloped stage of the adaptation policy cycle.

Geographic coverage and governance level

Knowledge sharing platforms tend to span the full range of governance levels, from international focus (ALM and World Bank platforms) to more restricted areas of focus (AfricaAdapt – exclusively on Africa) to a stated focus of community-based examples (AfricaAdapt and WeAdapt). This is in line with the breadth of evidence and resources on adaptation available for documentation and dissemination. The nature of the resources shared is also influenced by the scale of governance in question, with policy information concentrated on those tools which have international to national focus, and those with more localised focus featuring a stronger emphasis on case studies of adaptation initiatives. It is worth noting that the focus on community-based examples may raise challenges in terms of accessibility, which will be explored below.

Stakeholder involvement

The range of stakeholders whose involvement is sought by these tools spans the full range of actors, with some initiatives placing equal importance on all stakeholder groups, but with many prioritising NGO and research engagement (presumably in documenting and sharing some results from the

initiatives they are leading). The ways in which stakeholders are involved range from one initiative to another. Some users are able to contribute content and experiences directly through the tool (AfricaAdapt, WeAdapt), whilst others contribute via administrators (ALM) and others where there isn't a clear call for user submissions (World Bank). The stakeholder group least focused upon appears to be the private sector, which suggests a possible emerging gap should there be a rise in private sector involvement in adaptation work, or a desire to draw stronger linkages between adaptation and mitigation.

3.2.3 Access / usability

Costs

As noted in the overview to this section, the majority of knowledge sharing tools are internet based (some exclusively web-based) and free to use. The primary exception to this is AfricaAdapt which also makes extensive use of paper-based and face-to-face approaches to overcome technological limitations in Africa and are freely available on request.

Training requirements

Generally speaking the platforms do not require extensive training to be used. However, depending on their level of sophistication, there can be different degrees of use ranging from simple browsing of existing content, to more advanced functions (particularly in the case of WeAdapt for example) such as contributing content, tailoring outputs, etc. That said, nearly all of the tools appear to assume a relatively high degree of general computer literacy. While all of the illustrative examples examined include a user's guide, these vary in the degree of detail and assumed previous knowledge of web-based text editors: complementary tools such as YouTube (in the case of AfricaAdapt), use of Google maps, etc. For some audiences this would not present a significant challenge, while for others, this may make certain tools virtually unusable for anything beyond basic browsing.

Similarly, the time required for use is generally seen to be very low, though if users are aiming to use some of the more sophisticated functions of the platforms, (in the case of WeAdapt or the World Bank Platform) or require additional time to use complementary tools alongside the knowledge sharing tool (e.g. for AfricaAdapt) the time required can rise considerably.

Accessibility

Due to their web-based and low-cost nature (most are designed to operate with little more than a high-speed internet connection) the tools have been widely used in all cases.

Financing

As costs are generally low for use of these tools, most do not offer financing. AfricaAdapt does offer funding for promoting knowledge sharing with marginalised communities and for events to convene its members. WeAdapt has offered training through external funding in the past.

Extended coverage

All of the illustrative tools in this typology were seen to be usable beyond their original focus, primarily in terms of reaching into different sectors or geographical regions. This may suggest that tools within

this typology are well-suited to modification to take into account a broader area of focus, such as mitigation or development.

Language

The vast majority of resources and guidance available through the knowledge sharing tools are only available in English. Of the illustrative examples reviewed, only one offered navigation in another language (AfricaAdapt, French) and two offered content in more than one language (AfricaAdapt, WeAdapt), while ALM offers online translation of its pages. Given that much of the implementation of adaptation initiatives occurs at a local scale where English is rarely the spoken language, this suggests a significant gap in terms of building a community of practice that engages the full range of stakeholders working on adaptation.

3.3 Adaptation assessment and process guidance tools

Table 7 presents the assessment of tool developers of their own tools and methodologies that are primarily related to the assessment of adaptation needs and process guidance for decision making. Their assessment includes an indication of the policy cycle their T&M can be used in, key areas the T&Ms are focused on, and additional observations.

3.3.1 Area of focus

Key areas

This category comprises two categories in Figure 4, namely vulnerability and capacity assessment and adaptation decision making guidance tools. These three categories are discussed together as they have a common aim to aid adaptation decision processes, whether at local, sub-national or national levels. They include local level vulnerability and adaptation assessments (such as CARE's CVCA) as well as decision guidance tools on adaptation focused more on national and sub-national levels (such as the Red Cross/Red Crescent Climate Guide).

Linkages to other areas

Most of the tools in this category are situated along the adaptation-development continuum in Figure 1 above, with a particular bias towards the "vulnerability" side, less on decisions for discrete adaptation interventions. Climate risks and stressors are mapped through local level risk perceptions based on traditional knowledge, and partly climate scenario projections. Community-based tools such as CARE's CVCA and CEDRA involve participatory exercises for mapping risks and hazards, and the resources that people depend on for their livelihoods.

Technology Needs Assessment is the only tool that gives equal attention to adaptation and mitigation in a development context, and is thus situated more towards the co-benefits access (though with a focus on development pathways). Other tools largely focus on adaptation, but with linkages to mitigation through attention to e.g. tree planting, and to making sure that adaptation actions that are recommended from the tools do not lead to increased emissions.

Table 7. Summary of 'adaptation assessment and process guidance tools ' category analysis

	Policy Cycle						Area			Emphasis / observations
	Awareness raising	Problem definition	Identification of options	Identification & selection of policies	Implementation of policies	Evaluation of policies	Adaptation	Mitigation	Development	
CARE CVCA	✓	✓	✓	✓		✓	✓	✓	✓	• Designed to be applied in a range of different contexts that users can adapt to their particular needs • Main focus adaptation and development, but some focus also on mitigation • Currently available in seven languages
CEDRA	✓	✓	✓	✓	✓	✓	✓	✓	✓	• Focus on climate change and environmental sustainability/degradation • Deliberately not sector-specific • Designed for local level NGOs • Primary attention to adaptation and development, but also focus on reducing emissions from development outcomes
GiZ Climate Proofing for Development	✓	✓	✓	✓	✓		✓		✓	• Aims to reduce risks from climate change in development programmes • Designed to be a "do it yourself" tool • Light training requirements • Focus on adaptation and development • Broad target audience
Red Cross/Red Crescent Climate Guide	✓	✓	✓		✓		✓		✓	• Main audience is Red Cross/Red Crescent Societies, but can also be used by other organisations • Little training needed to use it, but user must work with partner organisation • Focus mainly on national and regional/sub-national levels of governance
Shared features										• All tools are free to acquire and use, but training and implementation will incur costs • All tools used in more than 10 countries •

✓	Some of this is done by the tool
✓	A lot of this is done by the tool
✓	This is the most important aspect of the tool.

3.3.2 Tool design

Fit with user demand

The adaptation assessment and process guidance tools were the most popular adaptation category with the users. The user survey revealed that about 20% of all the recommendations for tools that were classified as 'the most useful' tool by the user were within this category. Some of the users preferred this category of tool to other categories, because many of the tools in this category are well accessible, inexpensive and accompanied by paper-based handbooks or instructions. This could be one of the advantages this category of tools has over other categories which require computer access/internet access and where access can be expensive. One user remarked that "Due to slow internet it is always difficult for us to download tools. I would prefer to use software based tools but which are quite expensive". The users further indicated that this category of tool has the potential to take into account not only adaptation aspects, but also development and mitigation aspects.

Geographic

Few if any of the tools are geographically specific. Indeed, in many cases the tools are developed explicitly to cover a wide range of geographical contexts, offering generic guidance on decision making processes.

Policy cycle

Although in principle covering the whole cycle from awareness-raising to evaluation of outcomes, tools in this category tend to be situated at the early stages of the policy cycle. Monitoring and evaluation of adaptation initiatives is still in its infancy, though it is receiving increasing attention (Silva Villanueva 2010). Among the illustrative tools, monitoring and evaluation of outcomes were generally not covered in great depth. However, this appears to be an area that is given increasing attention. CEDRA, for example, is planning a more detailed evaluation for its next version that is due in 2012.

Governance level

The focus of the tools in this category ranges from mostly local or village level (CARE's CVCA, CEDRA) through to sub-national and national (Red Cross/Red Crescent Climate Guide). Some of the process guidance tools focus more on the informal and civil society organisations (including NGOs), but even if this is the case, there will usually be an element of either working with the government or trying to influence policy processes at local or national levels. An important point here is the complements between tools focusing on *agency,* namely household or community resource access and people's capacity to respond to shocks and stressors (typically community based tools like CARE's CVCA, CRiSTAL and CEDRA), and those putting more emphasis on *structures* that may hinder or support household livelihood strategies (such as TNA and GiZ' Climate Proofing for Development).

Stakeholder involvement

Stakeholders are involved through the tool development and implementation process in many of the tools, though the types of stakeholders differ. Community-based tools such as CVCA and CEDRA typically involve NGOs, whereas the Red Cross/Red Crescent has engaged more with IGOs.

3.3.3 Access / usability

Costs

Like with most other categories, this group of tools tends to be freely available on the internet (in the form of manuals, handbooks and supporting materials), while costs are incurred in the training and implementation components. Costs vary widely, from those incurred by individual participants attending training workshops to the personnel needed to implement the tools. Some – but not all – offer financial assistance for training through their local partners, or the organisation's own projects.

