# Framing adaptation economics in decision-making: a policy-led framework

Key Messages

- Historically, the main framework for assessing adaptation options has been centred on an impact-assessment methodology which takes a “predict-then-optimise” approach. This raises problems: studies tend to focus on the long term and ignore uncertainty, and the approach is less relevant for early practical implementation.
- The ECONADAPT policy-led framework aims to address these limitations by providing a set of decision-making steps and rules that focus on adaptation decisions, including managing uncertainty. It provides a framework to help with the early scoping, phasing and prioritisation of adaptation, as well as later, more detailed economic appraisal.
- For detailed appraisal, a suite of approaches can be considered, depending on the adaptation problem.  For more future orientated risks, economic assessments are increasingly extending conventional decision support tools (e.g. Cost-benefit analysis, Cost-effectiveness analysis, Mulit-criteria analysis) to decision making under uncertainty, with techniques such as real options analysis, robust decision making, portfolio analysis and iterative risk management.
- These more detailed approaches can be resource intensive and technically complex.  In some cases, such as for large investment decisions or major risks, they will be appropriate. However, it is also possible to apply the decision making under uncertainty elements from these methods in ‘light-touch’ approaches that capture their conceptual aspects, while maintaining a degree of economic rigour.

## Context

Most of the early literature on adaptation used scenario-based impact assessment frameworks, which typically adopt a sequential approach, starting with climate model projections of future climate change and combining these with socio-economic information to assess the future impacts and damage costs of climate change using damage functions or impact models. These assessments sometimes go on to assess the costs and benefits of adaptation options to defined climate projections, usually to achieve an optimum or acceptable level of adaptation. These studies tend to have a long-term perspective, typically assessing impacts and adaptation around mid-century, when the climate signal more strongly emerges.

The principle framing for impact assessment is a scientific (science-first) approach. Such an approach is deterministic; beginning with climate change projections and ending with a wide range of impacts that are used to frame adaptation options. It uses a *predict-then-optimize* approach which assumes perfect foresight, as future climate impacts and adaptation responses are assessed one scenario at a time, with the optimal or most cost-effective level of adaptation (based on costs, benefits and residual damages) assessed for each individually. The results from these studies very often conclude that adaptation is very cost-effective / has high benefit to cost ratios.

There are, however, a number of problems associated with this approach in a practical policy context. The long-term focus does not align to immediate policy needs, namely what adaptation is needed over the next decade.  Furthermore, these impact studies are quite stylised and omit wider (non-climatic) drivers, existing policy and the socio-institutional context and governance. They predict future climate and adaptation responses to defined scenarios, rather than providing information to decision makers on what to do given uncertainty exists (and is often large).

Finally, they tend to focus on technical costs of adaptation options, and opportunity and transaction costs are ignored. As such, on their own, impact assessment based frameworks do not meet the needs of decision-makers for practical adaptation implementation.

Policy and methodological developments

Reflecting these issues, a number of key shifts have been identified in the literature and the ECONADAPT project has drawn these together to provide a policy framework.  First, there has been a move towards a policy-orientated approach, in which the primary objective of the analysis is framed around adaptation, coupled with a greater emphasis on integrating (mainstreaming) adaptation into current policy and development. Second, there has been a shift to look at the phasing and timing of adaptation, with an increasing recognition of uncertainty and the use of iterative risk management approaches.

Recognising these shifts, the policy led framework (Watkiss and Hunt, 2011) aims to re-orientate studies towards adaptation decisions (summarised in Figure 1). There is a much greater attention on early steps around identifying the existing policy context and objectives, wider non-climatic drivers and existing baselines and interventions, as well as the context for decisions.

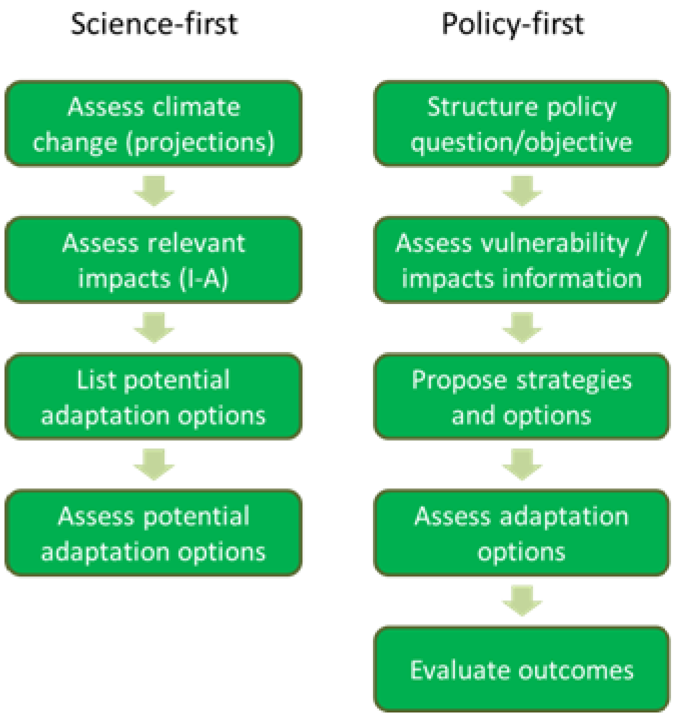


**Figure 1. Science-first vs Policy-first / Policy-orientated approaches. Source: Adapted from Dessai and Hulme (2007) and Ranger et al. (2010).**

