# Cover Delivery Report

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1 The WP Leader sends personally the deliverable and the Cover Delivery Report to the Project Manager by email
DEVELOPMENT OF IMPROVED METHODS AND METRICS FOR ASSESSING IMPACTS VULNERABILITY, AND ADAPTATION

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Summary

Many frameworks and methods for assessing adaptation have been developed over the last 20 years, yet these often have not been adopted in the context of formal adaptation policies in Europe and elsewhere. Reasons and problems include: (i) a fragmentation of methods and tools, (ii) a lack of linkages to actual policy needs, (iii) a lack of understanding and communication of uncertainties, (iv) the often expert-based nature and complexity of methods used versus actual user demands, and (v) a lack of consistent data, definitions and metrics. This report systematically addresses those critical issues by developing and applying a toolbox defined as a set of models, methods and metrics geared towards the assessment of impacts and vulnerability and adaptation options.

We report on the progress made and problems encountered during the first iteration of work leading to a toolbox prototype, which is applied to the regional case studies. The report comprises an overview of climate change impact, vulnerability, and adaptation assessment frameworks as well as existing toolbox platforms, and outlines areas of improvement to be applied to the MEDIATION toolbox. We then present a conceptual blueprint of the toolbox design, and describe the next steps to be taken to create a more stakeholder-oriented platform, based on inputs from the MEDIATION case studies and outside sources.
1 Introduction and objectives

The main objective of MEDIATION work package 2, in cooperation with work package 3, is “to develop and apply a toolbox, defined as a set of models, methods and metrics for the assessment of impacts and vulnerability and adaptation options.” It is foreseen that the toolbox will provide much of the tools and methods for the MEDIATION project and will be applied to salient adaptation problems identified in the case studies of MEDIATION.

Many frameworks, methods and toolboxes for assessing adaptation have been developed by the scientific community, yet these have not generally been adopted in the context of formal adaptation policies in Europe. Reasons and problems have been among others: (i) fragmentation of methods and tools, (ii) lack of linkages to actual policy needs, (iii) lack of understanding and communication of uncertainties, (iv) expert-based nature and complexity of methods vs. user demands, (v) lack of consistent data, definitions and metrics.

We systematically address these aspects and aim at improving on the state of the art by:

- Better linking methods and metrics to relevant adaptation policy needs as voiced by stakeholders.
- Better integrating the tools for impacts, vulnerability and adaptation assessment leading to a more consistent and systematic assessment. Integration may occur by means of one integrated tool/model, often it will mean composing a set of climate change impacts, adaptation and vulnerability (CCIAV) tools.
- Improving of individual tools and methods, which will however be less the focus of this element of work.

This deliverable D2.2 describes the development and first stages of improvement of the toolbox and sets the stage for further iterations of the toolbox. The report is organized as follows:

We first provide a brief overview of key elements in climate change impacts and vulnerability assessments, including key definitions, and an extensive review of key of adaptation tools, followed by a survey of current toolboxes for CCIAV and other related fields. We then present an analysis of both CCIAV assessments, with input from other MEDIATION deliverables, and toolboxes, and derive lessons learned and possible areas of improvement for the MEDIATION toolbox. This leads to the introduction of the toolbox, first in a broader scope, how it complements other aspects of the project, and then a design overview in terms of a blueprint of the toolbox’s basic structure. We proceed with a description of how the toolbox will be populated, along with an overview of current methods, and conclude with next steps for the toolbox.

2 CCIV assessment elements

While a more comprehensive review of CCIV assessment elements is presented in the Mediation deliverable 2.1, a short overview is given below, to inform the reader, and provide a framework for the elements included in Mediation case studies and subsequently, included in the toolbox of methods, tools and metrics.

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<td><strong>Framework</strong>: refers to a combination of an approach (such as top-down or bottom-up) that prescribes an entire process of assessment and which may include a certain method or methods (sequence of actions designed to achieve a prescribed result), which in turn might employ various tools (such as computer climate models).</td>
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Method: A set or sequence of steps that should be followed in order to accomplish a specific task within a larger framework. Method can be implemented through using a number of tools. Examples include: Methods for development and use of scenario data in the vulnerability and adaptation assessment, e.g. those presented in the UNEP Handbook (1998) and IPCC-TGCIA Guidelines on the Use of Scenario Data for Climate Impact and Adaptation Assessment (1999).

Tool: A means or instrument by which a specific task is accomplished. Examples include: RCMs, impact models, decision tools (cost-benefit analysis, MCA, TEAM, ADM, etc), stakeholder tools (vulnerability indexes, Livelihood Sensitivity Exercise, etc.).

Metric: System of measurement including the item to be measured, unit of measurement, and the value of the unit.

Source: UNFCCC, 2008; UNFCC, 2007; Rosenzweig and Tubiello 2006

Climate change research is complex and varied, comprising elements from many different research backgrounds, as it is a multi-disciplinary issue. While the field consists of great variability in terms of methods and approaches, efforts have been made to create a typology of assessment frameworks, most notably in the IPCC’s Fourth Assessment Report. Figure 2 describes some characteristics of the four main approaches to CCIAV assessment. These frameworks can be further simplified into top-down and bottom-up approaches (Carter 2007). Top-down approaches are more scenario and research oriented, using large scale climate scenarios derived from global models as inputs into climate change impact models, whereas bottom-up, or vulnerability, approaches are more driven by stakeholder and policy requirements. These assessments focus more on localized analysis, with the goal of assessing local vulnerability, adaptive capacity, and practical measures to adapt to a changing climate. A third type of approach, the integrated assessment, aims to bridge the gap between top-down and bottom-up approaches, using a variety of methods from other CCIAV frameworks to compare the trade-offs between large, top-down solutions (mitigation) and more localized measures (adaptation) Mäkinen and Carter 2011).

Within the differing assessment frameworks, multiple approaches may be used simultaneously. In order to promote clarity and consistency, we use the IPCC’s definitions for key terms, including classifications of different approaches listed below, in Box 2 entitled “Cross-cutting and multi-sector approaches” and in Box 1, “Definitions of CCIAV Keywords”:

Cross-cutting and multi-sector approaches

Scenario methods and tools are used mainly by climate change analysts and decision makers to consider vulnerability and adaptation options in the context of different possible future conditions. There are several methods and tools that can be used for downscaling climate data or developing socio-economic scenarios. The downscaling techniques can be used to produce small-scale climate data of the type often required by impact models and to develop future climate scenarios at the local and national scales.

Decision-support tools are general analytical tools that assist analysts in making choices between adaptation options. Some of these tools rely on a single quantitative metric and focus on a single decision criterion. Others enable the user to define and incorporate more than one decision criterion. Other tools seek to inform the larger policy decision questions, taking into
account the institutions involved and affected when pursuing given adaptation options.

**Stakeholder analysis tools** typically include a range of techniques that can be used to gain or account for on-the-ground perspectives – for example, of highly vulnerable populations. They can also be used in processes aimed at clarifying the sometimes competing perspectives of stakeholder groups.

**Uncertainty and risk management** tools enable the user to address the errors and unknowns often associated with data and information used to evaluate climate change adaptation measures. A key element of uncertainty and risk analysis is defining the decision criterion that is most appropriate for the question at hand. Sector-specific methods and tools have been used in top-down/scenario-driven studies to assess impacts of climate change. Sectoral tools can provide a quantitative estimate of the possible harm to certain sectors and/or systems due to future climate change.

Source: UNFCCC 2007.

### 3 Review of current adaptation (institution-analytic) tools

While Deliverables 2.1 and 3.1 provide extensive reviews of key methodologies for impacts, vulnerability, costing and adaptation assessments, the following section fills a gap and supplies key analysis of adaptation tools, including background on current policy needs, criteria to consider when utilizing tools, as well as the lessons learned from analysis of notable tools.

Many reviews of adaptation decision-making tools have been conducted in the past and are drawn upon in this document (e.g. UNDP 2010; Basic, 2007; Dickinson, 2007; Garg et al., 2007; Kurukulasuriya, 2010; the SustainabilityA-TEST project (IVM 2006), the ADAM Digital Compendium). However, for evolving the Integrated Methodology and the design of the Common Platform is important to place the outputs of these tools in the wider climate adaptation research process and in particular to address gaps that are not currently filled e.g. how to address the institutional capacity building that will be required to undertake identified adaptation options, how to include multiple stressors in a climate based analysis and how to ensure a cross-sectoral approach to policy.

Traditionally, research on vulnerability and adaptation has been based on climate impact assessment, with a progression towards devising hotspots of vulnerability, and more recently detailed protocols for vulnerability assessment. However, vulnerability is complex and dynamic, composed of multiple stresses, which interact at a range of scales often producing cascading and unexpected impacts (Downing et al., 2005; Bharwani et al., 2007). The social nature of these dynamics, including ‘path dependency’ and ‘lock-in’, are difficult to understand or predict and add more uncertainty to that which must already be accounted for in studies of climate impacts and adaptation. Representing these varied pathways of vulnerability and adaptation requires a range of innovative methods, techniques and tools, which should be highly customizable for different contexts or developed for the specific research question.

#### 3.1 What are current policy needs and knowledge demands?

In terms of tools and information access, research has shown that some national and regional decision-makers feel that it is too early to speculate on what tools and information will be useful to deal with the decisions that will need to be made within the next 20 years (Pfenninger et al., 2010).

Nevertheless, we will review some of the decision-making tools that have been used in a range of sectors, assessing the conditions under which they can be successfully applied. Research in
Mediation has so far indicated that all of case study regions are at very different stages in the adaptation policy cycle (Pfenninger et al., 2010). Some are not at the stage of recognizing adaptation in their national management plans requiring guidance on the most appropriate awareness-raising methods to employ e.g. Italy, whilst others recognize climate change issues and already apply some level of adaptation risk assessment and analysis but require more specific analysis to identify the most suitable measures e.g. Finland.

If we take the examples of 2 cases-studies in Mediation and consider the knowledge demand and policy needs in each, based on research carried out so far (Pfenninger et al., 2010), it may aid the identification of user needs of different tools, what is missing from the analysis process and the ‘conditions of applicability’ in which tools can and cannot be applied. Pfenninger et al. (2010) conducted a series of interviews with national stakeholders in different European countries to establish policy needs and gaps in climate adaptation, including the use and requirements of tools and information.

3.1.1 Italy
There is currently no evidence of a national political commitment on adaptation in Italy and thus raising awareness on the issue may be a high priority initially. Though the lack of a national initiative cannot be compensated for by local action, steps have been taken at the local level, on issues such as heat waves and droughts. Some local decision-makers, as well as national public bodies and regional decision-makers have regulatory powers and the capacity to act (Pfenninger et al., 2010). However, a strategy to both trigger and harmonize regional and local action is needed, and this requires multi-level governance and coordination.