Training requirements

Developers' estimates of training requirements vary. Some assert that no training is required; others see training as an essential part of the tool itself. The implementation time varies, but generally takes from 5-12 weeks (sometimes longer) if done full-time. However, for most tools implementation is spread over a longer duration. For CEDRA, the period from the first workshop to the final report is specified as 9 months; 3 months after the last workshop. Where specified, training for the illustrative tools ranges from 1-8 days, in some cases distributed over two separate workshops. All illustrative tools have some accompanying guidance and case study material available, which is being developed further as the tools gain more experience and data.

Accessibility

Most tools in this category will have an internet-based component (guides and handbooks), but most also rely on downloadable step-by-step handbooks that require little additional equipment for implementation.

Audience

Audiences for these tools range from households (raising awareness of climate risks and understanding vulnerabilities and adaption constraints), village leaders (local level planning/resource allocation) to sub-national and national level policy makers (raising awareness of the impacts of climate change at a local level).

Implementation requirements

Tools range from those that are closely linked to the organisations that developed the tools (e.g. Red Cross/Red Crescent Climate Guide, CEDRA) to those that can be implemented on a 'do it yourself' basis (e.g. GiZ' Climate Proofing for Development). For CEDRA, independent implementation is not encouraged as the implementation process is considered integral to the understanding of the tool itself. By their nature, tools in this category are intended to be quite broad, and use outside its core focus area is possible.

Guidance material

Most of the tools will have case study material either online or in hardcopy format.

Languages

All illustrative tools are available in more than one language, and the trend appears to be an increasing availability also in other languages. For example, CARE's CVCA is also available in French, Spanish, Portuguese, Vietnamese, Bahasa Indonesia and Thai.

Table 8. Summary of 'assessment of mitigation potential / resource potential' category analysis

	Policy Cycle						Area			Emphasis / Observations
	Awareness raising	Problem definition	Identification of options	Identification & selection of policies	Implementation of policies	Evaluation of policies	Adaptation	Mitigation	Development	
McKinsey MACC	✓	✓	✓					✓		• Stakeholder involvement • Mitigation focused with a focus on potential, costs and investment of over 200 mitigation opportunities • Need co-operation with McKinsey • Detailed data access limited to project partners; published reports provide summary results [5]
ECN NAMAC	✓		✓	✓				✓	✓	• Easily accessible (free of charge) • Broad country coverage (104 n-AI countries) • Support for international negotiation • Low stakeholder involvement • Mitigation focused • Less attention to national and sub-national implementation due to limited resolution
Geospatial Toolkit	✓		✓	✓				✓	✓	• Worldwide geographical overview of resources • Easily accessible • Low requirements and costs • Limited resolution within countries • Only identification and selection of options and policies • Mitigation focused
SWERA RREX	✓		✓					✓	✓	• Detailed overview of resources and further factors per country • Easily accessible (download internet) • Low requirements and costs • Only limited number of countries covered (12) • Stages after identification of mitigation options • Link to adaptation and development - mitigation focused
Shared features										• Quantitative support for earlier stages of the policy cycle (mitigation) • If analysis for a particular country available - easily accessible and low costs • Good global coverage • Almost entirely focused on mitigation • Less emphasis on later policy cycle steps, starting with policy selection

✓	Some of this is done by the tool
✓	A lot of this is done by the tool
✓	This is the most important aspect of the tool.

[5] All sharable data is in the published reports, with details in the appendix of the global cost curve report and the appendices of the national reports

3.4 Mitigation tools: Assessment of mitigation potential / resource potential

Table 8 presents the assessment of tool developers of their own tools and methodologies that are primarily related to the assessment of mitigation potential and/or resources potential. Their assessment includes an indication of the policy cycle their T&M can be used in, key areas the T&M are focused on, and additional observations.

3.4.1 Area of focus

Key areas

The tools within this group range from resource assessment tools for renewable energy (GEOspatial Toolkit, SWERA RREX), to broader mitigation assessment tools (Marginal Abatement Costs Curves - MACC - by organisations such as McKinsey & Company, ECN). They are primarily used to provide information for mitigation in the form of potential and associated costs. Resource assessment tools tend to be heavily GIS focused and lay out resource locations for renewable energy. Mitigation assessment tools tend to be broader in that they represent energy efficiency, forestry and further options for reducing CO_2 emissions. However, due to their more aggregate nature, they lose some detail in the information and are more prone to assumptions than the resource assessment tools.

Linkages to other areas

All of the tools in this group almost entirely focus on mitigation. They are rather technical in their focus and do not include any linkages to adaptation. Instead, currently they have to be combined with information tools for adaptation. Potential fields for linkages exist however. One could, for instance, imagine the development of 'Mitigation and adaptation cost curves' taking account of the linkages between the costs (Halsnæs 2001). Another idea could be the illustration of GIS information for mitigation potential together with GIS information for adaptation (vulnerabilities).

3.4.2 Tool design

Fit with user demand

Only 5% of the respondents reported the use of tools within this category, in particular they mentioned Marginal Abatement Cost Curves. Furthermore, two respondents mentioned MACC as least useful tools, due to a lack of data available, and one respondent mentioned that he would like to have access to MACC. In contrast to this, the tool developer survey identified that all tools are used in over 10 countries. This seemingly large discrepancy between the demand and supply side, especially with respect to the resource assessment tools, could be explained through a difference in perception of what constitutes a tool.

Policy Cycle

In the first instance, tools within this category are especially suited for the 'Identification of mitigation and/or adaptation options'. However all tools raise awareness among various stakeholders through providing information on the mitigation potential and their costs in a transparent manner. The later stages are not supported by these tools, which can be explained by their rather technical nature.

Geographical usage

Marginal abatement cost curves can be potentially developed for any country worldwide. To date, the McKinsey GHG abatement cost curve is a tool for global and national assessments. Two releases of the global cost curve have been published with regional breakdowns. Additionally, specific country cost curves have been developed for about 30 countries. ECN has collected data for its MACC for 104 non-Annex 1 countries. Of the resource assessment tools examined, SWERA RREX contains data for the whole world. However, the resolution and therefore quality of the data varies widely from country to country. The Geospatial toolkit however is limited to a number of countries (13) spread across the world regions.

Governance level/Scope

Similar to all other tools and categories examined, the national level is the main governance level of this category. One of the exceptions is the ECN MACC, which primarily aims at the international level in supporting the international climate negotiations. McKinsey has developed a global greenhouse gas cost curve as well as various national ones. The Geospatial toolkit contains detailed national but also regional data. SWERA RREX provides a global overview of resources and therefore can be used at an international level, but also provides high resolution regional data for some countries.

Stakeholder involvement

The ECN MACC was put together entirely based on literature research and without stakeholder involvement. The creation of MACC from McKinsey includes the involvement of key stakeholders from the government, the private sector, NGOs and the scientific community. Both resource assessment tools included heavy involvement from a number of stakeholders from the scientific community, as well as national policy makers and donors in their creation.

Output monitoring

Neither MACC initiatives cover any explicit monitoring of their outcome. Monitoring can be performed by the user, however, through comparing the options provided by the MACC with the actual implemented options. The resource assessment tools do not provide for any monitoring either.

3.4.3 Access / usability

Cost

Costs vary widely for the tools examined. The McKinsey global cost curve is readily available on the website, as are a number of country cost curves. Engaging McKinsey to develop a cost curve involves a cost, which is at the high end of the spectrum of the tools discussed here. For McKinsey's Climate Desk tool users can take a license for and in some cases free licenses are granted upon request. The more aggregated ECN MACCs are available for free on the internet and are intuitive in their use. The resource assessment tools are all available for free on the internet through either a web application (SWERA RREX) or for download (Geospatial Toolkit). Both provide guidance and do not require any additional training.

Training requirements

Of the tools examined, only the McKinsey MACC requires special training to use. The length of training depends upon the number of staff trained. In general 8-10 man days of training are required before using the tool.

Accessibility (Formats)

The resource assessment tools and the ECN MACC are fully accessible through the internet. However, the Geospatial toolkit is only available for a limited number of countries. Development of further countries has to go through the tool developer NREL directly. Through McKinsey's Climate Desk, licensed users can access the full details of the global cost curve results, assumptions and have simulation options. The McKinsey cost curve model is currently a proprietary model.

Audience

The primary audience of all tools are national policy makers. Due to the technical nature of the tools however, technical experts and the scientific community are also a major focus of all tools. In-country donors, however, are not a major focus of any of the tools.

Implementation requirement

The resource assessment tools and the ECN MACC are all DIY tools that do not have any major implementation requirements. McKinsey can be engaged to develop a MACC for a country, region, city or company. Duration of the engagement depends on its scope (e.g. any industry deep dives; investor perspective etc). A usual duration is 2-4 months.

Case Study - Guidance Material

Guidance material is available for all tools, for the resource assessment tools and the ECN MACC on the web pages and for McKinsey through the company. Case studies are available on the McKinsey web page. The Geospatial toolkit countries are case studies in themselves. Case studies are however not available for the ECN MACC and SWERA RREX. It remains unclear whether these would be useful here.

Languages

All tools in this category are only available in English.

3.5 Mitigation tools: GHG emission and energy models

Table 9 presents the assessment of tool developers of their own greenhouse gas emissions and energy models. Their assessment includes an indication of the policy cycle their T&M can be used in, key areas the T&M are focused on, and additional observations.

