



# UKCIP Adaptation Wizard

Extract from Climate adaptation: Risk, uncertainty & decision-making

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## Stage 4: Identify options (tiered)

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### Introduction

For any particular problem, there is likely to be a number of different options that will meet the decision-maker's criteria. Initially, it is important that a wide range of potential options is considered to avoid the premature rejection of viable options. This will include options ranging from 'do-nothing' to 'do a little' to 'do a lot'. In terms of options that are robust to future climate change, and will help manage the consequences of climate change, the decision-maker should attempt to identify **No regret** and **Low Regret** options at the outset.

Adaptive management – the sequential and continual process of making the best decision at each decision point and reviewing the performance of previous decisions – is an important strategy for handling uncertainties, including those associated with climate change. Sequential adaptive management should be directed towards an overall strategic objective. In all cases an objective must be to keep open possible future options, that is, avoid decisions that constrain future options for adaptation.

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[www.ukcip.org.uk/wordpress/wp-content/PDFs/Risk.pdf](http://www.ukcip.org.uk/wordpress/wp-content/PDFs/Risk.pdf)

## Key issues

If a **climate adaptation** decision is being made, there are a range of generic adaptation strategies that can be considered in response to climate change risk and uncertainty. Examples of the types of strategies are shown in Table 2.x in Part 2. For a decision identified at Stage x as being **climate-influenced**, the information provided in Part 2, Table 2.x should be useful in stimulating the decision-maker's thinking on appropriate options.

Which options are most appropriate will depend on a range of factors, including:

- whether the decision is operating at the policy, programme or project level;
- the non-climate impacts of concern;
- the relevant climate change impacts;
- the decision-maker's attitude to risk; and
- the degree of risk and uncertainty surrounding the decision.

As some of these factors may only become clear following further iterations round the risk assessment, options identification and appraisal loop, there is likely to be a need to revisit the options under investigation. New options may emerge which provide a more appropriate means of managing risk and uncertainty for a given decision. For example, if the objective were to build 1,000 houses, one option would be to build them at Site A. However, if the preliminary climate change risk assessment suggests that Site A may be subject to an increased risk of future flooding as a result of climate change, two options could be taken forward: A1, build the houses with integral flood-proofing, and A2, build the houses with a two metre embankment around the site perimeter.

## Questions

The types of questions that may assist in identifying options in a manner that takes into account climate change risk and uncertainty are outlined in the box below. Given the wide range of possible options which could be devised under the headings in Part 2, Table 2.x, it will be important to use appropriate tools to reduce to a manageable set the number of options examined within Tier 2 and Tier x risk assessment and options appraisal stages. This is the role of the Stage 5 Tier 1 options appraisal (see opposite).

## Key questions for Stage 4

1. What type of options should be considered? What are the likely consequences of the 'do nothing' option, or of not adjusting existing options to take account of forecast changes in climate?
2. If the risk assessment stage has identified climate change as a significant factor for your decision, then can options be identified that are more robust to climate change?
  - » Generic climate adaptation strategies may help identify specific options appropriate to the particular problem.
3. Can 'no regret' and 'low regret' options be identified?
  - » Potential no regret options would perform well under present-day climate, and under all future climate scenarios.
4. Can the options be defined in a flexible manner to allow for sources of uncertainty?
  - » e.g. Can adaptation options be identified that could be increased at a later date, or implemented separately or in combination or in sequence to provide flexible levels of response to risk? For example, could staged options be appropriate?
5. Delay is a possible option. Would it be feasible or advisable to delay making a decision until further information is available? Consider:
  - » the rate of climate change vs. the timescale for implementing the decision;
  - » the magnitude and nature of the risk (especially in relation to low probability high consequence events that are also highly uncertain);
  - » the value (reduction in uncertainty) to be gained from improved monitoring or research to better characterise
  - » the climate hazard (including climate scenarios and ensembles), exposure pathways, impacts and costs, and
  - » the effectiveness of risk reduction and management options.

## Tools and techniques

Table 12: Tools and techniques for Stage 4

Tool/technique	Familiarity with issues	Number of stakeholders	Comment
Brainstorming	little/some/great	few/some	These tools have already been outlined for Stages 1 & 2
Consultation Exercises	great	many	
Focus Groups	some/great	some/many	
AIDA	some/great	few/some	
Problem Mapping Tools	little/some/great	few/some/many	
Checklists	some	not applicable	
Screening	some	few/some	
Free-form gaming	some/great	some/many	Identify conflicts and other decision-making strategies
Policy exercise	some/great	some/many	

## Stage 5: Appraise options (tiered)

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### Introduction

Options appraisal is closely linked with risk assessment and comprises evaluation of the options against the criteria established in Stage 2. The prime purpose of the options appraisal stage is to provide a robust basis upon which to recommend the 'best' way (the preferred option) to meet the overall decision criteria. Options appraisal informs the decision; making the decision is within Stage 6.