In addition to these complexities, when updated climate information is needed, it is not always available to policy-makers who may be faced with a great variety of adaptation policy options. Tools such as web portals for information or databases dedicated to adaptation for different climate change scenarios may be useful. More information on national and regional impacts and vulnerabilities as well as on costs of adaptation is also essential. The report and exchange of best practices would be a good tool to support policy-makers. However, in general tools and information needs are harder to elicit as Italy is in the earlier stages of the adaptation cycle (Pfenninger et al., 2010).

3.1.2 Finland
Finland started incorporating adaptation at the national policy level with a national strategy in 2005. The initial years were mostly used for awareness-raising and research. Finland is not overly threatened by climate change at the moment, but in terms of information needs and analysis, it seems that more socio-economic research and cost-effectiveness analysis is desired to reduce uncertainty (as in the Spanish case). Information access is expected to improve with the launch of the Finnish climate change portal in 2011 and appropriate tools with a shallow learning were also identified as important. At an institutional level, greater multi-level governance is required with more inter-agency coordination in the forest sector with a central coordinating body as well as more involvement of the local level. From a practical standpoint, further synergies between adaptation and mitigation in the forestry sector need to be identified alongside additional climate change options or pathways i.e. most options are ‘no regret’ strategies and beneficial regardless of climate change (Pfenninger et al., 2010).

3.2 Criteria to consider when choosing a tool
It is clear that all our case studies in Mediation, including Italy and Finland, are at different points in the national adaptation planning policy cycle and therefore will have different needs from the Mediation platform. To accommodate these different needs will require different entry points and
user journeys through the platform. It is important to capture the range of these needs as far as possible and define them more clearly at the design stage of the platform.

We argue here that new approaches are needed which:

(a) are less top-down and quantitative than have been used in the past - possible hybrids of techniques (both top-down and bottom-up, both model-driven and participatory) developed to address a specific context and question (Kemp-Benedict et al., 2010).

(b) recognize that there are different tools, methods and approaches to successfully address an adaptation problem at different stages of the research process.

Based on the Mediation Integrated Methodology, the first step of any adaptation case study is to identify an (preliminary) adaptation question to be explored. Once a question has been formulated, methods can be applied and results can be evaluated, which will probably lead to the formulation of a new knowledge and thus new questions (O’Brien et al., 2000). This means that during the course of a case study, a sequence of questions is usually explored, and this may require a range of methods fit for each particular purpose.

(c) use multiple methods during a single stage of the research process (e.g. identifying adaptation options) to produce a robust set of alternatives.

(d) require an increased emphasis on institutional adaptive capacity.

Responding to climate change must be supported by institutions that are ready to respond to the adaptation challenge, before they are already ‘locked-in’ to a specific decision-pathway. Thus, supporting organisational change and avoiding ‘path-dependency’ in parallel to identifying context-specific adaptation responses will facilitate a more successful response. Identifying adaptation options alone through databases and web portals will not achieve this.

(e) recognize that climate adaptation research should be vulnerability- and not climate-driven.

3.2.1 Goals

In the context of vulnerability and adaptation research, the goals of many methods and tools can usefully be categorised in the following way. Those which:

- raise awareness on adaptation needs
- support the development of projects/programmes/policy for implementing strategies, and,
- facilitate the implementation and operationalisation of adaptive management strategies.

These broad goals are a useful way to map methods to more specific objectives and the tools required to achieve these objectives, to identify potential gaps.

3.2.2 Users

Further to this there are other important criteria for choosing tools for adaptation research. The extent to which these criteria can and cannot be met by different tools is important to be aware of. This should be made transparent in the analysis. These criteria can be separated into two
categories – the needs of the users of the tools and the characteristics of the subjects of the analysis. For the former category, this includes but is not limited to:

- Who will apply the tool and their specific requirements i.e. different users can have different entry point for the same tool and a different user journey
- What goal the tool is trying to fulfil
- Spatial scale (multi-level analysis e.g. linking local and regional action)
- Sectoral focus (single, multi or cross-scale analysis)
- Form (model, participatory process, combination, etc)
- Time required for implementation
- Skills required for implementation (training available?)
- Inputs needed (type of data)
- Types of output e.g. quantitative, visual, narrative etc.
- Examples of ‘good practise’

3.3 Components of analysis

For the subjects of the analysis and the ‘research question’ there are further considerations regarding the extent to which different tools address particular elements identified in other research on dynamic vulnerability and adaptation as critical (Downing et al., 2005). The extent to which these are addressed or not should be made transparent in the analysis. These components include but are not limited to:

- Heterogeneity - differential exposure units / stakeholders
- Dynamic vulnerability - this changes over time and cannot be captured by static indicators. This has implications for adaptation policy.
- Agency - actions are rooted in the behaviour of actors and institutions (requiring organisational or behavioural change) and involve dynamic feedback with the environment.
- Networks - socio-institutional networks drive and bound adaptation
- Scales – vulnerability and adaptation is constructed simultaneously on more than one scale - both temporal and spatial
- Multiple stresses interact, in different ways over time, and vulnerability is not just climate driven.

3.4 Review of current adaptation (institution-analytic) tools

Many reviews of IVA tools have taken place in the past (UNDP 2005, Basic, 2007, Dickinson, 2007, Garg et al., 2007, Kurukulasuriya, 2010, the SustainabilityA-TEST project, the ADAM Digital Compendium etc) and rather than repeating this here we will refer to them and try and add something more to contribute to the needs of the Common Platform. We will elicit conditions of applicability and use which can be reduced to keywords and translated to the tags as needed for the Mediation common platform.

In 2007 the Institute for Development Studies (IDS), together with the World Bank and the International Institute for Sustainable Development (IISD) convened a series of meetings "to assess progress and fill crucial gaps around adaptation tools for development". The objective was to take stock of the tools and methods available to improve decision-making with regards to climate variability and change. A summary report was produced (IDS, 2007), which organized tools according to: the intended audience, level of screening provided, spatial scale, training time, application time, main data type and whether economic analysis was included. These categories
included web-portals, computer-based decision tools, targeting project design and screening approaches to evaluate portfolios and justify design changes.

The Compendium of Adaptation Models for Climate Change (2008) presents and summarizes 35 selected adaptation models for climate change (see Annex I for full list). The Compendium was a contribution to the Nairobi Work Programme and provides scientific and technical information on adaptation models for climate change. In order to be included in the compendium, a model had to adhere to the following criteria:

- It is applied to **humans** adapting to climate change
- It incorporated adaptation, even in a basic way
- It is based on climate variability/change
- Studies using the model can be replicated
- Output could be applied to policy

For a model to meet the Incorporated Adaptation requirement in the Compendium, it had to fit within one or more of the following categories:

- Simulates agent adaptation
- Policy/Decision Variable
- Statistical Downscaling
- Estimate cost water man
- Adaptation Assessment
- Assess/Evaluate adaptation options
- Emissions targets
- Adaptation module
- Links several IAMs
- Cost effective adaptations
- Induced/Evaluates adaptations
- Assess strengths of adaptation

Models in the compendium were classified based on their treatment of adaptation into two categories:

- **Adaptation Centered Models (ACMs)** – which explore a variety of adaptation options and allow for these options to be evaluated/manipulated, and according to the authors, represent a "more promising direction for future development".

- **Impact Centered Models (ICMs)** – which measure the impacts of climate change and some gross measurements of adaptation. However, adaptation in these models is assumed to be a fixed parameter of measureable quantities, rather than a dynamic set of options.

Further classification and presentation of the model descriptions (which the author notes as having been "extracted from peer review literature, model authors and corresponding websites") was based on model typology which categorizes models based on:

- **sectors** (Agricultural (36%)*, Coastal (7%), Economic (43%), Forestry (0%), Human Health (0%), Hydrological (0%), Multi-sectoral, Economic (43%), Social (14%) and the

- **engines or parameters they employ** (Agent Based (5%), Behavioural (6%), Cost Benefit Analysis (5%), Evaluation (10%), Integrated Assessment Models (25%), Optimization (6%), Qualitative (7%), Quantitative (25%) or Simulation (11%)).
The ‘Handbook of Current and Next Generation Vulnerability and Adaptation Assessment Tools’ by Garg et al. (2007) provides an assessment and critique of frequently used vulnerability and adaptation assessment (VA) tools so that users "are better informed and can take a more conscious decision in selecting appropriate tools for their use". It begins by outlining the characteristics that lend credibility, accuracy and stakeholder acceptance of a tool and use these in their assessment and description in subsequent chapters on approaches which are relevant, accurate, measurable, produce reproducible analysis, comparable, cost-effective, flexible enough to adapt, able to identify trends, and readily understood.

Subsequent chapters provide an overview and assessment of strengths and weakness of available tools under three categories:

- **Impact and vulnerability tools by sector** (Agriculture, Water Resources, Coastal Resources, Human Health, Forestry and Natural Ecosystems, Energy and Environment and Infrastructure and Industry)
- **Integrated vulnerability and assessment tools** - PRIMES (Energy System Model), Prospective Outlook on Long-term Energy Systems (Poles), Externalities of Energy (Extreme), Integrated Assessment of Climate Protection Strategies, RICE and DICE, IGSM (The MIT Integrated Global System Model), MERGE, and MAGICC/SCENGEN (Model for the Assessment of Greenhouse-gas Induced Climate Change/Regional Climate SCENario GENERator).

The final chapter of the handbook, looking at future directions for adaptation tools, outlines suggested components of an integrated vulnerability index that are more dynamic in nature and try to capture the relationship between different indicators and adaptive capacity.

### 3.4.1 What are the ‘conditions of applicability’ for choosing a tool?

Climate adaptation decision tools analyze a specific context and choose from multiple adaptation options to meet a common adaptation policy objective (for a detailed review of formal decision methods see D1.4 on Uncertainty Methods and for a review of socio-economic methods see D3.2).

Here we present the ‘conditions of applicability’ for a small sample of practical adaptation decision support tools, and mention where particular decision frameworks are incorporated within the tool. Conditions of applicability are relevant for the Mediation toolbox as they will provide keywords or ‘tags’ that are planned for the online database which can search through and filter methods appropriate to a given context. The existing reviews of tools and our survey of them, though not exhaustive, has led to observations and recommendations that are important for the design of the Common Platform. The tools reviewed, which can be found in Annex 2 of this document, are:

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*Parentheses next to each of the above indicate the percentage of models in the compendium which fit these criteria.
3.5 Lessons Learned from Application of Current Adaptation Tools

The tools surveyed above have been compiled in a Table in Annex 3, for ease of comparison of the checklist of ‘conditions of applicability’. The goals that are met by each tool are listed in a Table in Annex 4. These show that while some tools are better at covering organizational change processes, they may not incorporate decision-making methods or economic analysis, while those that cover more of the broad research goals, omit the analysis of adaptive capacity while more formal decision making and economic analysis may be included. Other significant gaps in current tools and approaches appear to be the analysis of cross-sectoral interactions and the costs of adaptation. As not all tools are appropriate for all situations, this may imply the need for a Common Platform that can guide the user to the appropriate tool(s) to use at the different stages of the climate adaptation process.