Table 9. Summary of 'GHG emission and energy models' category analysis

	Policy Cycle						Area			Emphasis / observations
	Awareness raising	Problem definition	Identification of options	Identification & selection of policies	Implementation of policies	Evaluation of policies	Adaptation	Mitigation	Development	
GAINS			✓	✓	✓	✓		✓		• Very easy to use (online tool) • No data requirements • Very broad sectoral coverage (also non-energy) • Free of charge to access/ use • Limited to mitigation • Only useful to a limited extent on the national level
ENPEP-Balance	✓	✓	✓	✓	✓	✓		✓	✓	• Detailed modelling with market based simulation • Broad audience; can be used by many stakeholders • Time for implementation relatively long • complex to implement and develop
LEAP	✓	✓	✓	✓		✓		✓	✓	• Relatively easy to access, use and acquire • Broad audience; easily accessible • Data/ resource requirements relatively low • Good coverage of whole policy cycle • Limited complexity of modelling; simplification of processes
Markal-Times	✓	✓	✓	✓	✓	✓		✓	✓	• Detailed modelling with good resolution of technical aspects • Once build flexible and easy to apply to various policy questions • complex to implement and develop • high data/ resource requirements • Time for implementation relatively long
RET-Screen		✓	✓	✓		✓		✓	✓	• Easy to access, use and acquire • Free training resource available • Language availability • Limited to project scope • Does not take account of economic interactions
Shared features										• Tools in this category are very frequently used • Support numerous stages in the policy cycle through analysis • Limited to no stakeholder involvement • Limited link to development • Limited to no process guidance • Limited to mitigation mainly

✓	Some of this is done by the tool
✓	A lot of this is done by the tool
✓	This is the most important aspect of the tool.

3.5.1 Area of focus

Key areas and linkages to other areas

The models in this group are clearly focused on mitigation. More precisely they often focus on the energy sectors and only few have other sector-based focuses as well (e.g. Gains). The latter are however not very detailed at sector level and provide mostly global data. Development aspects are rather secondary. As one developer put it, 'the focus of the tools is often mainly on technology development'.

3.5.2 Tool design

Fit with user demand

Within our user survey, 34% of those interviewed used tools out of this category, which indicates the frequent use of tools in this category, as this was by far the largest number of tools used out of one category. The tool-developer survey supported this examination; each of the examined tools is used in at least 10 or more countries (some even in 200 countries, e.g. RETScreen). Furthermore two users identified LEAP as the most useful tool and others have addressed that they would like to have access to LEAP and MARKAL but lack the resources.

Geographical usage

GHG emission and energy models can and have been applied in all world regions. Models tend to be rather specific rather than geographically specific.

Policy cycle

In principle these models can provide support across the whole policy cycle. Their main focus lies on the identification of mitigation options and, though to a lesser extent, on the identification and selection of policies. However, due to the possibility of them being used flexibly, they are also often used for other steps in the policy cycle such as the evaluation of policies.

Governance level/Scope

The majority of the tools in this group are aimed to support national level decision makers. However some also support more sub-national levels going down to the project level (RETScreen). Many of these tools are further aimed at supporting international decision making processes through informing on national characteristics such as mitigation scenarios.

Stakeholder involvement

For most of these tools stakeholder involvement is very limited. The tools in this category can be applied by a single person or a small group of people. An exception here is LEAP which, through its transparent setup, can be used in a stakeholder process.

Output monitoring

Output monitoring and evaluation is mainly limited to monitoring user statistics. Most tools do not explicitly include a method for monitoring the results of the modelling exercises. However this can be performed by the tool user through comparing scenario results with real life developments. An exception is RETscreen which includes an explicit output monitoring model.

3.5.3 Access / usability

Costs

There is a discrepancy with respect to the cost of access between the models. Most models examined are downloadable at no cost, some at no cost for certain users (e.g. LEAP for developing country users) and some have costs for access that are incurred by all users (e.g. MARKAL), whereby the costing often depends on software requirements. Most tools provide training at different cost levels, depending on prior knowledge of the user and level of desired understanding (MARKAL, LEAP). RETScreen offers free training on the internet and Gains requires no training. During the implementation phase, which includes the model development and/or use, the main costs incurred are those that arise for the tool user/ developers. For models that need to be heavily context adjusted (e.g. to the country's circumstances) this can take up to one year (MARKAL) and is considerably less for simpler models such as LEAP. GAINS is a readily available tool on the internet that already includes all relevant data sets, and therefore does not incur any costs for development. Furthermore, implementation costs often depend on data availability[6].

Training requirements

Since the models tend to be complex, training is recommended in most cases before they can be used.

Accessibility (Formats)

Models tend to be readily available for download on the Internet and sometimes on CD-Rom.

Audience

The tools are most often implemented by technical experts. Once the tools have been acquired and the users have been trained, all tools examined can be implemented completely independently by the user. The main audience of their outcomes are national policy makers.

Implementation requirements

Generally tool developers and specialised trainers carry out this training.

Case Study – Guidance Materials

All tools have guidance materials available on their web pages and all except GAINS also have accompanying case studies.

Languages available

The language availability splits the group into two. While some tools are only available in English (MARKAL, ENPEP Balance) others are available in multiple languages (LEAP, RETScreen). However this cannot be fully explained by how widely they are used, as MARKAL for instance is applied in more than 200 countries. It could be that those tools that are intended for a broader user audience and are often more easily accessible (i.e. less complex), are available in multiple languages.

[6] Data requirements are very difficult to estimate and quantify and therefore were not regarded in depth here.

3.6 Mitigation tools: Low carbon development / technology platforms or databases

Table 10 presents the assessment of tool developers of their own tools and methodologies that are primarily related to low carbon development and/or technology platforms or databases. Their assessment includes an indication of the policy cycle their T&M can be used in, key areas the T&M are focused on, and additional observations.

Table 10. Summary of 'low carbon development / technology platforms or databases' category analysis

	Policy Cycle						Area			Emphasis / observations
	Awareness raising	Problem definition	Identification of options	Identification & selection of policies	Implementation of policies	Evaluation of policies	Adaptation	Mitigation	Development	
Reegle	✓	✓	✓	✓	✓	✓	✓	✓	✓	• Focused on renewable energy support • Broad governance
Climate TechWiki	✓	✓	✓	✓	✓	✓	✓	✓	✓	• Focused on Information on technology and policy options • Focus on adaptation & mitigation • Broad audience • Mobile phone app in planning • Relatively new with limited case study material available in certain areas
HEDON	✓	✓	✓				✓	✓	✓	• Support on small scale application • Strong focus on development • Partly in other languages available • Mostly limited to sub-national level
OpenEI	✓	✓	✓	✓	✓	✓	✓	✓	✓	• Broad audience • Introductory videos for wiki use • Relatively new with limited content in certain areas • Information contained with a strong USA focus in certain areas
Shared features										• Support awareness raising heavily • Free of cost; easy access • No training requirements • Cover mitigation and development well • Frequently used • Broad scope • Only provide indirect (passive) support • Focus on earlier policy cycle steps and neglect of later • No process guidance • National circumstances largely neglected • Only available in English

✓	Some of this is done by the tool
✓	A lot of this is done by the tool
✓	This is the most important aspect of the tool.

3.6.1 Area of focus

Key areas and linkages to other areas

Mitigation and development are the main focus of the tools within this group. Climate Tech Wiki focuses more heavily on mitigation (and adaptation), HEDON on development and OpenEI equally on both. Adaptation seems to be covered, at least to some extent, by all platforms. Only the Climate Tech Wiki has a major focus on this however. Potentially all of these platforms could be extended to include other focus areas beyond those they currently cover.

3.6.2 Tool design

Fit with user demand

Since all platforms are easily accessible on the internet at no cost, they can potentially be used in any region worldwide. User data was unfortunately not available, but it seems safe to assume that this is no problem. 21% of all examined users claimed to have used some form of knowledge sharing platform. No user mentioned platforms as most or least useful tools.

Geographical usage

Platforms contain information relevant for all world regions.

Coverage/ policy cycle

The three platforms examined only support the policy cycle steps indirectly. This is done through providing background information that can be used in the steps. Thereby the main focus for all is the identification of mitigation options. Similar to all other categories, the platforms thereby focus on earlier steps of the policy cycle, where awareness raising plays an exceptionally important role.

Governance level/scope

Generally the scope of the platforms is broad and they can support the international, national and regional level decision making process. Among the platforms examined the national governance level is the most prominent one, followed by the international and the regional.

Stakeholder involvement

Knowledge sharing platforms are generally aimed at multiple audiences. All stakeholders can be involved in the discussions and steady improvement of the information available. For all platforms examined, involvement is provided through interactive web-site based communication, such as blogs (Reegle), comments (Climate Tech Wiki), discussion (OpenEI) or Forums (Hedon). Such input ensures that the content has some sort of protection mechanism to ensure integrity. Furthermore, depending on the aim of the platforms, certain stakeholder groups might be more involved than others, e.g. in Hedon NGOs play a larger role than other actors. Generally groups that have resources available and are willing to contribute will probably provide the most input (e.g. scientific community, NGOs).

Output monitoring

Monitoring is mostly focused on the monitoring of access to the websites. The Climate Tech Wiki, for instance, records statistics of site visits and analyses them in terms of number of visits, countries of

visitors, time, etc. Other platforms monitor user numbers and integration of the data (open data formats) in 3rd party applications (Reegle). Hedon monitors the use of applications available on their website (e.g. Boiling point) by sending out M&E surveys and their on-line toolkits and wiki knowledge through access monitoring similar to the Climate Tech Wiki.