In addition, the ECONADPT policy framework has a strong focus on the phasing and timing of adaptation, advancing an iterative climate risk management (ICRM) approach, as recommended in the IPCC Fifth Assessment Report (IPCC, 2014).  This centres on the fact that practical adaptation involves a broad set of response types, addressing different problems.  The framework starts with current climate variability and then assesses future climate change, considering uncertainty.  It then maps out how adaptation decisions map out against these risks, and recommends categorising actions into three types of **early policy decisions** and associated interventions, i.e. actions that could be undertaken in the next decade for addressing the impacts of short, medium and long-term climate change, under conditions of uncertainty.

These are:

1. Immediate actions that address the current risks of weather and climate extremes (the adaptation deficit) and also build resilience to future climate change. This includes early capacity-building and the introduction of low- and no-regret actions, which provide immediate economic benefits as well as future benefits under a changing climate.
2. The integration of adaptation into immediate decisions or activities with long life-times, such as infrastructure or planning (climate smart development). This involves different options (to 1

above) because of future climate change uncertainty.  It involves a greater focus on climate risk screening and the identification of flexible or robust options that perform well under uncertainty

3. Early monitoring, research and learning to start planning for the future impacts of climate change. This includes a focus on adaptive management, the value of information and future option values and learning so that appropriate decisions can be brought forward or delayed as the evidence and knowledges emerges.

The three categories can be considered together in an integrated adaptation strategy, often termed a portfolio or adaptation pathway.  An illustration of the framework is shown below (Figure 2). The framework starts with climate change (top), which is split into a number of linked risks, each related to different policy problems and time-scales. This starts with current climate variability and extremes (top left), i.e. the adaptation deficit. Over time, climate change will affect these existing impacts, and lead to major new risks (top right), though often with high uncertainty. In response, an adaptive management framework has been recommended for adaptation (bottom).

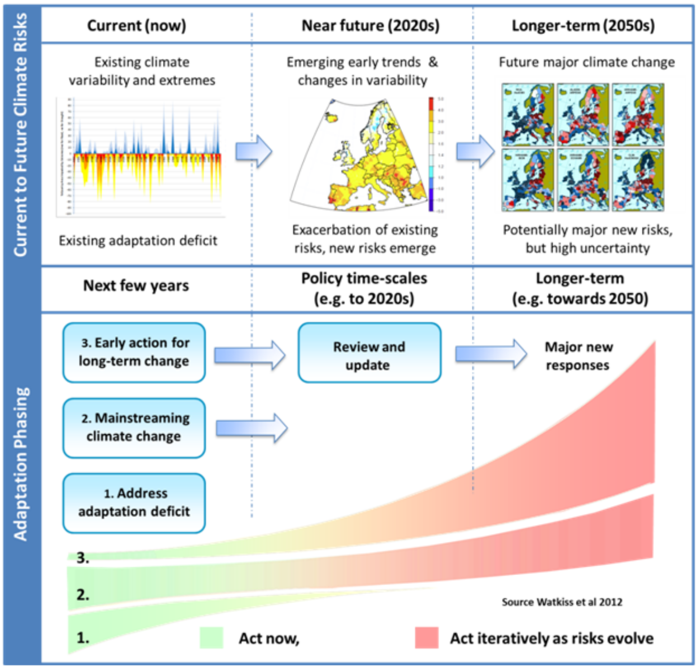


**Figure 2. An iterative climate risk management framework for adaptation (Source Watkiss et al 2014).**

Main implications and recommendations

The application of the framework can help frame the overall consideration and early prioritisation of adaptation and aligns to typical policy or appraisal cycle. It has particular relevance at the two points where decision support tools are particularly important;

- i) for shortlisting options and
- ii) for prioritising the shortlisted options.

For the first of these, the framework can be applied to help in the identification, timing and sequencing of adaptation and the short-listing of options, with for example the identification of the three types of early adaptation actions in the Figure 2. This can help identify focus areas for a sector plan or strategy or identifying a broad list of options for an individual project.

For the subsequent prioritisation of shortlisted options, i.e. appraisal, the ECONADAPT project is also providing additional guidance, on the use of decision support methods and tools that fit within the policy led framework.

There are already a number of decision-support tools that are used in detailed (economic) appraisal, notably cost-benefit analysis (CBA), cost-effectiveness analysis (CEA) and multi-criteria analysis (MCA). However, due to the challenge of uncertainty, these techniques have limitations in appraising with adaptation.