The conclusions of many of the existing reviews of decision-making tools support our observations and findings here documented here. Adaptation is an ongoing social process and one of the issues that is clear is that many so-called ‘adaptation tools’ only analyse a snapshot of the context and do little to determine the relationship between variables critical to the success of adaptation scenarios, which will also change over time. Therefore, for the Integrated Methodology and Common Platform it is important to make a link between the outputs of these tools and how they can link to building the adaptive capacity that will be necessary to undertake the identified options. For example, the PACT framework highlights the issue that information and awareness on climate change issues does not necessarily lead to action even if adaptation options are known, and this implies that many tools (particularly those that emphasise adaptation options alone) must also be complemented by more process-based tools to build adaptive capacity and approaches which include monitoring and evaluation.

For example, comparison of the tools in Annex 4, reveals that some of the variables identified as important in work on vulnerability and adaptation (Downing et al., 1995) are not considered to any great extent in the adaptation tools currently available.

- **Heterogeneity - differential exposure units.**
  Most non-process based tools do not seem to address differential exposure units. This implies that even if it is recognised that multiple actor groups need to be analysed the methodological process will need to be repeated for each group. This makes it more difficult to deduce interactions between groups unless this process is well-designed and participatory amongst the range of actors.

- **Dynamic vulnerability - this changes over time and cannot be captured by static indicators. This has implications for adaptation interventions.**
  Few existing adaptation tools are able to address changes over time in a way that captures the possible changes in future social vulnerability. Largely this is because current tools are not able to capture an understanding of the relationship between variables that drive vulnerability, which include multiple stresses, and there is too much uncertainty associated with identifying
and understanding the interactions between these drivers. However, there are methods that try to address this uncertainty (see D4.1) and tools such as agent-based social simulation, for example, can create scenarios of dynamic future vulnerability and adaptation over time based on an analysis of current vulnerability (Bharwani et al., 2005).

○ **Agency** - actions are rooted in the behaviour of actors and institutions (requiring organisational or behavioural change) and involves dynamic feedback with the environment.

Although adaptive capacity drives some approaches, there is variation in how much the reasons ‘why’ particular decisions are made are explored. Eliciting such formal and informal socio-institutional drivers is key for the design of successful policy guidance or implementation. It is important to capture the diverse and heterogeneous characteristics of multiple agents, with differing goals and perceptions (i.e. what actors say they do is often different from what they actually do), interacting in a system and to test their response to scenarios of different environmental or socio-political change. This level of understanding of the interaction of driving forces for actors’ decisions are not captured to any depth in many tools in the field of adaptation.

○ **Networks** - socio-institutional networks drive and bound adaptation

Organisational capacity for change and recommendations for how to achieve this are addressed in detail by process based tools such as PACT, and to a much lesser extent by simpler tools such as BACLIAT. On the other hand, PACT probably has a slightly steeper learning curve and is more focussed on operationalising and implementation than awareness-raising alone (though awareness-raising is achieved as a by-product of the process involved).

○ **Scales** – vulnerability and adaptation are constructed simultaneously on more than one scale, both temporal and spatial

As mentioned temporal scales for decision-making are often not covered in any dynamic way, except perhaps in terms of qualitative scenarios using visioning exercises for the next x number of years, short-term vs. long-term etc.

Different spatial scales are covered by different tools, but cross-scale analysis is often missing and thus dependent on any extended analysis carried out by the user/researcher. However, linking local and regional action and inter-agency coordination has been mentioned as a key need by stakeholders in our national studies (Pfenninger et al., 2010).

○ **Multiple stresses interact, not just climate related ones.**

As the field of climate adaptation has evolved, multiple stresses are captured to some extent by some tools, but often not in a way that is not driven by climate, or in a way that does not go beyond filling out a checklist.

In-depth narrative analysis, for example, which would uncover many types of social or socio-institutional stresses, and the interaction of both bio-physical and social factors, is often missing. This also means that cross-sector analysis is often missing from the actual tool and relies on further interpretation by the tool user/researcher.

○ **Economic analysis**

While economic methods are included by some tools, such as ORCHID, the goal of which is project screening, those whose goal may be more implementation oriented, such as CRISTAL or PACT do seem not cover them as much. It would be worthwhile exploring further, the reasons for this.
These observations are not to suggest that all tools must cover all of the above variables, as each tool can be applied at different stages of the research process, and are often developed for a specific purpose. Nevertheless, the recognition that all of these components are important and the awareness that where areas are not covered by a particular tool or method, they should be addressed at a different stage in the research process is key for furthering tool development and general research in the climate adaptation field. This holistic approach will be important to capture in the Common Platform.

For example, as mentioned above, Naiade has been used in a participatory way on several occasions, by means of combining the use of MCA software with input from focus groups and interviews. Input from stakeholders is usually used to define both the criteria and the alternative sets in order to render the outcomes of the MCA application more transparent and relevant. Then, Naiade can be used in a participatory way as part of a larger social Multicriteria policy assessment. In this way, MCA can become Social Multicriteria Evaluation (SMCE) and its application process entails the following steps:

1. Structuration of the problem, where the main boundaries and components of the issues at stake are defined;
2. Institutional analysis, aimed at examining the main interests involved;
3. Generation of the policy options;
4. Development of the Multicriteria impact matrixes, e.g. via Naiade;
5. Application of the mathematical procedure to aggregate and discriminate the alternatives;
6. Sensitivity analysis, to assess the robustness of the analysis (e.g. to see when changing parameters varies the final ranking result).

If understood as such, SMCE can be seen more as a general approach to policy evaluation, where it is thought that the pluralism of conflicting interests, values and options have to be taken into account, rather than only an isolated method. This lends support to the notion that applying both institution-analytic (bottom-up) and decision-analytic (top-down) methods in innovative ways should be explored and lessons learnt from this process to further inform the design of the Common Platform.

3.5.1 The need to assess, build and monitor adaptive capacity

As mentioned earlier, many stakeholders find it difficult to articulate what tools and information they need at this time (Pfenninger et al., 2010) and thus the first step must be engage with them more broadly to identify in combination with the tools we know currently exist, what gaps the Common Platform should address.

Framings of adaptation, such as the Performance Acceleration through Capacity-building Tool (PACT) introduce the idea of discrete levels of an attribute and that allow the user to identify where they currently are, their ultimate goal, where they would like to be at some defined time in the future and get practical guidance on what it might take to achieve this, giving the information you need to make the next steps (Lonsdale et al., 2010).

In this way, PACT also attempts to address issues of path dependency and ‘lock in’ as there are clearly increased difficulties in adapting just after lock-in has begun, and the window for
intervention is normally extremely short so methods to exercise capacity have to be developed ahead of time (Lonsdale et al., 2010).

However, it is clear that all our cases are at different points in the national adaptation planning policy cycle and therefore will have different needs from the Mediation platform. To accommodate these different needs different entry points and user journeys through the platform may be useful.

The shift from classical climate impact assessment to devising priorities for vulnerability analysis and appraising and evaluating adaptation options is now considered increasingly important, and the diversity of methods used in climate change adaptation research should be better reflect these needs for practical real-world applications at national, regional and local levels. Further efforts to monitor and evaluate the impacts of these tools, share lessons learnt and our methodological footprints will allow us to reflect on existing deficiencies and develop some useful directions for future tool development (e.g. Kemp-Benedict et al., 2010).

3.5.2 Conclusion and recommendations

Our survey of tools reinforce the findings of other reviews and also add further observations which we have distilled to the following set of recommendations for the design and implementation of the Common Platform.

- There is a need for the Common Platform to address the multiple stressor context within which adaptation policy will need to focus if it is to be effective. This is similar to the UKCIP and PACT approaches which do not assume that all sectors are well adapted to current climatic conditions.
- There is a proliferation of tools and methods in this field, but there is a need for increased emphasis on process-based decision making and institutional capacity building.
- Case studies are a valuable means to spread information and to demonstrate how tools have been applied and more examples of ‘good practise’ are needed.
- There is a trend that is beginning to move towards increased monitoring and evaluation processes, which also facilitates the identification of ‘good’ and ‘bad’ practise.
- Though some tools incorporate an analysis of multiple stressors to some extent, this is often not detailed enough to balance the emphasis on climate data and climate impacts.
- There is increasing consensus for harmonized multiple tool development (Munda 2003).
- Many tools appear to be sector and scale dependent and while there are many case-based examples for water, land, and to some extent coasts, examples of tool use in other sectors are more poorly represented. E.g. in health, ecosystems, tourism and so on.
- Linking local and regional action and inter-agency coordination remains a key need, as articulated by stakeholders in our national studies (Pfenninger et al., 2010).
- There appears to be a lack of actual adaptation decision-making tools and more tools for project screening to ensure that adaptation is fully considered in climate change analyses.
- In relation to this, the analysis of cross-sectoral interactions must attract more attention in tool development.
- Methods for assessing the economic implications of adaptation must be more widely developed and integrated within other tools, particularly participatory tools such as CRiSTAL and PACT.
o Modelers and designers of the Common Platform must continue to engage with stakeholders in the cases-studies to elicit needs and potential uses of the Common Platform.

o Identifying different individual ‘user journeys’ will be important for tailoring guidance on how to approach climate adaptation.

o Different user entry points will be needed to cater for different stakeholders who are also at different stages of the climate adaptation process, as is the case in our country case studies.

o The lack of holistic decision- as opposed to project-screening tools implies better tools need to be developed to actually support decision-making. The first step for this is to learn lesson from existing projects. This requires a mechanism for sharing ‘good’ and ‘bad’ practise.

o Creating more participatory tools which address all the conditions of applicability mentioned here also introduces the problem of subjectivity and bias. However, this should not excuse their exclusion and instead transparency in the process of using tool and introducing as much sensitivity analysis and monitoring and evaluation as possible can help to reduce this bias.

Of course, there is no one best tool to deal with climate adaptation as it affects different people, regions and sectors in different ways. UKCIP have developed a useful generic methodology to guide users in different contexts to deal with adaptation, whatever impacts they may be facing. Based on the analysis of tools done here and past experiences of using tools in the adaptation field, Figure , provides a framework detailing the types of approaches that can to be taken to try and address the gaps that individual tools, used only in isolation, can result in. It is these steps that the Common Platform should try and incorporate as guidance for both novice and more experienced users involved in climate adaptation.
Figure 1: Missing steps in adaptation research – and those that the Common Platform should take the user through.

Whilst the uncertainty of impacts and their relationship to adaptation in differing context remains, ‘good’ practise must take an iterative and reflexive approach recognising that adaptation is a continual social process of adjustment and learning at multiple scales amongst multiple types of actors and formal and informal institutions, with wide-ranging goals, perceptions and beliefs which will ultimately drive behavior. For example, PACT identifies areas of path dependency to avoid lock-in and to maintain flexibility and adaptive management. Understanding what drives behaviour and why different actors take different decisions is often bound to knowledge that is tacit, and while this is difficult to elicit, it is this depth of analysis that is necessary for improving the adaptive capacity of individual actors and institutions.