3.6.3 Access / usability

Costs

All of the examined platforms are accessible at no cost, some can be used without prior registration (Climate Tech Wiki, Reegle, OpenEI) and others provide the possibility for members access (Hedon). There are no costs associated with training and implementation.

Training requirements

There is no training necessary to use the platforms. They are all very intuitive and can be used by anybody without prior knowledge of the subject area, although users have to be computer literate. OpenEI provides introduction videos to the use of wikis. Hedon and OpenEI offer training for the tools that are associated with and promoted through the website.

Accessibility (formats)

All platforms are purely online based and can be accessed by anyone. Some provide additional accessibility through open data formats (Reegle), mobile phone apps (upcoming for the climate tech wiki), or also have their information available in hard copy (Hedon).

Audience

The main audience differs largely between the platforms. While the Climate Tech Wiki and OpenEI aim to inform national policy makers, technical experts as well as in-country donors equally, Reegle has a clear focus on national policy makers and HEDON prioritises technical experts and in-country donors.

Implementation requirements

All platforms can be independently used by the user.

Case studies

All platforms have guidance material and some have case studies on their pages available.

Languages available

All web based platforms are available in English. Reegle plans to extend to other languages in the future and HEDON provides parts of its contents in other languages.

3.7 Mitigation tools: Low Emission Development Strategies (LEDS)

Table 11 presents the assessment of tool developers of their own tools and methodologies that are primarily related to Low Emission Development Strategies. Their assessment includes an indication of the policy cycle their T&M can be used in, key areas the T&M are focused on, and additional observations.

Table 11. Summary of 'Low Emission Development Strategies (LEDS)' category analysis

	Policy Cycle						Area			Emphasis / observations
	Awareness raising	Problem definition	Identification of options	Identification & selection of policies	Implementation of policies	Evaluation of policies	Adaptation	Mitigation	Development	
LEDS framework and toolkits	✓	✓	✓	✓	✓	✓	✓	✓	✓	• Easy access, large amount of information available free of charge • No special training required (only for tools used) • Overview and support for steps to be taken in LEDS implementation • Policy cycle: strong support in all stages • No pro-active stakeholder involvement • No support for regional level implementation
MAPS	✓	✓	✓	✓	✓	✓	✓	✓	✓	• Very comprehensive stakeholder approach for mitigation planning • Broad coverage of mitigation and adaptation • Accessibility: No internet page to date – everything through tool developer • Policy cycle: currently less support for later stages • Special training required
ESMAP	✓	✓	✓	✓	✓	✓	✓	✓	✓	• Strong focus on development • Coverage of mitigation and adaptation • Special training required • Methodology spread over different modules that users need to connect themselves
Shared features										• Strong stakeholder involvement • Covers large parts of the policy cycle well • Strong co-focus on mitigation and development • Consideration of adaptation • Large time and resource requirements • Implementation is often expensive but financing usually available • Has only recently been applied more – limited experience • Currently mainly implemented in countries with a medium level of development

✓ Some of this is done by the tool

✓ A lot of this is done by the tool

✓ This is the most important aspect of the tool.

3.7.1 Area of focus

Key areas and linkages to other areas

The methodologies examined in this category mainly focus on development and mitigation as an attempt to promote low carbon growth. However the tool developer survey revealed that all methodologies examined either already deal to some extent with adaptation, or plan to do so in the future. ESMAP for instance has included work for adaptation in the energy sector. However the links to adaptation remained largely unclear within our survey, and all three methodologies clearly focus on mitigation. It is interesting to note that all examined methodologies regard development as a most important aspect. ESMAP thereby finds development more relevant than mitigation. Furthermore, while MAPS and the LEDS framework and toolkits focus on all sectors, ESMAP only focuses on the energy sector.

3.7.2 Tool design

Fit with user demand

Currently the LEDS examined are limited in the number of countries that they support. The tools provided by ESMAP under their Low Carbon Growth Country Studies programme thereby have been applied in ten countries, MAPS is used in six countries and LEDS framework and toolkits have been used to support LEDS work plan development in six countries. Since the concept is relatively new, all are actively planning to increase their use worldwide. None of the LEDS methodologies were mentioned by users as either most nor least useful tools and methodologies. Again, this is probably due to the novelty of the approach. However, our in-country policy maker interviews identified that Chile is currently implementing MAPS successfully. However LEDS are mainly implemented in countries with a medium level of development (e.g. South Africa, Chile, and Colombia).

Policy Cycle

LEDS aim to guide the user through the process of achieving low emission planning. With respect to the policy cycle, all tool developers claim to cover all parts to some extent. There is a clear focus on the identification of mitigation options, though the whole first part of the policy cycle up to the identification and selection of policies is covered well by all methodologies (ESMAP, MAPS, LEDS framework and toolkits). The implementation and evaluation of policies is currently addressed to a lesser extent by the methodologies, though all provide some sort of support. The LEDS framework and toolkits thereby provide the most support for these later stages. However it seems that the tool developers aim to add support for the later steps in the cycles in the future (ESMAP).

Geographical usage

LEDS can and are applied worldwide. They tend to cover a very wide ranger of sectors.

Governance level/Scope

As for most other categories, the main scope of the methodologies is the national level. Currently LEDS processes are initiated for the national level. The response from ESMAP showed however that they could also be applied on sub-national levels. All methodologies aim to inform the international process to some extent, but do not regard this as their main focus.

Stakeholder involvement

A main focus of all LEDS examined is extensive stakeholder involvement. For all methodologies in this category, all groups are involved in the process to come up with a wide overarching strategy. The survey found however, that the most important stakeholders are the national policy makers, civil society and scientific/academic communities. Certain programmes such as MAPS do not prioritise stakeholders in such a manner and instead attempt to involve all stakeholders across society.

Output monitoring

All LEDS tool developers claimed to have a process installed that monitors the outputs and outcomes of its application. Unfortunately, it was not possible to find out how this is exactly done.

3.7.3 Access / usability

Cost

Access, or in the case of the LEDS, an initial overview of the methodologies is generally available at no cost. This includes the acquisition of knowledge resources. Training costs vary between the methodologies and reach from relatively low costs (LEDS framework and toolkits) to relatively high costs (MAPS). The main costs arise during the implementation phase, as many different tasks have to be covered, e.g. studies have to be carried out, stakeholder processes have to be organised. However financing is often available from international organisations. As LEDS are complex the implementation takes, in all cases examined, a minimum of 3 months.

Training requirements

MAPS and ESMAP state that special training is required to use the tool. Application of the LEDS framework and toolkits does not require training. Training for individual tools of the LEDS framework and toolkits may be necessary but would need to be provided by tool developers: for MAPS by specialised trainers and for ESMAP by specialised trainers and tool developers. With respect to the training duration, all tools differ as well: LEDS framework and toolkits requires only 1-2 days of training, ESMAP requires on average 3-5 days of training and MAPS requires more than 8 days of training.

Accessibility (Formats)

Our analysis shows that LEDS can be very different in their accessibility to the user. While the LEDS framework and toolkits are easily accessible through the internet, MAPS does not have an internet page to date and can only be accessed through contact with the organisers of the programme. However information on the Long Term Mitigation Scenarios (LTMS) process, which is closely related to the MAPS process, is commonly available in book format (Raubenheimer, 2011). ESMAP provides publications and knowledge resources on their web pages. ESMAP and MAPS also provide hard copies and ESMAP CD-Roms as well. However this does not mean that the user will be fully able to implement the LEDS by themselves.

Audience

LEDS has a very broad audience. Whilst the main focus is the national policy makers, in-country donors and technical experts are also regarded by all tool developers as the main audiences.

Implementation requirement

A main issue is the independence of implementation. MAPS and ESMAP can optionally be implemented with the tool developer. LEDS framework and toolkits can be applied and customised by users in relation to differing country circumstances (DIY tool).

Case Study - Guidance Material

All LEDS provide guidance material, as well as case studies that can be referred to.

Languages

LEDS framework and toolkits and ESMAP are only available in English. The LEDS framework and toolkits however provide a plug-in for translation. Since the MAPS webpage is not up and running yet, there is no information on the languages available.

3.8 Technology needs assessments (TNA)

Table 12 presents the assessment of tool developers of their own tools and methodologies for technology needs assessments. The assessments by the tool developers include an indication of the policy cycle their T&M can be used in, key areas the T&M are focused on, and additional observations.

Table 12. Summary of 'Technology needs assessments (TNA)' analysis

	Policy Cycle						Area			Emphasis / observations
	Awareness raising	Problem definition	Identification of options	Identification & selection of policies	Implementation of policies	Evaluation of policies	Adaptation	Mitigation	Development	
TNA	✓	✓	✓	✓	✓	✓	✓	✓	✓	• Covers adaptation and mitigation • Process guidance as well as information provision (see climatetechwiki) • Limited integration of adaptation and mitigation analysis • Strong focus on technological options

✓ Some of this is done by the tool

✓ A lot of this is done by the tool

✓ This is the most important aspect of the tool.

Note: There is only one tool/methodology within the category. Hence the below is not a comparison, but rather a discussion of the tool using the same descriptive criteria outlined above. However this tool covers both mitigation and adaptation. It is therefore also discussed in section 3.3 with Adaptation and process guidance tools.

3.8.1 Area of focus

Key areas and linkages to other areas

The TNA handbook focuses on identifying priority technologies for mitigation and adaptation. This is done in the light of a developing country's short, medium and long-term (sustainable) development priorities.