In the last few years, a number of alternative decision support approaches have therefore emerged for the economic appraisal of adaptation (Figure 3). These include the extension of conventional decision support tools for adaptation, i.e. CBA to include new approaches that explicitly address uncertainty. The main methods advanced are real option analysis (ROA), robust decision making (RBM), portfolio analysis (PA), and iterative risk management (IRM).

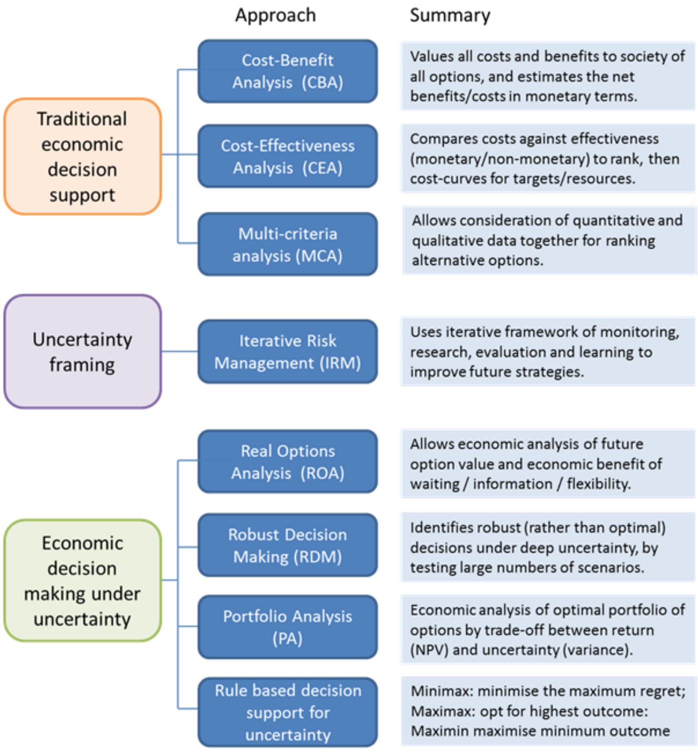


**Figure 3. Summary of Adaptation Decision Support and Appraisal Tools (Source: updated from Watkiss et al 2014).**

Whilst these tools have primarily been developed in the context of project-level appraisal, in principle they can be used to prioritise policy initiatives at the national and sectoral scale. However, at the national-sector level, these tools serve principally as an organising framework, often with semi-quantitative versions due to data availability, though they provide a good guide to the economic sense of the initiatives. At the project level, where data is available, they can be applied more quantitatively.

There are no hard-or-fast rules on which tool to use in which application, though, certain techniques do align to various elements of the policy led framework above (related to specific contexts or sectors). For example, for analysis that is focused on current climate variability (the adaptation deficit), existing decision support tools can be used, including CBA. For the analysis of the design of near-term infrastructure, with long life-times and longer-term challenges, it will be more appropriate to consider new decision support tools such as robust decision making or real options analysis.

However, the formal application of these methods is resource intensive and technically complex, and this is likely to constrain their formal application. In some cases, such as for large investment decisions or major risks, their application is likely to be appropriate. However, it is also possible to apply the decision making under uncertainty elements from these methods in ‘light-touch’ approaches that capture their conceptual aspects, while maintaining a degree of economic rigour.. This allows a wider application in qualitative or semi-quantitative analysis. This can include the broad use of decision tree structures from ROA, the concepts of robustness testing from RDM, the shift towards portfolios of options from PA, and the focus on evaluation and learning from IRM for long-term strategies.

Bibliography

Dessai, S., and Hulme, M. (2007) Assessing the robustness of adaptation decisions to climate change uncertainties: A case study on water resources management in the East of England, Global Environmental Change, 17, pp.59-72. *http://dx.doi.org/ 10.1016/j.gloenvcha.2006.11.005*.

IPCC (2014). Summary for Policymakers Working Group II Contribution to the IPCC Fifth Assessment Report Climate Change 2014: Impacts, Adaptation, and Vulnerability, *http://ipcc-wg2.gov/AR5/images/uploads/IPCC_WG2AR5_SPM_Approved.pdf*.

Ranger, N Millner, M., Dietz, S., Fankhauser, S., Lopez, A., and Ruta G (2010). Adaptation in the UK: a decision-making process. Policy Briefing Note for the Committee on Climate Change Adaptation Sub-Committee.

Watkiss, P. and A. Hunt (2011). Method for the UK Adaptation Economic Assessment (Economics of Climate Resilience). Final Report to Defra. May 2011. Deliverable 2.2.1

Watkiss, P., Hunt, A., Blyth, W. and Dyszynski, J (2014). The use of new economic decision support tools for adaptation assessment: A review of methods and applications, towards guidance on applicability. Climatic Change. *http://dx.doi.org/ 10.1007/s10584-014-1250-9*

Further Information
Design of Policy-Led Analytical Framework [pdf]
Contact
Paul Watkiss
Partner
Paul Watkiss Associates