4 Review of Toolbox Literature

In the recent past, the number of tools and guidelines pertaining to climate change has skyrocketed, driven mostly by international aid agencies and NGO’s, yet, there still is to be widespread use of a suite or toolbox of different methods. Instead, there are a myriad number of different tools that each performs well in some niche, with individual strengths (IISD 2007). In a recent review of 30 well-known and widely used tools and guidelines available for use in climate adaptation mainstreaming, only 3 were classified as “knowledge and information sharing platforms,” namely, the website weAdapt, the Adaptation Learning Mechanism (ALM), and the NAPA platform (Olhoff and Schaer 2010). Other known tools, guidelines or toolboxes include the UK Climate Impact Programme and Canada’s Climate Change Tools for Adaptation.
4.1 Context of Climate Change Adaptation

The weADAPT platform - http://weadapt.org/
weADAPT is a web-based platform that serves as an information repository and means of sharing tools, data, training materials, and experiences with adaptation decision-making at various spatial levels (project, regional, national levels etc.) designed for use by policy makers and project planners. It is classified as a “discussion platform” attempting to increase the worldwide knowledge base for the adaptation community through collaborative work (Olhoff and Schaer 2010). The platform is primarily organized spatially, its main feature being a Google Earth layer that graphically presents information and links to a custom wiki through a map display. The platform also includes the Climate Change Explorer and the Adaptation Explorer, tools with the aim of providing information for climate, vulnerability, and adaptation decisions.

The custom wiki (wikiadapt.org) is primarily an information sharing platform, aimed at enhancing the knowledge base of users. Initially, weADAPT and wikiADAPT were separate, but linking of the two tools has created a spatially organized wiki, collecting data on vulnerability, climate conditions, and other data relevant to adaptation, while offering the ability to both access and contribute data. (SEI 2010a and SEI 2010b).

The Adaptation Learning Mechanism (ALM) - http://www.adaptationlearning.net/
ALM is another web-based platform established with the same general goals as weADAPT, mainly, to encourage a sharing of knowledge on adaptation. The site aims to share details of project partners, methods, tools and actual experiences, with the target user group being policy makers and development practitioners (Olhoff and Schaer 2010). Again similar to weADAPT, the website’s scope is very broad, covering various spatial levels worldwide.

The platform seems to be structured with an intelligent, rapid search function. Entries are classified geographically, by region and country, and then by themes (agriculture, disasters, etc.) types (data, assessment, case study, etc.) and finally by keywords and tags. The ALM search function, while not as beautiful or spatially aware as weADAPT, is simple and succinct, allowing the user to quickly and accurately find any desired information that fits any number of search parameters (ALM 2010).

The UK Climate Impacts Programme (UKCIP) - http://www.ukcip.org.uk/
The UKCIP has a number of different tools and guidelines on a web-based platform, most notably the Adaptation Wizard and the REGIS tool.

The UKCIP Adaptation Wizard is a web-based tool, designed to help assess vulnerability to current climate and future climate change, identify options to address climate risks, and develop a strategy to address identified risks. It is also a guide to the information, tools and resources that UKCIP provide. The framework is circular, emphasising an adaptive approach to managing climate change and the need to revisit decisions in light of new information. Certain stages within the framework are tiered, which allows the decision maker to identify, screen, prioritize and evaluate climate and non-climate risks and options, before embarking on more detailed risk assessment and options appraisal. The UKCIP Business Areas Climate Impacts Assessment Tool (BACLIAIAT) is a simple checklist that can be used to assess the potential impacts of climate change at an organisational level. It examines threats and opportunities from climate change for Logistics, Finance, Markets, Processes, People, Premises and Management implications.

REGIS simulates future climate impacts on two regions of the UK, allowing for analysis of cross-sectoral impacts. Both tools are designed in a user-friendly manner, with planners and managers of the UK being the primary users. As it is a national program, it is limited in scope to the UK.
region. The UKCIP website should be seen more as a loose affiliation of tools or a central collection point for climate change information, rather than a toolbox, as no linkages exist between separate information sources, nor is there an easy search or overview function (UKCIP 2010; Olhoff and Schaer 2010)


The NAPA platform is designed as an online library, providing NAPA teams with access to websites, publications, and tools to assist with completion of national adaptation programmes. Organized in a fairly straightforward manner with a relatively simplistic search tool, the platform groups material into sectoral topic areas, plus additional guidance on NAPA, and listings of specific tools for NAPA support, and while the focus is on the country level, multiple scales are included. (UNITAR 2011)

**Canada’s Climate Change Impacts and Adaptation Division (CCIAD) Tools for Adaptation - [http://adaptation.nrcan.gc.ca/index_e.php](http://adaptation.nrcan.gc.ca/index_e.php)**

Canada’s adaptation toolbox is still in the formative stages and thus not accessible to the public, but according to the CCIAD of Natural Resources Canada, the toolbox will be a web based platform providing information about current projects, available tools, and case studies, presumably at a national within Canada. The project is being designed with an end user group of practitioners and experts in each sector (CCIAD 2010).

### 4.2 Context of Environmental Policy


This toolbox, built alongside a guide for conducting an integrated assessment of health risks of environmental stressors in Europe, seems most similar to the MEDIATION WP 2 goal of creating a toolbox to aid in integrated assessments of climate change. It is designed as one component that can be utilized in all parts of an assessment, assisting in framing of the issue, design, and execution. The toolbox itself consists of data, models and tools, as well as examples of completed assessments and assessment techniques, giving the user additional insight into how certain tools can be used to aid in the process. It also acts as a clearinghouse for assessments completed by users who wish to share their experience and provide feedback (INTARESE 2010).


The e-textile toolbox was part of an European Commission funded project to improve cooperation between Asia and Europe in the field of textile manufacturing, aimed at improving environmental impacts of the industry, as well as its efficiency. Although called a toolbox, the website can be seen more as a guidebook and a set of recommendations, lacking any data or tools to be utilized by users. It helps users analyze specific portions of their workflow, in order to reduce production costs, improve quality and environmental performance, and increase efficiency, mostly by providing a guide that helps the user self-analyze their current performance and highlight areas to improve upon (e-textile 2010).
5 Lessons learnt from review of existing methods, metrics and Toolboxes for CCIAV assessment

5.1 Lessons Learned from CCIAV review

While the Mediation Deliverables 2.1 and 3.1 present an extensive analysis of the state-of-the-art in terms of both impact, vulnerability and adaptation methods, their results as they pertain to the design of the toolbox, as well as other independent research on key gaps and advances, the usage of common metrics, and general integration, is presented below.

5.1.1 Increasing Emphasis on Vulnerability

CCIAV assessments have evolved greatly in the time period since their general use, and while the majority of research has focused more on the cost of adaptation measures, rather than climate impacts and risk, CCIAV assessments have recently been more strongly focused on informing adaptation decisions. The climate change modelling community is increasingly embracing a more risk-based approach (see, for example, Jones 2004; Carter et al. 2007); regional climate modelling and statistical downscaling methods, as well as climate and socio-economic downscaling techniques are increasingly being applied (Goodess et al. 2003). Importantly, assessments of climate change impacts and vulnerability have changed in focus from an initial analysis of the problem to the assessment of potential impacts, and finally, to the consideration of specific risk management methods (Carter et al. 2007). This stronger focus on risk-based assessment of adaptation is particularly important for fat-tailed (i.e., non-normally distributed) catastrophic impacts that are potentially very large, uncertain, unevenly distributed, and may occur in a distant future.

As vulnerability is seen by some as key in the future of climate change research (Füssel and Klein 2006) emphasis should be placed on case studies, via the toolbox, to incorporate vulnerability and risk-based estimates of impacts. This can be made possible by highlighting areas that are lacking in vulnerability methods and suggesting appropriate tools or methodologies to enhance estimates of future impacts.

5.1.2 Improving variety of adaptation analyses

Work presented in MEDIATION Deliverables 3.1 and 3.2 provides a valuable addition to the toolbox. Currently, case studies address adaptation analysis primarily via consultation with stakeholders. The incorporation of results from the above analysis provides valuable and applicable methods, moving beyond input from stakeholders, incorporating initial evaluation of both adaptation options and impacts, coupled in a cyclical manner with design and further analysis of further adaptation options, through decision-support tools such as cost effectiveness analysis, cost benefit analysis and general equilibrium models, multicriteria analysis, and optimisation models.

Incorporation of these methods into the toolbox presents both the case studies and the end users with both the actual methods and associated guidance provided by the toolbox to better analyze adaptation options.

5.1.3 Use of Common Metrics

A third result of the review of CCIAV assessments reveals a lack of conformity in regards to the metrics used to describe and analyze results. A lack of consistency across and within sectors and disciplines leads to incomparability of results. A solution to this problem is the institution of a set
of common metrics used to measure impacts and adaptation measures, varying by sector, but standardized in order to make different studies easily comparable, and to enhance analysis. A list of common metrics, proposed in Watkiss and Hunt (2011), can be found in Table 1.

Table 1: List of proposed common metrics for Mediation

<table>
<thead>
<tr>
<th>Sector</th>
<th>Possible Metric</th>
</tr>
</thead>
<tbody>
<tr>
<td>Health</td>
<td>DALY, fatality or life year saved (all impact metrics).</td>
</tr>
<tr>
<td></td>
<td>Some health thresholds exist (maximum occupational temperatures, comfort levels)</td>
</tr>
<tr>
<td>Sea level rise</td>
<td>Reduction in land area at risk (exposure metric) per ha. For the measure relative to value of land protected per ha (impact metric).</td>
</tr>
<tr>
<td></td>
<td>Pre-defined acceptable risks of flooding as objective / threshold level for adaptation</td>
</tr>
<tr>
<td>Agriculture</td>
<td>Impact based metrics include unit of crop yield, reduction in water stress, production or land value. Change in value added as a result of adaptation measures.</td>
</tr>
<tr>
<td>Water resources</td>
<td>Impact metrics for water availability (household) and M³ of water provided.</td>
</tr>
<tr>
<td></td>
<td>Possible thresholds in terms of environmental quality (Directives) or acceptable flows. Possible thresholds for risk of supply disruption.</td>
</tr>
<tr>
<td>Extreme Events (including infrastructure)</td>
<td>Floods – as for SLR in terms of acceptable levels of risk as objective</td>
</tr>
<tr>
<td></td>
<td>For other extreme events, possible metric in terms of level of risk reduction, or pre-defined acceptable levels of risks</td>
</tr>
<tr>
<td>Ecosystems and Biodiversity</td>
<td>Critical targets (sustainable levels) and standards (overall objective). Unit of ecosystem services affected</td>
</tr>
<tr>
<td>Business &amp; industry</td>
<td>Net value added</td>
</tr>
</tbody>
</table>

Source: Watkiss and Hunt (2011)

5.2 Lessons Learned from Toolbox review

After examination of a number of toolboxes in different fields, the most readily apparent conclusion is that there is no single pattern of construction; overall design is based on a number of decisions, falling on a continuum between one extreme and another, which changes depending on proposed users as well as the identified goal of the toolbox. Each platform balances a choice between simple and complex, whether it be in verbose, in-depth descriptions of each component, or a simple, bullet point list overview, with links to outside resources, or between a built in search tool allowing for fast location of specific data and a structure that leads the user to the appropriate methods based on a linear website design. These are just two examples, but a number of choices have to be made, and there exists no truly right or wrong answer; the toolbox needs to cater to its select user group, depending on the stated goals.