3.8.2 Tool design

Policy cycle

The TNA handbook covers all policy steps up until the identification and selection of policies and stops short before the implementation of policies. In order to achieve its main focus - the identification and prioritisation of technologies - it first helps identify developing priorities and then helps in selecting priority sectors. Policies selection is then supported through a system mapping of barriers and opportunities for the prioritised technologies.

Use of tools

Two in-country policy makers interviewed mentioned the TNA process is or has been used in their country (Chile and Rwanda). The current version of the Handbook is applied by UNEP Risoe Centre in 36 developing countries (http://tech-action.org/countries.htm) with funding from the GEF.

Stakeholder involvement

The TNA handbook is a process with high stakeholder involvement from all sides of society. However, its main focus lies with national policy makers and the private sector.

Governance level/scope

National and regional stakeholders, together with sector based stakeholders, are the main foci of the handbook.

Output monitoring

The handbook contains monitoring of data availability and quality at each step, as well as a sensitivity analysis. Explicit monitoring takes place within the UNEP Risoe TNA project (http://tech-action.org/). Three regional centres (Latin America, Africa, Asia) guide the TNA countries and monitor the processes in these countries.

3.8.3 Access / usability

Accessibility

The TNA handbook is available on the UNFCCC website as a free download and as a hardcopy distributed by UNDP and UNEP. Furthermore USB sticks are distributed at the annual Conference of the Parties (COP).

Training

Training is available from UNEP Risoe through a series of regional workshops. Costs are estimated by the tool developer to be above 2000 USD. However, financing is available from the Global Environment Fund (GEF). As the handbook itself is a guidance book, there is no additional guidance material available. There are no case studies available.

Implementation

The TNA is a process of approximately two years, managed by a 'permanent' national TNA team with workshops, etc. Costs are generally above the 2000 USD range.

Languages

The TNA handbook is available in English, Spanish and Chinese.

Audience

The main audience is very broad, covering all identified user groups to an equal extent.

4 Inter-category analysis - Cross comparison of categories

*After Section 3 analysed tools within one category, this section analyses the differences and similarities between the categories. This is achieved in two steps. First, all mitigation and all adaptation categories are compared and analysed amongst each other (Section 0 and 0), providing further insights to users interested in the tool landscape for adaptation **or** mitigation. In a second step mitigation and adaptation categories are compared between each other (Section 0), which is of interest to users interested in both adaptation **and** mitigation tools and their interrelations. The last part of this section provides a summary of the tool landscape (Section 0).*

4.1 Comparison of adaptation tool categories

Fit with user needs

The user survey showed that tools in the adaptation assessment and process guidance category were considered comprehensive, mostly inexpensive, and offering a range of access forms (ranging from paper-based versions to online versions), and relatively easy to use. Users further indicated their positive experience with adaptation data and information provision tools, nevertheless some users remarked that some of these tools tend to be rather expensive and require computer/internet access. Limited access to the tools due to intellectual property rights were another drawback mentioned. Adaptation knowledge sharing tools were considered important; however their use still appeared to be limited among the survey respondents.

It is clear that many tools are constantly being modified, expanded and adapted on the basis of user experiences and feedback providing opportunities for improving the tool. As tools gain more data, more examples can be used to illustrate tool use.

Other key findings on adaptation tools

Key areas

A number of the tools highlighted linkages to mitigation, even if this is not their primary focus. This was partly an issue of data information tools for potential climate change and their impacts would generate important insights into needs for mitigation, but also that suggested adaptation options did not lead to increased future emissions.

Category design / extent

Governance level/scope

The **geographic scope** of adaptation tools seems to be largely governed by the scale of the information supply rather than the information demand at this point. Lack of locally specific data was mentioned by users as a key constraint to a wider applicability of tools. At present, not all types of tools will be usable at all scales. This could be addressed at two levels; first in ensuring that users are aware of the scalar limitations of the types of tools they are potentially selecting, and that developers consider whether these gaps can be filled given the current state of adaptation knowledge and practice. In cases where these gaps cannot yet be filled, it may be worth considering what tools or resources might present a suitable alternative.

Category access / usability

Training and Implementation

Broadly, many tools are reported to require little or no **training**, with the most of up to eight days in total. However, many tools require considerable time commitments to implement. **Implementation** times vary widely, from two weeks up to 12 weeks spread over nine months.

Languages

There is a need for tools on adaptation that are **available in** multiple **languages**. Given their emphasis on context-specific planning processes, adaptation assessment and process guidance tools are so far available in more languages than tools in the two other adaptation categories. Furthermore tools are developed in an increasing number of languages, and sections are added, e.g. on monitoring and evaluation which many tools have so far not tackled in any depth

Audience

Many adaptation tools are developed for broad audiences and developed to suit a wide range of geographical contexts. This includes the global coverage of scenario-based tools, the broad coverage of knowledge sharing tools, and the emphasis on an ability to adapt process guidance tools to a range of planning contexts.

4.2 Comparison of mitigation tool categories

Fit with user needs

In the past, GHG mitigation tools were the most frequently used category. 1/3 of the users surveyed stated that they are using a tool out of this category. One particular tool has been used frequently: LEAP. The use of LEDS has only recently gained momentum, but is still limited. Among the users surveyed 10% have used such tools. The tool developer survey identified that the LEDS examined were usually applied in a limited number of countries but all mentioned that a large number of countries are planning to implement these. The tool developer survey also identified that the other process guidance tool examined, the TNA, has been applied more frequently in the past. The nature of the platforms, which are freely accessible on the internet, does not allow for exact examination of how commonly they are used nor did users mention their use. However website access information indicates that they are also very widely used. The tools assessing the mitigation/potential also have a steady user base (app. 15% of all users surveyed).

Other key findings on mitigation tools

Key areas

GHG tools and the tools summarised under assessment of mitigation/resource potential have the clearest focus on mitigation of all four categories. In comparison to the other categories, no tool examined in these categories has strong linkages to adaptation. Surprisingly LEDS on the other hand were also found to have a very strong focus on adaption. However, it remained unclear from the tool developer survey to what extent the LEDS methodologies examined currently cover adaptation,

whether it is the intention to do so, or whether this is actually already happening[7]. Both the platforms examined, as well as the LEDS, focus on development, whereby all the LEDS have a clear focus on development and the platforms differ from platform to platform.

Category design / extent

Policy cycle

In the earlier stages of the policy cycle, tools in the LEDS category cover the largest number of steps of all mitigation categories. This can be explained by the fact that LEDS are process guidance tools that currently aim to help the countries to lay out low carbon strategies. It is important to note, however, that LEDS mainly focus on the process part. When it comes to generating information they often rely on tools in the other categories (esp. GHG models and mitigation assessment).

The TNA handbook is similarly strong in these stages, but not as wide spanning as it focuses around prioritising technologies (hard and soft). In the later stages of the policy cycle LEDS and TNA are currently only providing support to a limited extent. In these stages, countries have the option to use GHG mitigation tools. These can be mainly used to accompany the process through analysis but only advance it actively to a limited extent. The platforms support all stages through knowledge sharing while the primary focus varies from one to the other.

Stakeholder involvement

The highest level of stakeholder involvement can clearly be identified by the process guidance tools (LEDS and TNA). Given their process typology, this is to be expected. The main focus lies thereby on national policy makers, though they also involve the private sector, civil society, NGOs and the scientific community. Donors are however involved to a lesser extent. GHG mitigation tools mainly involve the scientific community and national policy makers. All the platforms examined have the opportunity for stakeholder involvement through web based communication. However, stakeholders have to actively pursue involvement.

Governance level/scope

The main governance level for all categories examined is the national level. Due to their openness in character, the platforms are suited for all the regional as well as international levels. With the GHG tools, it depends on the characteristics of the tools; some, such as RETScreen are suited for sub-national levels, others not. LEDS are currently applied at national level only, but could also be applied at sub-national levels in the future.

Output monitoring

For the platforms and the GHG tools, active output monitoring is achieved through monitoring user statistics. However GHG tool users can monitor their output themselves through comparing scenario results with real life development. With respect to the categories under the process guidance typology, all LEDS developers mentioned that they have some sort of output monitoring in place. For the TNA handbook, UNEP Risoe explicitly monitors the output of its work.

[7] Clapp (2010) suggests that this is the case however

Category access / usability

Accessibility

The platforms are easily accessible by users who have access to the internet, as all examined were free of charge. While all GHG tools were available for download on the internet, some incurred a cost to do so. While the TNA handbook is freely accessible on the internet, only the LEDS framework and toolkits are freely available of the methodologies in the LEDS category.

Training

None of the platforms examined require or provide training. For the GHG mitigation tool category training is usually recommended, as models tend to be complex, although there is a large difference within the category with respect to costs and extent of the training. Generally, training is available at various cost levels. The training requirements within the LEDS category differ by methodology. However, for all tools within the LEDS category training is recommended, while the recommended training duration differs heavily. The TNA handbook requires substantial training. Guidance material was available for all tools in all categories.

Implementation

Implementation costs are very high for LEDS and TNA handbooks. For the GHG mitigation tools, costs that arise during implementation are mostly associated with the human resources needed for the programming/use of the tools. For the process guidance methodologies examined, implementation takes more than three months, while this differs highly between the GHG mitigation tools. While all mitigation models can be implemented by the user themselves after training, this differs highly between the process guidance methodologies. For some, support is optional but recommended (e.g. TNA Handbook); for others it is required to work together with the tool developers (e.g. MAPS).