### Key issues

Many of the options considered in an assessment will concern choices regarding **how much** (including, if any) adaptation (e.g. how large a safety margin or headroom allowance) and **when** to carry out such measures. Such choices are therefore dependent on changes in the probability and magnitude of the significant climate variables identified by the risk assessments under Stage x. The choices between options can involve significant costs and environmental and social impacts. Consequently, decision-making on climate change adaptation may often involve important trade-offs between the environmental, economic and social implications of such options. These need to be considered with care. Allowing a greater safety margin may entail higher costs – for example, a greater security of water resource supply could entail the high costs and environmental impacts of providing a reservoir. Which option is chosen will therefore be determined by the decision-maker's attitude to the risks associated with over- or under-adaptation.

The UKCIP report "Costing the impacts of climate change in the UK" (Metroeconomica, 200x) provides a standard methodology for undertaking the options appraisal process.

Although each of the options identified should contribute to meeting the decision-maker's objectives (e.g. the reduction and improved management of climate risk), each option may be associated with other risks. These may be related to the inputs on which the options are based (for example, whether the demand for 1,000 houses in a particular area will be realised) or to the outputs (the risk that the houses cannot be built within the planned time-scale or that the budget is exceeded). The risks associated with each option, and the assessment of their significance, should be undertaken under Stage x as part of the iterative process.

### Screening options

A further key purpose of the options appraisal is to seek ways of refining the options so as to **seek better options** with lower environmental, social and economic impacts. The 'best' option may involve a combination of elements of the options appraised that exploits strengths identified for specific options. Hence the appraisal should analyse differences between the effectiveness of the different options. Moreover, it should focus on specific important elements of the options and identify the key determinants of these impacts so as to identify ways of ameliorating them. Such insights can be much more useful than any specific numbers (or conclusions) that the appraisal generates. Orders of magnitude estimates may often be sufficient to identify the best option. It is more important that the appraisal covers comprehensively all the major impacts and considerations than provides a precise estimate on just part of the problem.

The tiered approach to risk assessment recommended in Stage x also applies within the options appraisal stage, which should start with the application of qualitative assessment tools. Semi-quantitative or more fully quantitative tools are then applied if warranted by the importance of the decision (in social, environmental as well as economic terms) and the anticipated difference in performance between the available options. For many decision problems, the combined use of a number of approaches may prove the most valuable. Hence the approach could be as follows:

- **Tier 1** – a systematic qualitative analysis, where the size, significance and relative importance of the risks, costs and benefits for each option are described. There should be an emphasis on **ranking** the options in terms of costs and benefits, but this may not involve quantification.
- **Tier 2** – a semi-quantitative analysis, where some aspects of the risks, costs and benefits are assessed in quantitative terms while others are assessed qualitatively; the assessment would aim to assess uncertainty by placing upper and lower bounds on the risks, costs and benefits.
- **Tier x** – a fully quantitative analysis, where the probable performance of each option in managing the risk is quantified in terms of costs and benefits and, in some cases or where possible (e.g. HM Treasury, 200x), converted into monetary terms.

At Tier 1, it should be possible to reduce a ‘long-list’ of options down to a ‘short-list’ to take forward for further in-depth appraisal, taking account of aspects such as vulnerability to climate change, technical feasibility, economic impacts, environmental impacts, and likely **stakeholder** acceptability.

In a few cases, screening tools may indicate that one option is likely to perform better than the others against the screening criteria. Where there is general agreement amongst stakeholders that this option is ‘best’, it may be the case that no further analysis is required (unless there are legal requirements or other drivers underlying the need for a fuller appraisal). Some form of uncertainty analysis may be used to determine that a particular option is indeed likely to perform better than other options. Justification for the rejection of options must be provided. In the majority of cases, however, the information developed through a screening exercise should make it possible to reduce the initial, wide-ranging set of options to a smaller number for more detailed (Tier 2 or x) analysis. In so doing, however, it should be remembered that no option that is technically feasible, and performs better than all of the other options on at least one important criterion, should be eliminated at this tier.

The form of more detailed analyses will depend upon the importance of the decision, the range of options identified and the data available. In general, quantitative analysis will provide more information to decision-makers, for example, on the trade-offs between options and their relative costs and benefits. However, quantitative approaches require more resources and more detailed data, together with the use of informed professional judgement to handle uncertainties. A balance will therefore need to be struck between the thoroughness of the analysis and the constraints in terms of data, budget and time-scale. Achieving this balance will require consideration of the questions in the box overleaf.