5.2.1 Differences between a toolbox and a guidebook

An important detail requiring discussion in the initial stages of toolbox construction is the question of what actually constitutes a method that is applicable for the MEDIATION toolbox.
The scope of a method must be more accurately defined; as the current definition stands, a method could encompass such things as the UNDP’s Adaptation Policy Frameworks (APF) for Climate Change, an extremely comprehensive, but entirely unspecific, guide for countries to identify and prioritize adaptation options (Lim et al 2004). Similar too is the UKCIP’s Adaptation Wizard, which is a simplistic and general step-by-step method of determining risks and potential adaptation measures. Both tools are designed for broad consumption by an audience that does not necessarily have any background in climate change adaptation. This question also relates to the MEDIATION toolbox’s target user group, as it is likely that with certain groups, such as experts in respective fields, broad simplistic guidelines would be rendered unnecessary, but as no user group has been concretely defined, this remains a question.

5.2.2 Search functions and ease of use

While all of the reviewed toolboxes exist as web-based platforms, there was by no means a standard structure to website navigation and organization; some have more novel methods of searching for data, such as weADAPT’s Google Earth layer, and others lack any ability to search and sort through data at all (i.e. e-textile). As the MEDIATION toolbox will be designed with ease of use in mind, as well as rapid location and acquisition of data and tools, an effective means of organization, and ideally a powerful search tool, are key elements in the toolbox design.

5.2.3 Information on and location of specific tools

Similar to searching abilities, each of the studied toolboxes differed in its presentation of data and methods. Some sites had extremely brief overviews before supplying the user with various links to papers, other guidebooks, and the tools themselves, while at the other end of the spectrum were very detailed descriptions and local (website-based) access to the method in question. The amount of detail seemed to vary with the intended audience; a broader audience with varying degrees of familiarity with an issue would be provided with simpler, but clearer descriptions, while a more expert-based user group was assumed to have prior knowledge, and given technical information and more direct access to primary sources.
6 Developing the Toolbox as an integral part of the common platform and integrated methodology

The toolbox design is more important than the actual contents; as case studies are well prepared for their work, the toolbox cannot, to a large extent, improve upon methods at an individual level, and there is little value added in terms of “helping” case studies. The toolbox can, however, positively influence the integrated methodology (IM) and common platform (CP) in assisting users to use tools and methods. The creation of a toolbox will allow users of the integrated methodology to access firsthand methods used in case studies upon which the IM is based, as well as provide clarity and improved access to individual Consortium tools for possible use in future studies. The toolbox also increases organization and clarity of the common platform, contributing to overall efficacy and relevancy to end-users, in the context of being an organized, easily accessible web database readily integrated into the rest of the CP.

While the toolbox will primarily create a typology of methods used within the Mediation project, there exists possibilities to collaborate with other similar efforts, notably the EU projects CLIMSAVE and ACE. CLIMSAVE is pan-European project with the goal of creating an integrated assessment methodology, and is highly integrated, including tools and methods analysing a range of sectors and incorporating impacts, vulnerability, and assessment of adaptation options. Through collaboration with the CLIMSAVE project, their efforts can be seen as an extremely large case study, and the tools and methods used therein incorporated into the Mediation toolbox in the same manner as the Mediation’s own case studies. While CLIMSAVE is not in the Mediation Consortium, any efforts to include their methods in the toolbox typology and increase access to both tools and results would result in positive benefits for both research groups.

ACE is another European effort to create a Clearinghouse of climate-related data and results from models of a range of sectors at EU research institutes. Collaboration with the Clearinghouse project could result in a more robust toolkit for both projects, via enhanced access to results and a standardization of typologies that allow an ease of incorporation from one dataset to another.

6.1 A First Blueprint for a CCIAV toolbox for MEDIATION

After an initial survey of both previously existing toolbox platforms as well as the individual items included in such a system, broad design parameters must be outlined, even before creating a typology of methods, in order to have a stated goal, which all future work can contribute to. While the clear definition of deliverable 2.2 is to create and populate a toolbox, this is essentially the extent of the design parameters. Taking into account the overarching purpose of the toolbox, as described in Section 5, a clearer blueprint of what the actual end product will look like can be put forth.

6.1.1 The toolbox at the macro scale

Building on previous work by varying organizations to create toolbox platforms (such as referenced in Section 3 and 4) as well as the need to seamlessly integrate with the Common Platform and contribute to the integrated methodology, the MEDIATION toolbox will at its heart be a relatively simple web-hosted database, augmented with a search function. This general design focus is both a result of constraining factors as well as the final stated goal of the work. Since the majority of input methods has been obtained from different consortium partners, as well as external organizations, each with different policies on use and/or alteration of methods, it is impractical to build a more integrated toolkit, as the sheer number of tools, all created with different methodologies and parameters, would make this an impossible task. Referring to Section
5, it is stressed that the true value-added of the toolbox will be in creating order and supplying information by standardizing the means of describing items. Creating a central database allows the toolbox to present information ranging from general to specific, as well as documenting previous research, providing details on strengths and weaknesses of methods, and how users could gain access to methods, all of which work towards the previously stated goals.

Figure 3 in section 6 provides a graphical depiction of the toolbox and contents. A structure made of discrete elements ordered by broad categorical definitions, the toolbox allows for the ordering of numerous items and realizing connections and combinations between them, while still being able to describe tools individually and allowing the ability to reframe the organizational structure and discussion of MEDIATION methods from one focused on case studies to focusing more on adaptation problems in general. This allows the end user to access items and information without having everything presented with a focus on research questions, which is the intent of creating a toolbox targeted to a broader audience than researchers alone.

Organization of the toolbox and a proper typology of applicable items is the first and most necessary step in forming the toolbox. Carter et al. (2007) introduces a useful, broad approach for classifying different methods as can be seen in Figure 2 below. This provides a skeleton around which further specification and details can be added to create an orderly collection of methods, metrics, and datasets.

![Figure 2](image-url)

Figure 2: Characteristics of different approaches to CCIAV assessment.
Source: Carter et al 2007

The table provides a means of organizing individual entries, but more is needed to allow an overarching order, with the end result of aiding in use of the toolbox. Two proposed typologies for toolbox entries can be seen in the Figure below, with origins in either a problem- or stakeholder - based scheme. A problem-based organizational scheme would classify items from broad characteristics to specific, in an order that would seem to lead a user to an answer, given a problem or a question of some kind. The reverse is true of a stakeholder -based system, in which the user knows almost exactly what they need, and wants to find it quickly and easily. While Figure 2 is fairly simple and nondescript, we should take note of the point that there are many different ways to organize the toolbox, favouring certain user groups over others, depending on decisions made. This most basic level of organization should be the first priority of the toolbox,
to create an understandable but effective typology, which provides the toolbox and the user with a basis for further improvements.

Overall, we suggest to approach from a problem- as well as stakeholder-oriented perspective:

![Diagram](image)

**Figure 3: Problem and stakeholder-oriented organization of the toolbox**

As shown in Figure 3, an organizational typology framed with stakeholders and toolbox users in mind would be fundamentally different from previous attempts such as is described in the IPCC AR4. Carter et al.’s description of methodological differences of various models and other toolbox items seems best fit for an expert audience, but in order to tackle the goals of adding value to the decision-making process, as well as improving general organization and ability to locate appropriate methods, more specificity is required, and broad categorical definitions do not suffice.

This results in the need for a multi-faceted approach to organization, coupled with a means of querying the toolbox for exactly what is needed by decision-makers. While Figure 3 describes one possible pathway of organization, it is admittedly just one possible means of organization, and as described, takes on a more hierarchical approach, which could result in undue importance being placed on any one factor. As the toolbox will not be populated with a limitless number of methods, there may be “bottlenecks,” where an incorrect choice in this search algorithm may result in a lack of items. To avoid this, the toolbox will implement a system of tags, which while adhering to the general flow described above, allow for more accurate representation of an item’s qualities, as well as allow for relative ease and speed to locate.

Tagging allows for an almost infinite amount of categorization and allows for a searching algorithm that appears uncomplicated and allows ease of use, while still effectively sifting through a potentially large amount of items. A first thought on organization was to create a
spreadsheet-like matrix of methods, with columnar values describing method attributes but this system quickly became unwieldy and unattractive. While acceptable from an organizational standpoint, something cleaner and more efficient is needed for use in this case. Tagging individual items with key sectors, geographical extents, and any number of other properties allows for all of the attributes depicted in Figure X to be condensed into one field. When coupled with the ability to search and sort by multiple specific key tags, the need to display these qualities directly in the toolbox is minimized, and an overall order providing functionality without overloading a user with complexity can be produced.

Searching or filtering of items by tags would allow the most relevant items to come to the forefront with minimal effort on the part of the user; given a multi-faceted search similar to that found on the Adaptation Learning Mechanism’s toolbox (Found in section 3.1), enabling the user to select by multiple attributes, and weighting results by filtering with a preference for items whose tags most closely align with search parameters. A search algorithm used here would initially be a simple linear database search, due to the relatively small number of items populating the toolbox and the speed of computer aided searching. Ordering would be based on a best-fit premise; items most closely adhering to restraints would be placed first, with less-optimal items being displayed sequentially.

While in the initial design, tags would be designed in a standard, categorical fashion to facilitate a linear search algorithm, tagging also allows for future abstraction and more novel approaches to searching. The potential of user-created tags would encourage evolving ideas and descriptions, and eventually lead to clouds of meaning, based on increased and varying descriptors used in place of a rigid set of search constraints. Use of more flexible tagging could also help implementing more informed search algorithms (such as graph transversal searches), compared to the initial use of the simplistic initial search function.

6.1.2 The toolbox at the micro scale

While previous efforts to compile methods and datasets into toolkits have been analyzed in section 4, and while these efforts were not always seen as perfect, they provide a good basis for comparison and guidelines of both pitfalls as well as novel ideas. A relatively common yet novel process was the use of online wiki-styled databases, a database that would address many of the goals for enhancing user experience. Most importantly, the layout and “look and feel” of these websites is ubiquitous the world over; Wikipedia is estimated to be the 8th most trafficked website worldwide. This ensures familiarity and an ease of use; it can also be custom tailored to fit the toolbox’s needs. Wikis are advantageous in that they allow community editing and updating of entries, as well as allowing new data to be added seamlessly and quickly by consortium members. It also allows each toolbox item to be indexed, described, and stored in a common location, with a common format, helping avoid problems associated with varying quality of access to tools from the various consortium members.