Languages

The largest variety of languages can be found within the GHG mitigation tools category. Within this category some tools, especially those intended for a broader audience, are available in up to 36 languages (RETScreen). There is a lack of different languages among the platforms, as most of them are only available in English. This is also the case for the LEDS category. The TNA handbook, however, is available in three major languages.

Audience

All categories potentially have a very broad audience. Between all categories, the main audience is national policy makers. However, due to their proactive stakeholder involvement, LEDS and TNA are likely to also reach a broader audience beyond national policy makers and technical experts. The platforms examined differed with respect to their primary audience, with some being broader than others.

4.3 Comparison across the whole landscape of tools

Fit with user needs

On the adaptation side there is a preference among users towards process guidance tools and adaptation assessment tools. On the mitigation side, however, there is a preference towards GHG mitigation tools. Process guidance tools are still relatively new and have only picked up recently (LEDS). Knowledge sharing tools for mitigation and adaptation are relatively new and were not identified by the user as frequently used tools; however they were mentioned as being important and appear to be gaining momentum. Interesting to note is that the TNA handbook has been used frequently, indicating a demand for addressing mitigation and adaptation simultaneously.

Other key findings on mitigation tools

Key areas

Linkages to development already exist in relatively large numbers of both mitigation tools and adaptation tools (e.g. LEDS for mitigation, TNA, etc.). Having primarily focused on adaptation or mitigation, a number of tools have highlighted linkages that already exist. The TNA Handbook focuses on both adaptation and mitigation, and some LEDS attempt the same. However, due to a lack of understanding about what is required of a tool to support climate compatible development, as outlined in Section 0, accompanied by the complex areas of mitigation, adaptation and development, there appears to be no comprehensive CCD tool currently available.

Category design / extent

Policy cycle

Both mitigation and adaptation tools currently focus on earlier stages in the policy cycle.
Current decision making tools thereby reach the furthest and provide support up until the identification and selection of policy measures and in some cases even the implementation. However the implementation and evaluation of policy measures/strategies is currently not achieved by them which could be explained by the fact that many developing countries are still in the earlier stages, i.e. the planning stages. This was also verified by the in-country policy maker interviews.

Stakeholder involvement

For both the mitigation and adaptation tools examined, stakeholder involvement is clearly highest with the process guidance tools. However while mitigation process guidance tools attempt to address as large a number of stakeholders as possible, this differs largely from tool to tool on the adaptation side.

Governance level/scope

For the mitigation categories the main governance level is the national level. For adaptation the main scope differs largely from one tool type to the other. For instance, data and information provision tools have a broad scope whilst knowledge sharing tools are dominated by local scale evidence. This reflects the differing nature of the scope of adaptation and mitigation (compare discussion in section 1.2.2.2).

Output monitoring

For the mitigation process, guidance explicitly included output monitoring. Platforms and GHG tools achieved this through monitoring user statistics. For GHG tools it is also possible through comparison of scenario and real life development by users to monitor the outcome. Generally this proves what was outlined in section 1.2.2.2: that outcomes from mitigation are generally easier to measure than those from adaptation tools. However this might differ from tool to tool and still requires an explicit monitoring effort.

Category access / usability

Accessibility

On the adaptation side almost all tools are easily accessible and mostly inexpensive, especially adaptation assessment and process guidance tools. On the mitigation side this differs largely from category to category. However, within the categories, a large number of tools is easily accessible and inexpensive. Hence both adaptation and mitigation tools are easy to access. This tends to be more costly and difficult on the mitigation side, especially with respect to some process guidance tools.

Training

Many adaptation tools are reported to require little or no training, with a maximum length of up to eight days. For mitigation tools this differs largely from tool to tool within some categories (GHG mitigation tool category) while the process guidance tool generally requires a large amount of training. Hence while a good number of mitigation tools only require limited training, the mitigation tools tend to require more training than adaptation tools. This is especially true for the process guidance tools.

Implementation

The implementation time for adaptation varies widely, from two weeks up to 12 weeks spread over nine months. The implementation times for the mitigation tools vary widely as well. For process guidance it can take up to two years. Within the GHG mitigation tools this differs largely, some requiring up to one year but some being easily implementable. Overall implementation time tends to be substantially higher for mitigation tools, although it varies widely across mitigation as well as adaptation tools. Such discrepancy might be explained by the differing urgency of the problem within developing countries.

Languages

The user of adaptation tools highlighted a need for more languages. Process guidance tools thereby address this need far more than other adaptation categories. On the mitigation the clearly dominant language is English. Some GHG mitigation tools are available in multiple languages. The TNA handbook is available in three languages as well. Overall mitigation tools seem to be available in fewer languages. This might be explained by the international scope of mitigation and the differences in priorities (adaptation: most vulnerable, mitigation: largest emitters).

Audience

Mitigation tools generally have a broad audience. However there is a preference towards national policy makers recognisable for most tools. Adaptation and mitigation tools are generally both developed for a very broad audience and adaptation tools in particular are developed to suit a wide

range of geographical contexts. However mitigation tools tend to have a stronger focus on national policy makers.

4.4 Summary

Figure 8 provides a summary of how the categories address the descriptive criteria evaluated. The graph shows one criteria per continuum. Individual categories are placed in relation to each other and to a scale to illustrate the landscape of tools. The intent is thereby to show an evaluation of the average of the overall category. Individual tools within categories might differ substantially. This is not reflected in the graph. Some major conclusions that can be drawn from this graph are summarised in Table 12. The evaluation is based on self-assessment by tool developers.