As a wiki was originally designed to be an online encyclopaedia, it can easily be translated into an encyclopaedia of methods, tools, and data used for European climate change adaptation decisions. This would help provide a consistent layout and standardized categorical descriptions of tools that could be tailored to the desired user group, in this case, policy-makers and stakeholders. This consistency is encouraged by applying a template based on the Nairobi Work Programme’s Compendium on methods and tools (2008) to evaluate impacts of, vulnerability and adaptation to, climate change. This would enable standardization of entries both within the Mediation toolbox as well as any possible use in outside projects. Table 2 outlines a typical entry to the toolbox.
Table 2: An example toolbox entry (Source: 2008. Compendium on methods and tools to evaluate impacts of, vulnerability and adaptation to, climate change. UNFCCC, Geneva.)

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Description</td>
<td>Explains the type of framework or tool being presented, what type of information this tool helps the user to evaluate and provides a basic summary of how the tool works, including the type of data required and the processes used to evaluate these data.</td>
</tr>
<tr>
<td>Appropriate use</td>
<td>Describes where the framework or tool is (and is not) applicable. This gives the user an idea of the stage at which it is appropriate to use.</td>
</tr>
<tr>
<td>Scope</td>
<td>Covers the spatial scope in which the framework or tool is applicable</td>
</tr>
<tr>
<td>Key output</td>
<td>Describes the final product of the framework or tool (e.g., a model, a cost effectiveness evaluation, an organizing framework).</td>
</tr>
<tr>
<td>Key input</td>
<td>Explains the information or data required to use the framework or tool.</td>
</tr>
<tr>
<td>Ease of use</td>
<td>Describes the level of difficulty associated with implementing the framework or tool.</td>
</tr>
<tr>
<td>Background</td>
<td>A short summary and citations of any previous research</td>
</tr>
<tr>
<td>Training required</td>
<td>Describes the level of expertise and any specific skills required to use the framework or tool effectively.</td>
</tr>
<tr>
<td>Training available</td>
<td>Describes the training available to learn how to use the framework or tool effectively.</td>
</tr>
<tr>
<td>Computer requirements</td>
<td>Describes the computer hardware and software necessary to use the framework or tool.</td>
</tr>
<tr>
<td>Documentation</td>
<td>Provides the citations for sources describing in detail how to use the framework or tool. Generally this is a user’s manual or similar document.</td>
</tr>
<tr>
<td>Applications</td>
<td>Briefly describes actual cases and projects where the framework or tool has been applied.</td>
</tr>
<tr>
<td>Contacts for framework/tools, documentation, technical assistance</td>
<td>Provides information on who to contact for further information, documentation, and technical assistance.</td>
</tr>
<tr>
<td>Cost and conditions of access</td>
<td>Provides information on the cost of obtaining documentation or software for the framework or tool, as well as access conditions (licensing, etc.)</td>
</tr>
<tr>
<td>References</td>
<td>Lists the citations for documents, articles, etc., that have critically discussed use of the framework or tool.</td>
</tr>
</tbody>
</table>

Through the template described in Table 2, each input to the toolkit is described following the stakeholder-based orientation typology described in Figure 3, which frames entries in a style that provides information more effectively for the target user. Figure 3 also describes the conceptual layout of the toolbox’s search function, which will be linked to the wiki database. Using Javascript linked to an HTML search page, a database consisting of tags in the key fields listed above, corresponding to individual toolbox entries, will allow users to immediately find methods of interest, rather than having to navigate and search through pages (possibly unsuccessfully) to locate the desired information.
Beyond this table overview of each method or dataset, it would be beneficial to provide the user with a short overview of the tool in question in terms of an abstract. This would provide more in-depth knowledge needed to accurately utilize the method, while not immediately requiring the user to read through journal articles or user’s guides with different standards and layouts. Again, this would allow rapid and effective use, providing information in a standard and direct form. Lastly, the toolbox should provide further links to overviews, peer reviewed articles, user’s guides, etc., as well as access to the actual data and tool. Access to the tool should be made obvious, not difficult or frustrating to find. Ideally, tools and data would be stored locally, that is, on the same website, but it is unknown how realistic this is, given the number of contributing institutions and their willingness to contribute methods and datasets to the project.

It should be noted that while much focus is given on the practical considerations of the toolbox, each step will be undertaken while keeping in mind the goals stated in section 2; improving integration, defining spatial scales, highlighting uncertainty, etc. Those themes are overarching, and can be factored into each step of toolbox creation and improvement. By providing a clear, easy to use, and well-defined set of methods, the toolbox will work towards the stated goals and enhance tool use in integrated assessments.

7 Populating the toolbox

We describe 3 iterations starting from the descriptions of the case studies and problems and moving on to more stakeholder orientation, and finally generalizing from the cases to generic adaptation problems. The case studies created a good starting point for populating the toolbox as they were developed to study a wide range of adaptation problems in various parts of Europe and they will form the backbone of the integrated methodology. Thus they provide the toolbox with what is hoped to be a varied set of methods that can be improved upon based on any potential gaps in tools or data. The iterative process used to create and populate the toolbox is shown graphically in the 3 following diagrams and steps:
1st iteration: Informed by cases and problems – The initial toolbox population was driven by the methods and datasets used in the case studies, as they highlight adaptation issues relevant to the EU zone in the future and allow for an initial collection of vetted methods of research and analysis. The broad typology presented in Figure 5 and 6 allows for a general overview of included method without unnecessary complexity, grouped by case study. This also allows for an easy analysis and later restructuring (in further iterations) when the focus is changed from a specific research question perspective to informing policy and generalizing to key adaptation problems.

Two noticeable trends in Figures 5 and 6 are the relative lack of vulnerability tools as well as the limited use of adaptation methods beyond scoping of options via interviews and stakeholder feedback, while impact methods are well represented. Much of the analysis is highly segmented, and lacks integration; however a few of the cases are notable exceptions, most especially the Guadiana basin drought study, which uses a heavily integrated approach.
Figure 5: Populating the toolbox with case study information (Part 1 of 2)
Figure 6. Populating the toolbox with case study information (Part 2 of 2)
2nd iteration: Informed by stakeholder workshops and interaction ("solutions") – After the initial period of organization fuelled by case studies; stakeholder workshops and other interactions will help to fill in missing gaps from a more stakeholder-oriented standpoint rather than a research standpoint.

Figure 7. 2nd Iteration (toolbox informed by stakeholder workshops and interactions)

Figure 8. 3rd Iteration (generalization to key adaptation problems)
3rd iteration: Generalization to key adaptation problems. Following population and restructuring of the toolbox from a research and stakeholder perspective, the focus will change from the specificity of MEDIATION case studies to a broader set of key adaptation problems, in order to complement the integrated methodology and common platform in aiding future adaptation decision processes, and encouraging more prevalent tool and method use, rather than in specific, “example” scenarios.

Examples of hybridized application of methods to case study analysis:

<table>
<thead>
<tr>
<th>Water management and drought - the case of the Guadiana</th>
</tr>
</thead>
<tbody>
<tr>
<td>In the NeWater project an innovative methodological pathway emerged as a good example of the range of interdisciplinary methods that should be applied when the issue requires a very context-specific approach, which is both ‘problem oriented’ and ‘stakeholder-driven’. Here, the research began with agro-economic and hydrological modelling. However, the need for an institutional and socio-economic analysis of vulnerability became clear and the team developed a hybrid model which included some social indicators and developed this using participatory processes which was structured by the use of a CART model (Stephen and Downing 2001) and Knowledge Elicitation Tools (KnETs) (Bharwani 2006). This exploration of hybrid models which allowed the inclusion of social variables in a semi-quantitative/semi-structured way was important as it opened up the possibility of iteratively including these social parameters in the agro-economic and hydrological models (Varela-Ortega et al. 2007) as well as agent-based models, which was also done in a parallel activity. This allowed the analysis of different scenarios, both policy and stakeholder driven over time. More details why such approaches are an improved method of vulnerability and adaptation assessment can be found here: <a href="http://weadapt.org/wiki/Introducing_Agency_into_Water_Resource_Simulation_Models#First_steps_for_the_future_of_water_resource_models">http://weadapt.org/wiki/Introducing_Agency_into_Water_Resource_Simulation_Models#First_steps_for_the_future_of_water_resource_models</a></td>
</tr>
</tbody>
</table>

8 Conclusions and next steps

Work package 2 of MEDIATION has been tasked with creating, populating, and improving upon a toolbox of methods, models, metrics, and datasets, which will then be used as part of the integrated methodology to analyze climate change adaptation problems in Europe. After a survey of existing impacts, vulnerability, and adaptation methods, as well as previous attempts to create a toolbox platform, a structure and design of the MEDIATION toolbox was decided on; a wiki style online database providing clear, standardized information on the variety of tools in the toolkit. As access to different methods or models varies depending on ownership or other factors, the toolbox is seen as a way to facilitate access to materials, previous research, and general information involving these tools, but not directly provide access. If possible, links will be made between tools, in a “hard” or “soft” manner, but actual improvements come about more so in the creation of a typology to categorize tools, and in making them more accessible to stakeholders and policymakers by presenting information in a more **stakeholder**-based form.

This document attempted to bridge the gap between the rather pragmatic idea of constructing a toolbox, as well as providing more conceptual research. As the toolbox construction, like the rest of MEDIATION, is an iterative process, there remains much to be done both pragmatically and in a more research oriented mode, but certain issues stand out more than others. One of the most glaring was the relative lack of vulnerability or adaptation analyses in the case study tools. Numerous sources, including Füssel and Klein (2006) highlight risk analysis and vulnerability as effective and recommended tools for assessing climate change impacts and adaptation, and describe the evolution of IAV studies towards vulnerability and risk analysis. As the goal of the
MEDIATION project is to advance towards an integrated methodology, it would do well to consider making more use of vulnerability assessments, both quantitative and qualitative. Also, in line with recent efforts in the field, linking vulnerability to an assessment of risk, where feasible (ie, for extreme events) would seem to be a priority for further work in Mediation to be tackled jointly by Work packages 2 and 3 to ensure consistency across these methodological work elements of Mediation.

Beyond a gap in vulnerability components, the toolbox is also currently lacking in adaptation methods, with case studies consisting mostly of stakeholder consultation and surveys. This will be improved with a closer interface between the case studies, work package 3 (focused on costing and adaptation analysis) and the toolbox. This interaction represents a large component of the next iteration in the toolbox development, which will be filling in missing methods from the more stakeholder-oriented perspective.
9 References


Canadian Environment Ministry (2010). Climate Change Impacts and Adaptation Division Tools for Adaptation.


Tanner, T. (2007). IDS in Focus Issue 02, Climate Change Adaptation, Screening Climate Risks to Development Cooperation, Institute of Development Studies, November 2007, ISSN 1479-974X


Watkiss, P. and A. Hunt (2011). Critical review and synthesis of available methods and

10 Annexes

Annex 1 - List of models included in the Compendium of Adaptation Models for Climate Change

- Agent Based Models (ABMs)
- Adaptation-Dynamic Integrated Model of Climate and the Economy (AD-Dice)
- Adaptation-Regional Integrated model of Climate and the Economy (AD-Rice)
- Automated Statistical Downscaling (ASD)
- Berg River Dynamic Spatial Equilibrium Model (modelBRDSEM)
- CALifornia Value Integrated Network (CALVIN)
- CanCLIM
- Canadian Regional Energy Model and Regional Energy Analysis Model (CanREM)
- Community Integrated Assessment Model (CIAM)
- Climate Impacts (CLIMPACTS)
- Climate Outlooks and Agent-Based Simulation of Adaptation in Africa (CLOUD)
- Complexity and Organized Behaviour Within Environmental Bounds (COBWEB)
- CRiSTAL Community-based Risk Screening - Adaptation and Livelihoods
- Dynamic Interactive Vulnerability Assessment (DIVA)
- Erosion Productivity Impact Calculator (EPIC)
- Evaluation of Strategies to Address Climate Change by Adapting to and Preventing Emissions (ESCAPE)
- Future Agricultural Resource Model-Adapt (FARM-Adapt)
- Framework for Uncertainty, Negotiation and Distribution (FUND2.9)
- Integrated Climate Assessment Model (ICAM2.5)
- Integrated Assessment of Climate Protection Strategies (ICLIPS)
- Integrated Model to Assess the Greenhouse Effect (IMAGE2)
- Information Society Integrated Systems (ISIS)
- Model for the Assessment of Greenhouse gas Induced Climate Change (MAGICC)
- Mini-Climate Assessment Model (MiniCAM 2.0)
- Model of Private Proactive Adaptation to Climate Change (MPPACC)
- Okanagan Sustainable Water Resources Mode (OSWRM)
- Policy Analysis for the Greenhouse Effect (PAGE2002)
- RegIS2
- Ricardian
- SimCLIM
- Soil Water Atmosphere and Plant model-Water and Salinity Basin Model (SWAP)
- Tool to Assess Regional and Global Environmental and health Targets for Sustainability (TARGETS)
- Tool for Environmental Assessment and Management (TEAM)
- Urban Water Futures: A multivariate analysis of future residential water demand in the Okanagan Basin, British Columbia (UWF)
Annex 2 – Review of Selected Adaptation Tools

Business Areas Climate Impacts Assessment Tool (BACLIAT)
http://www.ukcip.org.uk/bacliat/

Objective
The UKCIP tool BACLIAT comprises a simple checklist for assessing the potential impacts of climate change under the following headings: Logistics, finance, markets, process, people, premises and management implications. It has been developed in partnership with representatives from a range of trade associations and professional bodies.

Approach
- Risk assessment of threats and opportunities using a checklist.
- Most effective when used as part of a group brainstorming exercise.

Complexity (awareness of multiple stresses, not just climate)
- Not to any significant extent as checklist is completed with climate as the driving factor.

Sector and scale (and cross-sectoral impacts at different scales)
- Level of a single organisation or an entire business sector.
- Examples available for Agriculture, Building design & Construction, Motor Manufacturing and Financial Services.
- Less emphasis on cross-sector interactions. These would need to be derived by the user.

Institutional scale (networks)
- No as ‘Process’ and ‘People’ have a different use here.

Temporal scale (dynamic vulnerability and adaptation)
- No

Economic methods
- No

Decision methods (agency and feedback)
- No

Output
- The output of a BACLIAT exercise is a long list of potential threats and opportunities from climate change under the six generic headings. These are:
  - Logistics: vulnerability of supply chain, utilities & transport infrastructure
  - Finance: implications for investment, insurance & stakeholder reputation
  - Markets: changing demand for goods & services
  - Process: impacts on production processes & service delivery
  - People: implications for workforce, customers & changing lifestyles
  - Premises: impacts on building design, construction, maintenance & facilities management
  - Management implications

Target user group
- Corporate or multi-facility operations
- Non industrial SME business manager

Target unit of analysis (heterogeneity – differential exposure units)
Inputs needed

- Most effective when used as part of a group brainstorming exercise.

Skills needed

- Training available

Examples of where has the tool been used

- UK

- Examples available for Agriculture, Building design & Construction, Motor Manufacturing and Financial Services sectors.

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Non-specific here means that this variable does not appear to be a specific part of the analysis, though it could be included in the execution of the method or in the interpretation of the results, depending on the user/researcher. i.e. the method could be repeated for different stakeholder groups, though heterogeneous groups may not be included in the method per se.
Objective
Naiade (Novel Approach to Imprecise Assessment and Decision Environments) is a MCA method able to deal with both qualitative and quantitative information concerning policy socio-environmental evaluation problems (Munda, 1995). Naiade has been used in a participatory way on several occasions, by means of combining the use of MCA software with input from focus groups and interviews resulting in the Social Multi–Criteria Evaluation process (SMCE) method.

Naiade also performs an equity and conflict analysis in order to identify those alternatives which could reach a certain degree of consensus or would provide a higher degree of equity among different interests' groups. It is a flexible method suitable for real-world applications, and in particular, for situations where fuzzy uncertainty or indeterminacy is recognised.

Approach
The application of NAIADE entails the construction of an impact (evaluation) matrix which includes, on one axis, a limited set of given policy alternatives, and on the other, a limited set of different criteria by which such policy alternatives are to be evaluated. Inside the matrix measurements of all the policy alternatives with respect to each evaluation criterion are given and the different alternatives are assessed by means of pair-wise comparison. This aggregation procedure takes into account both the number of the criteria in favour of each alternative and the intensity of the actors’ preferences. In principle, the determination of the criterion scores is independent from the actors’ preferences; for instance, impact on employment can be chosen or used as a criteria to evaluate a given set of policy alternatives but the score of each criterion may not depend on the actors’ preferences.

Complexity (awareness of multiple stresses, not just climate)
- Strategic implementation (engagement and behaviour change)
- Event recording
- Risk assessment

Sector and scale (and cross-sectoral impacts at different scales)
- Built environment
- Transport: Local, regional or national transport
- Agriculture & forestry
- Waste, Water and Wastewater Industry

Institutional scale (networks)
- To some degree: positions of the various interest groups (e.g., possibilities of convergence of interests or of coalition formation).
- While the equity analysis of NAIADE (the aim of which is to represent the position of each stakeholder with regard to each alternative), departs from the assumption that each stakeholder is equally powerful, it should be counterbalanced with an institutional analysis of real power relationships, which occur within the policy–making process.

Temporal scale (dynamic vulnerability and adaptation)
- Can be implicit in the analysis

Economic analysis
- Yes
Decision methods (agency and feedback)
- MCA - can incorporate several sustainable development aspects as separate criteria to compare alternative policies, such as the following: intergenerational effects (e.g. on the loss or natural or social capital), (de−)coupling aspects, adaptability and (ir−)reversibility. MCA is suitable to compare impacts independently of the gauge year. MCA can incorporate the impacts on different groups/sectors/regions as separate categories and give a clear overview of the differences for these sectors. MCA is suitable to compare impacts independently of the spatial dimension, as long as the spatial dimension of the separate criteria are comparable. Distributional effects and global impact can be accounted for as a criterion to assess the various alternatives.

Output
- Ranking of policy alternatives according to a set of evaluation criteria, (for instance, a compromise solution/s);
- Indications of the distance of the positions of the various interest groups (e.g. possibilities of convergence of interests or of coalition formation);
- Ranking of the alternatives according to the actors’ impacts or preferences.

Target user group
- Transport Strategist
- Planner / architect
- Investment fund managers

Target unit of analysis (heterogeneity – differential exposure units)
- Positions of the various interest groups (e.g. possibilities of convergence of interests or of coalition formation).

Skills needed
- Specialist

Examples of where has the tool been used
- Naiade has been used in a participatory way on several occasions, by means of combining the use of MCA software with input from focus groups and interviews. Examples include:
  - Water management in the municipality of Troina, Sicily (De Marchi, et al., 2000, Funtowicz et al., 1998)
  - Exploration of alternatives to development of an area around a National Park in the Pyrenees under threat of sky resort expansion (Munda, 2003; Tabara, 2003).
  - Plausible electrification alternatives in a rural area covering the Biosphere Reserve of El Montseny nearby Barcelona (Russi, D. 2004).
Adaptation Wizard
http://www.ukcip.org.uk/wizard/

Objective
Developed by UKCIP the Adaptation Wizard is a web-based tool that is designed to take help users gain a basic understanding of climate change as well as integrate climate risks into their decision-making.

Approach
The UKCIP decision-making framework has 8 stages as shown in Figure A1 and provides a flexible and suitably generic approach to decision making under climate change. For this reason, it could be applied with equal relevance across many countries.

The framework is circular, emphasising an adaptive approach to managing climate change and the need to revisit decisions in light of new information and as new knowledge emerges. Certain stages within the framework are tiered, which allows the decision maker to identify, screen, prioritise and evaluate climate and non-climate risks and options, before embarking on more detailed risk assessment and options appraisal.

Figure A1: The UKCIP decision-making framework.

- Complexity (awareness of multiple stresses, not just climate)
  - Non-specific
- Sector and scale (and cross-sectoral impacts at different scales)
  - Multi-scale
- Institutional scale (networks)
  - No
- Temporal scale (dynamic vulnerability and adaptation)
  - Can be implicit in the analysis
- Economic analysis
Yes - the tool takes users through an economic analysis of adaptation options and scenarios.

Decision methods (agency and feedback)
- No

Output
- A decision-support rather than a decision-making tool, it plays a valuable awareness-raising and educational role.

Target user group
- It is a high-level, generic tool that is valuable to newcomers to the climate change issue, as well as those who are preparing to adapt.

Target unit of analysis (heterogeneity – differential exposure units)
- Non-specific

Inputs needed
- Quantitative and qualitative

Skills needed
- Various

Examples of where has the tool been used
- UK
- Application time <1 month
Performance Acceleration through Capacity-building Tool (PACT)

http://www.alexanderballard.co.uk/projects.php?id=13

Objective
Developed by Hampshire County Council (HCC) in the UK and Alexander Ballard Ltd, the Performance Acceleration Climate Tool (PACT) identifies a number of principles underlying effective change by organisations on climate change issues and can be used to review an organisation’s performance against 9 pathways, based on these principles. PACT reviewers use the tool to identify what pathways are holding back progress on climate change within the organisation, and suggests ways in which performance could be improved.