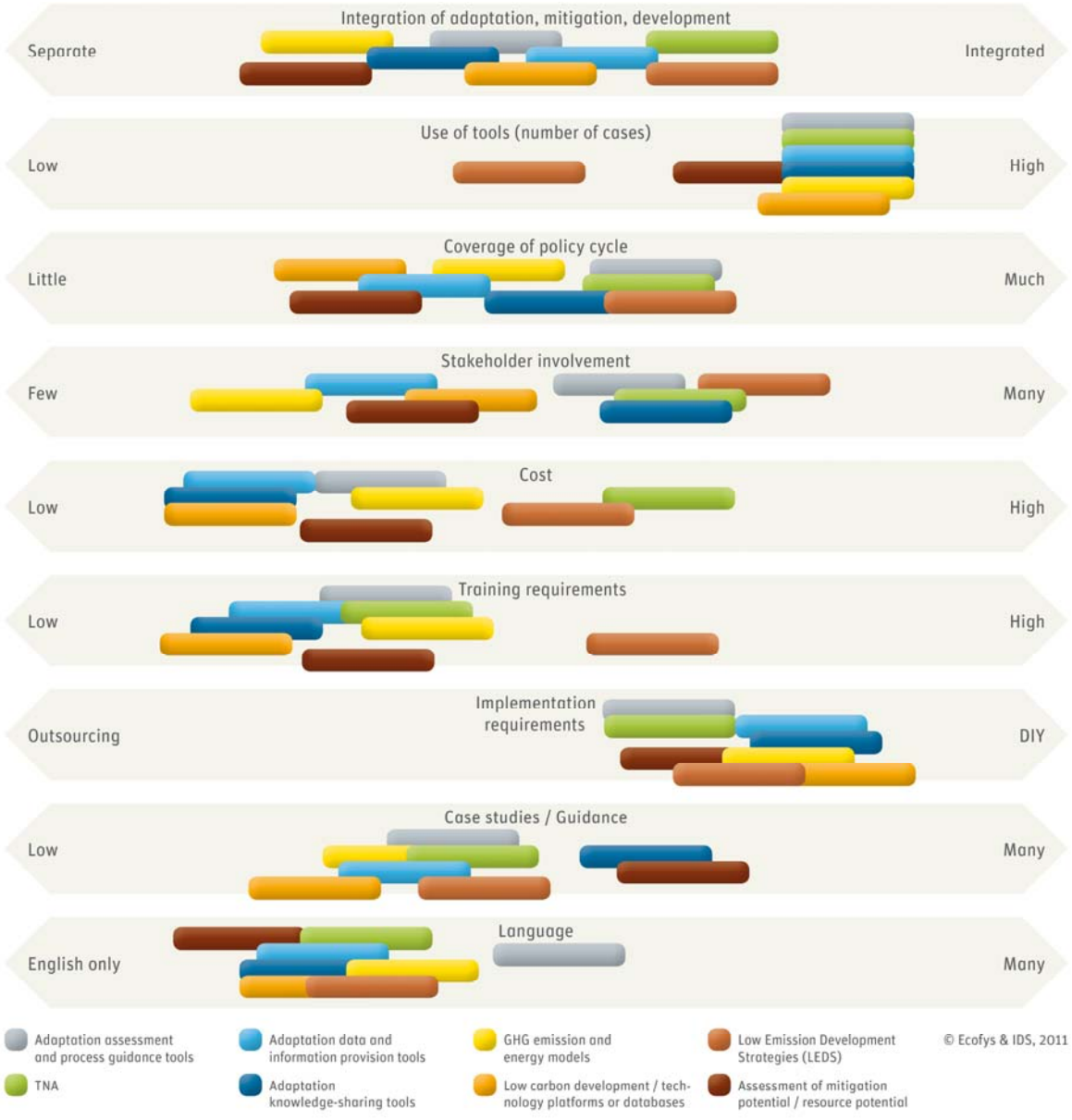

Figure 8. Summary of the inter-category analysis. Source: tool developer survey

Table 13. Summary of the inter-category analysis – major observations

Key areas	• Mitigation categories tend to have less overlap with the other key areas than adaptation categories. • All adaptation categories have strong links with development, and several make reference to mitigation (assessments informing mitigation strategies, and making sure that adaptation recommendations don't increase emissions) Process guidance tools (such as LEDS and TNA) integrate all key areas, however still currently only to a limited extent.
Use of tools	• Most T&M in the categories are applied in more than 10 countries. • Mitigation T&M seem to be applied less widely than adaptation T&M which could be explained by the sub-national nature of adaptation • LEDS, due to its novel nature and complexity, are the least applied category to date.
Coverage of policy cycle	• The process guiding categories for mitigation and adaptation cover the largest parts of the policy cycle. However, support is currently mainly limited to early policy cycle stages. • Implementation, monitoring and evaluation are generally less emphasised in tools; however these are areas receiving increasing attention
Stakeholder involvement	• Process guiding categories involve, by nature, the most stakeholders. This is followed by the knowledge sharing T&M. • Information provision and model tools involve the fewest stakeholders. This is more or less the same for adaptation and mitigation. This may be related to the technical nature of information contained in these T&M.
Cost	• The cost of accessing tools tends to be low, especially for the knowledge sharing platforms and databases which are usually free to use. • However the cost may rise due to training needs, human resources needed during implementation (e.g. LEDS and TNA) or in some cases during programming and, where needed, data collection (e.g. GHG mitigation models).
Training requirements	• In general the process guidance T&M require the most training in length of time, while GHG mitigation tools recieved the strongest recommendation for user training. • The data and information platforms do not require any training, though they tend to require technical knolwedge to interpret their content. • Adaptation T&M require, on average, less training than mitigation T&M.
Implementation requirements	• Tools in many categories can be applied independently by the users, although training requirements to enable this might differ. • However, for process guidance methodologies, working with the tool developers is recommended or required. • A note of caution should be added as this might differ for individual tools within categories.
Case studies/ Guidance	• Tools in most categories are accompanied by guidance material and case studies. • However the platforms for data and information have a rather low amount of guidance. This could be reasoned by the fact that they are intuitive in their use and do not need guidance or case studies.
Language	• Language coverage, aside from English, is low with current tools. • There is a need for more languages in both adaptation and mitigation categories. The GHG mitigation tools category shows the largest variety with up 36 languages for RETScreen. Also the TNA can be mentioned as it is translated in three languages. However, many of the others, among them the platforms for information sharing, are only available in English and perhaps some parts in one other language (e.g. French or Spanish).

5 Selecting tools for climate compatible development

Previous sections have shown that there are a number of gaps but also opportunities in currently available tools. One key message is that the selection of tools will have to be adapted to the specific contexts in which they are to be applied, as users have different starting points and hence will wish to follow different routes in their use of tools for climate compatible development planning. The following sections discuss three types of options for users in selecting tools to fit their needs, called 'one stop', 'gap filling' or 'strategic selection'. Each option utilises the opportunities and limitations in the current landscape of tools in different ways. The sections discuss characteristics and assumptions as well as potential strengths and weaknesses for each option.

5.1 Option 1: "One stop"

This option sees the development of a single "climate compatible tool" which covers both the policy and the CCD spectrum. This approach sees the integration of the different range of actions, steps, and stakeholders, falling under the process articulated within the tool. In the short term, the practical implications of such a tool (when considered against the reality of policy development/implementation processes) are probably such that it might be inoperable in real contexts as it would require significant costs, human capital and expertise in both adaptation and mitigation to use the tool. It also seems an unlikely option given the current gaps in our understanding of CCD. That said, its potential for creating synergies and contributing to coherent policy in the longer term warrants exploration. Investment in this option would likely see funding directed to a developer (or a coalition of developers) to creating a "one size fits all" tool which would consequently need to be quite complex. In addition, it would provide an opportunity to bring the adaptation and mitigation community closer together for the common goal of climate compatible development.

Characteristics

- This option involves developing one key tool to cover the whole planning "landscape" in terms of climate compatible development and steps in the policy and planning cycle.
- One key "climate compatible" tool that covers as many adaptation and mitigation steps as possible (high level tailoring).
- Given the complexity of each field, such a "one stop" tool or methodology would have to be integrative and comprehensive.

Assumptions

- That there is funding and tool developers are willing to develop it
- Funding is directed to tool developers in this case
- That there is demand for such integrated planning; in many countries responsibilities are split between different ministries and/or expert groups
- That there is universal participation from different parts of society

Strengths

- May simplify planning processes and respond to calls for tools that can speak to many different departments/ministries
- Might be able to harness the co-benefits described in Section 1, especially with respect to adaptation and mitigation

- Allows for a more direct integration of mitigation, adaptation and development
- Brings together the adaptation and mitigation communities
- Allows countries with limited resources to include all aspects in their planning
- Allows for coordination of existing and future efforts within the fields of adaptation and mitigation and helps to improve the integration of these in national development plans

Weaknesses

- Adaptation and mitigation planning in a development context is highly context specific so important local characteristics may be lost (so generic that it becomes less relevant)
- Unclear whether assumptions hold – who would develop these tools? And unclear whether there really is a demand
- Would need to develop such a tool as none exist so far (although some users have indicated plans to develop such a tool, for example Practical Action suggest developing a tool for planning low carbon climate resilient development, and some tools already include a common methdology for adaptation and mitigation, although integration is missing (e.g. TNA Handbooks).
- Not clear yet what such a tool would look like, as planning for climate compatible development is very complex and there are few examples of where this has happened. At the moment there is not enough empirical evidence and theoretical evidence to support the planning and implementation of climate compatible development. It might be preferable to have sectoral tools or tools for specific purposes rather than tools for all aspects of climate compatible development incorporated in one generic tool. Such a generic tool would either be rather generic and lacking detail, or it would require large amounts of expertise and time, due to its complexity.
- Costs, human capacity and expertise might be limiting factors for a large scale integrative tool which should respond to all key aspects of adaptation, mitigation and development at the same time.
- Individual fields of mitigation and adaptation are complex enough and a combination within one tool would add uneccessary complexity (as cited in the in-country interview conducted with Israel); tool might become very cumbersome and of limited use
- Responsibilities of mitigation and adaptation often lie with different ministries and/or expert groups. It is unclear how a tool could pull these together.

5.2 Option 2: “Gap filling”

Like option 1, this option sees integration and creation of coherence being driven *by* the tool/methodology processes. In this case however, the policy and CCD spectrum is covered by a range of existing tools that have been retrofitted, revised and combined, alongside the development of new tools which fill existing gaps. Investment in this option would again be directed primarily toward the tools development community, this time to enable the retrofitting of existing tools, gap identification, and development of other tools to fill these gaps. Option 2 seems better aligned with current realities around the diversity of actors who would be called upon for doing CCD, and for the current uncertainty about what CCD actually *is.* It does assume, however, that the best space for doing this integration is still at the level of tools and methodologies.

Characteristics

- A suite of tools leaving as few gaps as possible (low level of tailoring)
- Minimal reprogramming, only tweaking, for example through retrofitting of existing tools
- New tools developed as needed (strategically situated) to fill the gaps identified

Assumptions

- Funding is directed to tool developers in this case
- That there is a central coordination identifying gaps that need to be filled
- That there is human capacity available to pull the individual aspects together and maintain an overview of all issues
- That gaps can technically be filled.

Strengths

- No need for reprogramming – current tools could be amended and partly used as they are
- Most efficient use of resources as only new tools would be developed along the policy cycle and climate compatibility continuum
- New training among practitioners is only necessary for new tools developed
- As it is based on currently available tools and only extends them, integration into development planning where this is already happening
- Could be developed when the need is identified and based on the identified user needs. This is especially relevant for instance with respect to the policy cycle. Currently, many developing countries are in the planning phase and have not reached the implemention of policies/strategies that need evaluation

Weaknesses

- Need (human) resources and coordination among different actors to pull all tools together
- Danger of missing important aspects at the intersections of mitigation, adaptation and development
- Danger of not fully understanding the gaps and how to fill them
- Problems in prioritising options, especially with limited resources available (although an option could be to address this as has already been done by the TNA for technologies)
- Especially in the field of mitigation where developing countries, given their lack of historical responsibility, may not necessarily place the same priority on mitigation, there is a risk of failed integration, especially with development. This may lead to non-action (this is partly done by existing tools such as LEDS).

5.3 Option 3: “Strategic selection”

Option 3 is perhaps best described as a different approach to gap filling, but user-driven rather than tool-driven. Here, the emphasis is not on building the integration process into the tools themselves, but rather to support the capacity of decision makers and their advisors to identify areas where tools are needed, select the appropriate tools, and to integrate the results from these tools themselves. Here, investment would be more heavily directed toward the in-country user-base for these tools rather than at the tools development community. The distinction between options 2 and 3 could be seen to be on a continuum with different increments of emphasis. Option 3 suggests a more limited emphasis on the role that tools and methodologies should play in the decision making process and instead places more

importance on the competence and coordination of the actors engaged in these processes. This acknowledges the uncertainty around what CCD looks like in practice and perhaps a more dynamic understanding of how it should be framed in a given context.

Characteristics

- User makes the linkages between different parts of climate compatible development and different tools, rather than the developer/the tool
- Identify strategic fields where an interaction between the key areas and the individual policy cycle steps would be helpful
- Medium requirement for new tools that are integrating only partial aspects of climate compatible development

Assumptions

- Funding is directed to governments and other key users in this case
- Critical points of intervention where there is a need for integration can be identified
- Current tools can be combined appropriately or new tools can be developed that address parts of climate compatible development
- There is no 'overarching' need for climate compatible development to the same extent across all areas of action

Strengths

- There are some current tools that already aim for strategic linkages in the climate compatible development arena (e.g. LEDS, TNA) and could be built upon
- This could be developed iteratively, as new areas with a need are identified

Weaknesses

- Users need to be experts to be able to make linkages and strategically select key tools for different parts of climate compatible development. Limited capacity and expertise might be a problem
- Difficult to identify the exact fields where such strategic intervention would be appropriate
- "Gaps are ok" (and are there for a reason) – CCD will be addressed only partially and there may be large areas of opportunity to deliver CCD. These gaps could be filled by non-climate tools.

Finally, it has to be acknowledged that tools are only part of the equation, as climate compatible development planning requires the human, institutional, technical and financial capacities to plan and implement policies and actions for climate compatible development. Tools and methodologies are merely technical facilitators to planning and implementing climate compatible development, but broader issues such as access to expertise, financing and technologies might play a more important role. Tools are therefore only a small part of the puzzle which lead to climate compatible development.

6 Conclusions and recommendations

This study analysed climate compatible development planning methodologies. Comparing and evaluating over 100 methodologies and tools, we draw the following conclusions grouped around the three research questions:

1. What tools and methodologies that address climate compatible development or its related aspects currently exist?

Climate compatible development remains an emerging concept which has yet to be fully articulated in detail and tested in practice. As shown in chapter 1, there is a lack of empirical and theoretical evidence to understand how climate compatible development can be planned and implemented across a diverse set of contexts.

Chapter 2 identified and reviewed available tools and methodologies combining adaptation and development as well as those combining mitigation and development. This comparative study showed that only a few tools and methodologies integrate adaptation, mitigation *and* development. There is however currently no existing tool for climate compatible development, nor is it clear yet whether such a tool would be possible or indeed desirable. The current lack of coordination and the compartmentalised nature of expertise between the adaptation, mitigation and development communities of practice poses an additional challenge to developing and applying a tool which is truly suited for climate compatible development. Finally, the study found that most methodologies identified focus on the early stages of the policy cycle, namely problem identification, assessment of options and selection of policies. Only a few tools and methodologies also assist in policy implementation and ex-post evaluation.

2. To what extent do these tools currently satisfy user needs in delivering climate compatible development?

The analysis of tools (Chapters 3 and 4) shows that the *development* of tools and methodologies in many cases are supply driven and their *use* partly linked to donor-funded programmes. This report looked at available tools in view of user preferences, and found *inter alia* that:

- Some users are adjusting existing tools to fit their national and local circumstances or developing their own tools if they do not find appropriate tools.
- Tools and methodologies for mitigation are often specific for national level governments, while many adaptation tools are designed to be applicable across a range of sectors, geographic and development contexts.
- There still appears to be a gap in guidance for national planning to fit particular country needs, perhaps particularly for adaptation. Feedback suggests that adaptation guidance tools at national level are better for awareness raising, and so far less applied for practical planning.
- Users also highlight the need for simple, user friendly tools that build on available data in a given country or context.
- Users also highlight the need for stronger consultation with tool users from the early stages of the development process; capacity building to enable effective use of tools; development of tools in a greater number of languages; and attention to policy timescales in developing tools (processes which can be completed within the appropriate time frames).

3. Where are there gaps and what is needed for planning climate compatible development?

The decision on which future pathway should be pursued in developing tools and methods for CCD is dependent on factors such as the development stage of the country, donor and developer coordination, the expected centrality of tools and methodologies in delivering CCD, and the degree of investment into other enabling environments outside of the tools landscape. Hence these recommendations for next steps are preliminary and, based on the current limited understanding and use of CCD approaches, somewhat speculative.

In Chapter 5 we outline three scenarios for the future, namely “one-stop”, “gap filling” or “strategic selection” of tools and methodologies. Each of these builds on a set of assumptions and requirements, and hence will apply more to some countries and contexts than others.

- The development of a “one-stop” tool to cover the entire CCD process would require coordinated investment at the tools level and a clear conceptual understanding of climate compatible development which is grounded in the realities of climate and development planning in developing countries.
- The second option (“gap filling”) would be to fill the current gaps by investing into the retrofitting and expansion of tools to enable existing tools to fit certain gaps.
- A third option (“strategic selection”) would be to follow a user-oriented approach which would develop users’ capacity to choose strategically from a range of existing tools to create an approach to climate compatible development which is fit for purpose. This would require investment into the training and capacity-building of national and local governments.

Given the evolution of the landscape of tools and methodologies to date, it is quite possible that the field will continue to develop incrementally and in a somewhat uncoordinated fashion (many different developers working independently in conjunction with different donors and governments) and, as such, a step change may be unlikely. Therefore a mix of the three scenarios described above may also occur.

An illustration of a possible evolution of tools and methodologies is presented in Figure 9. The figure does not suggest an ‘ideal’ pathway towards climate compatible development; as highlighted above, choice of future direction will be highly context-dependent. While it is clear that an integrated *discussion* of mitigation, adaptation and development is necessary at all levels, integration of *tools* may vary at different levels. On the one hand, one could imagine that methodologies in some categories, such as energy modelling or vulnerability assessments, will be further developed to serve their particular purpose. Such tools may benefit from dialogue between users but may remain stand alone tools (upper half of Figure 9). Such a development would be in line with the “gap filling” and “strategic selection” scenarios. On the other hand, integration into one *tool* could be envisaged at the policy selection stage and beyond (lower end of Figure 9). Methodologies e.g. within the “low emission development strategies” category could be the first that truly integrate mitigation, adaptation and development. Some existing tools in that category have already started to integrate adaptation.

As the theory and practice of climate compatible development progresses, more methodologies may be developed that also cover the later elements of the policy cycle, such as policy implementation and

ex-post policy evaluation. Tool developers of process guidance tools could also be encouraged to extend the scope of their tools to those steps.

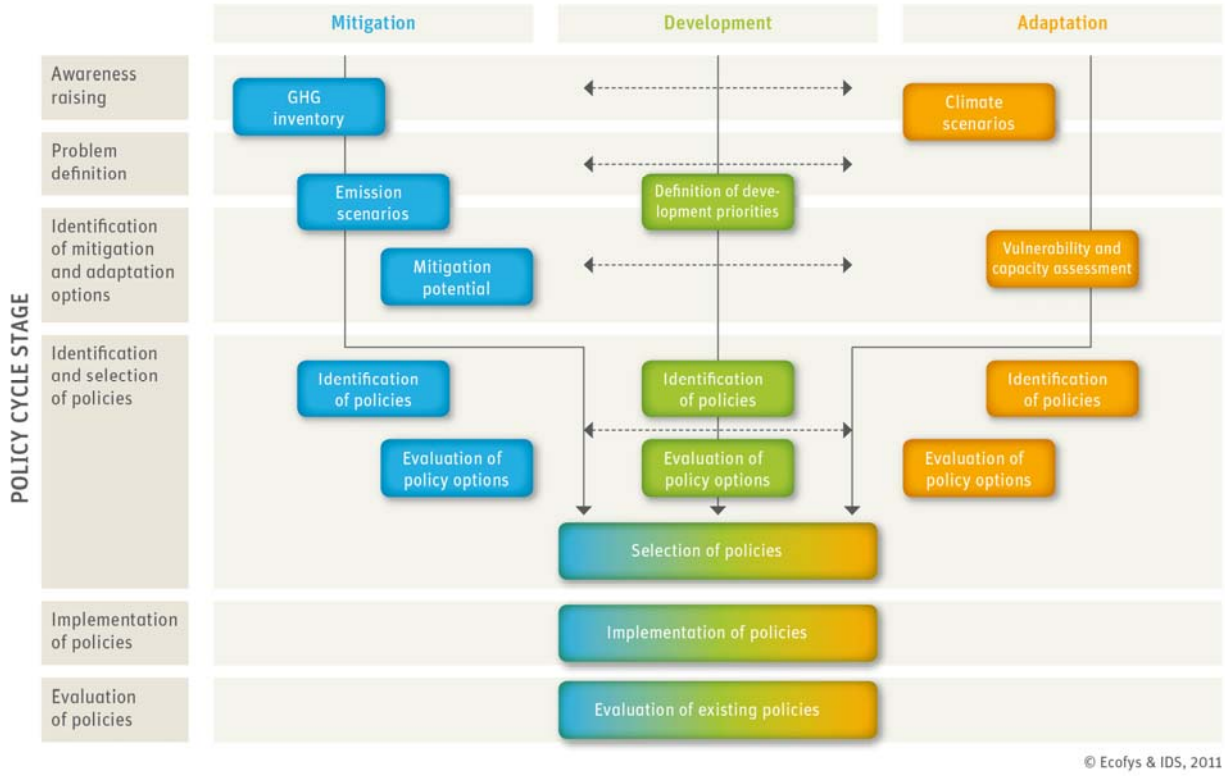

Figure 9. Illustration of an option to integrate tools for decision making on climate compatible development in the future. The figure demonstrates that integrated discussion is necessary at all steps (horizontal arrows).

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