Approach
The tool reviews nine complementary areas, or “pathways”, which are fundamental to tackling climate change, and assesses each one on a scale of achievement (response levels). These are Awareness; Agency; Leadership; Agents of change; Working together; Learning; Managing operations; Programme scope and coherence; and, Expertise and Evidence.

Complexity (awareness of multiple stresses, not just climate)
- Yes although adaptive capacity is viewed through a climate change lens

Sector and scale (and cross-sectoral impacts at different scales)
- Multi-sector, multi-scale
- County council scale application pilot

Institutional scale (networks)
- Yes

Temporal scale (dynamic vulnerability and adaptation)
- Can be implicit in the analysis

Economic analysis
- No

Decision methods (agency and feedback)
- No

Output
- The PACT tool helps an organization to see where and how to develop different levels of response through gathering and organising information about nine organisational ‘pathways’ – complementary capacities (comparable to ‘competencies’ at an individual level) which need to improve together if change is to take place.

Target user group
- Climate change policy officers and consultants

Target unit of analysis (heterogeneity – differential exposure units)
- Heterogeneous subjects included in an integrated analysis

Inputs needed
- Qualitative

Skills needed
- Originally supported by a trained assessor and external moderators
- Self-assessment module is also now available

Examples of where has the tool been used
- UK – Hampshire County Council example
Climate Change Impacts and Spatial Planning Decision Support Guidance (ESPACE)
http://www.espace-project.org/

Objective
Although this guidance use the lens of spatial planning, it is based around the UKCIP decision-making framework and PACT and helps to address 3 important questions:

- How can you identify the potential climate change risks associated with your planning decisions?
- Could decisions that you make significantly constrain the ability of others to adapt to climate change?
- What does climate change adaptation mean for national, regional and local development planning?

Approach
- The ESPACE spatial planning guidance has been usefully aligned with the relevant stages in the UKCIP decision-making framework illustrated in Figure A1. The different climate change risk assessment tools (risk screening, constraint mapping, etc), that are introduced and the stages at which they are most likely to be of use in the decision making process, are illustrated in Figure A2.

Figure A2: Linking the initial stages of the UKCIP decision-making framework and proposed climate change risk assessment tools.
Complexity (awareness of multiple stresses, not just climate)
  - Yes
Sector and scale (and cross-sectoral impacts at different scales)
  - Urban planning
  - Multi-scale
Institutional scale (networks)
Temporal scale (dynamic vulnerability and adaptation)
  o Yes
  o Can be implicit in the analysis
Decision methods (agency and feedback)
  o No
Target user group
  o Climate change policy officers and consultants
Target unit of analysis (heterogeneity – differential exposure units)
  o Heterogeneous subjects included in an integrated analysis
Inputs needed
  o Qualitative
Skills needed
  o Moderate
Examples of where has the tool been used
  o Urban planning
Community-based Risk Screening Tool – Adaptation and Livelihoods (CRiSTAL)

http://www.cristaltool.org/

Objective
Developed by IISD, IUCN, SEI and Intercooperation this is a screening tool designed to help project designers and managers integrate risk reduction and climate change adaptation into community-level projects. It helps project designers and managers:

- Understand the links between livelihoods and climate in their project areas;
- Assess a project’s impact on community-level adaptive capacity; and
- Make project adjustments to improve its impact on adaptive capacity and reduce the vulnerability of communities to climate change.

Approach
- To assist project designers and managers integrate risk reduction and climate change adaptation into community-level projects.

Complexity (awareness of multiple stresses, not just climate)
- Yes

Sector and scale (and cross-sectoral impacts at different scales)
- Agriculture, water resource management, infrastructure, and natural resource management at the community scale.
- Local, regional

Institutional scale (networks)
- No

Temporal scale (dynamic vulnerability and adaptation)
- Can be implicit in the analysis

Economic analysis
- Not at present

Decision methods (agency and feedback)
- No

Outputs
- Vulnerability and livelihood profiles
- Details for project modification.

Target user group
- Project designers and managers.

Target unit of analysis (heterogeneity – differential exposure units)
- No

Inputs needed
- Detailed project inputs and vulnerability data.

Skills needed
- Training time < 1 hour

Examples of where has the tool been used
- Nicaragua, Mali, Tanzania, Sri Lanka
- Application time < 1month
Opportunities and Risks of Climate Change and Disasters (ORCHID)
http://www.ids.ac.uk/climatechange/orchid

Objective
Developed by IDS, this tool is designed to be a light touch screening process for donors, development organisations and their partners to integrate risk reduction and adaptation processes into their programmes. The process utilises quantitative inputs from climate science which are applied to the risk assessment of programmes usually at wide scales, and using directional trends rather than discrete figures.

Approach
Figure A3 illustrates the different stages of the screening methodology, emphasising its role in raising awareness and conceptualising adaptation as a learning process. While it will not be feasible to reduce all climate risks, this process allows for their more systematic consideration in development programmes and thus within a multiple stressor context.

- Figure A3: The ORCHID climate risk management and assessment methodology
  - Complexity (awareness of multiple stresses, not just climate)
    - Yes, but climate-driven albeit from a disasters perspective
  - Sector and scale (and cross-sectoral impacts at different scales)
    - Integrated approach to disaster risk reduction and adaptation to future climate change
    - Regional, national
  - Institutional scale (networks)
    - No
  - Temporal scale (dynamic vulnerability and adaptation)
    - Can be implicit in the analysis
  - Economic analysis
    - It employs cost-benefit analysis to prioritise additional adaptation and disaster risk reduction options relevant for the programme.
  - Decision methods (agency and feedback)
A multi-criteria analysis is undertaken involving programme stakeholders, ideally including beneficiaries, to determine high priority adaptation options that can be integrated into the programme objectives and activities. This analysis uses criteria developed by stakeholders, including coherence with national policy, flexibility across a range of possible future climate impacts, and cost effectiveness, which is informed where feasible by an economic cost benefit analysis.

The process as a whole also helps identify generic strategic lessons for programming and how to incorporate climate risk management into regular programme development (Tanner, 2007).

Output

A range of adaptation options are identified for tackling unmanaged risks and exploiting opportunities for strengthening adaptive capacity (Tanner, 2007). The process makes recommendations for how programmes might enhance risk management through adaptive practices and cost-benefit analysis and sector economic assessments are undertaken for areas where clear adaptation options can be discerned and where sufficient data is available.

Target user group

Aims to raise awareness of climate risk management and future climate change among staff, to stimulate dialogue with donor partners, to integrate disaster risk reduction and climate change adaptation policies and activities.

Target unit of analysis (heterogeneity – differential exposure units)

Non-specific

Inputs/skills needed

- It makes use of already available climate and vulnerability data and considers existing climate and disaster risk management practices.
- Project documents
- Interviews with project staff
- Past trends in vulnerability and disaster risk

Based on an initial profile of current and future climate impacts, the process identifies those programmes in regions and sectors that may be at risk from climate impacts, or that present good opportunities for improving adaptive capacity. Drawing on further technical inputs on hazards, impacts and vulnerability, potential risks to programme activities are identified, which are then assessed against existing risk management practices (Tanner, 2007).

Examples of where has the tool been used

- The ORCHID methodology has been piloted in DFID country offices in Bangladesh and India, has been tested in China and was adapted for use (as CRISP) for broader sector support in Kenya.
- Application time: 2-6 months
ADAM Digital Compendium (Adaptation Catalogue)

http://adam-digital-compendium.pik-potsdam.de/

Objective
The Digital Compendium contributes to emerging knowledge on adaptation by acting as a portal for the dissemination of the transdisciplinary results from the ADAM project. The following types of analysis are included in the Compendium: workshops, a meta-analysis of climate change impacts, a macro-economic analysis, an adaptation catalogue and risk/damage maps. There is emphasis here on the Adaptation Catalogue, though this draws on other resources in the Compendium

Approach

- The Adaptation Catalogue acts as an inventory of practical adaptation options and associated enabling institutional frameworks, and differentiates between options according to the form of adaptation (institutional structures and processes, planning and management practice, financial / legal, or technological), hazard, landscape type (urban, rural, coastal), economic sector, geographical region, responsible actor (highlighting whether public or private), and the scale of implementation.
- Workshops and interviews were conducted and synthesised into key messages about what supports and what hinders adaptation and a set of learning examples that describe the experiences that decision makers and organisations have gained in the adaptation learning process are also included.

Complexity (awareness of multiple stresses, not just climate)

- Comparison by type of impact (Drought, Flooding, Heat wave, Sea level rise), adaptation options (Technological, Soft engineering, Management best practice, Planning and design, Legal and regulatory instruments, Insurance and financial incentives, Institutional), risk management (Risk identification and assessment, Risk reduction, Preparedness, Risk transfer, Disaster Response, Emergency response, Relief and reconstruction), sector and landscape type.

Sector and scale (and cross-sectoral impacts at different scales)

- Agriculture, Biodiversity (and nature conservation), Buildings and construction, Energy, Fisheries, Forestry, Health, Industry, Insurance and financial services, Tourism, Transport, Urban planning and design, Water resources
- By landscape type - Urban, Rural, Coastal, Geographically non-specific

Institutional scale (networks)

- Comparison of adaptation options (Technological, Soft engineering, Management best practice, Planning and design, Legal and regulatory instruments, Insurance and financial incentives, Institutional)

Temporal scale (dynamic vulnerability and adaptation)

- No

Economic analysis

- Supporting analysis in the Compendium includes an assessment of the potential feasibility and application of measures in different contexts, their associated costs and benefits (where such quantitative data are available), and the wider implications for sustainable development.

Decision methods (agency and feedback)

- No

Outputs

- The searchable database should not be considered comprehensive; the catalogue is intended to showcase good practice measures that are relevant to different hazards
and applicable in different contexts, hence providing stakeholders with valuable knowledge that may assist their decision-making.

- Lessons learnt from the project are supplied which cover: Making wise decisions, Adaptation networks, Why action is hard, Organisational implications, Policy implications, Research implications.

Target user group
- Valuable to newcomers to the climate change issue, as well as those who are preparing to adapt.

Target unit of analysis (heterogeneity – differential exposure units)
- Includes scale of implementation, institutional context, and main actors involved (with emphasis on the role of private and public sector)

Skills needed
- Training time < 1 hour

Learning examples supplied
- **Financial institutes**
- **Tisza river basin**
- **Water supply (SE England)**
- **Comparative analysis: London, Greater Manchester and Berlin**
- **Urban water supply (Cape Town)**
- **Urban adaptation (Berlin)**
- **Desertification (Mongolia)**
- **Insurance industry**
- **Guadiana river basin**
- **Tourism (Guadiana)**
- **Water governance (Guadiana)**
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<td>ANNEX 3 GOALS MET BY EACH TOOL</td>
<td>Business Area Climate Impacts Assessment Tool (BACLIAT)</td>
<td>Novel approach to imprecise assessment and decision environments (NAIAD)</td>
<td>UKCIP Adaptation Wizard</td>
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