The approach taken to options appraisal will determine how the data are analysed, the way in which the alternative options are compared, and the criteria that are used in decision-making itself.

For example, where **cost-benefit analysis** is required of a public policy, the aim is to compare estimates of the costs to society of taking action (e.g. managing a climate change risk) with the anticipated benefit or reduced disbenefit to particular receptors. If sufficient data are available, it may be possible to place a monetary value on the economic, environmental, human health and social benefits and costs. Where such valuation is feasible, expressing the benefits in the same units (money) as the costs allows the direct comparison of alternative measures. In risk terms, the aim should be to provide the decision-maker with an estimate of the confidence associated with the determination of the cost-benefit ratio.

In many cases, however, it can be difficult, impossible or misleading to undertake an appraisal in monetary terms. In such cases non-monetary, or a mix of monetary and non-monetary appraisal

methods, allow alternative options to be compared. For public sector decisions in the UK, monetary values should be attributed wherever feasible (HM Treasury, 200x).

## Questions

### Key questions for Stage 5

1. How do these options rate in relation to the criteria and risk assessment endpoints established at Stage 2, and as informed by the Stage x risk assessment?
  - » Where there are multiple criteria, MCA techniques may be used.
  - » Can different levels of confidence be attached to the likely performance of different options? If so, what are they?
  - » Can particular options be confidently excluded because they are unlikely to meet the acceptability criteria?
2. Do you need more precise definitions (operational definitions) of these criteria to appraise the options?
3. Would other criteria have led to a different form of options appraisal?
4. Would further, more detailed Stage x, 4 or 5 (Tier 2 or Tier x) assessments provide a basis for improved discrimination between options, or help develop better options?
5. Have you identified, during Stage x, the risks associated with implementing each option?
6. Could the options being considered possibly constrain other decision-makers' ability to adapt to climate change (i.e. contribute to climate maladaptation)?
  - » Options that may constrain climate adaptation can be difficult to identify at Stage 1 and 2, and may only become apparent during or after Stage 5 appraisal of options.
  - » Other options might be identified (Stage 4) to either avoid or mitigate the maladaptive effect.
  - » If it is believed that the options being considered may adversely affect the ability of other decision-makers or stakeholders to manage climate change risks in the future, their interests and involvement in the decision-making process should be considered.

## Tools and techniques

The descriptions of the tools in Table 1x have been grouped as follows:

- Qualitative Methods – which employ a systematic qualitative analysis – these are suitable for use at Tier 1;
- Alternative Methods – which usually employ a semi-quantitative analysis in order to compare different attributes or parameters, and can be used at Tier 2; and
- Quantitative and Economics-Based Methods – which (usually) employ a fully quantitative analysis of risks, costs and benefits – which are suitable for use at Tier x. This will include:
  - » Assessment of the costs of the options and any wider social and economic implications.
  - » Assessment of the environmental impacts and benefits of the options. Such assessment needs to be based on a risk assessment of the impacts and needs to allow for and reflect adequately the uncertainties in these assessments.

The choice of tool will depend on the decision-making criteria adopted at Stage 2. Economics-based tools are appropriate if financial criteria are the only ones that apply. Normally, a comprehensive assessment of the costs of adaptation would consider not only economic criteria, but also social welfare and equity.

Given the number of tools, two columns are included to assist in the selection of potentially useful tools: 'C' for complexity and 'D' for data requirements. Both parameters are rated on a scale of L (low); M (medium); and H (high).

## References

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Metroeconomica (2003). Costing the impacts of climate change in the UK: Overview of guidelines and Implementation guidelines. UKCIP, Oxford, UK.

Table 1x: Tools and techniques for Stage 5

Tool/technique	Qualitative methods	Alternative methods and/or economics based methods	Quantitative	C <sup>6</sup>	D <sup>6</sup>	Comment
Consultation Exercises	x			M	M	Outlined in Stages 1 & 2
Focus Groups	x			M	M	
Ranking/Dominance Analysis	x			L	M	
Screening		x		L	M	Outlined in Stage 4
Scenario Analysis	x	x	x	M	M	Outlined in Stage 3 and described in detail in Part 2, Sections 3.6 & 3.7
Cross-Impact Analysis	x			M	M	
Pairwise Comparison	x			L	M	
Sieve Mapping	x			H	H	
Maximax, Maximin, Minimax, Regret			x	M	M	Described in Part 2, Section 2.6.1
Expected Value			x	M	H	Described in Part 2, Section 2.6.2
Cost-Effectiveness Analysis			x	L	M	
Cost-Benefit Analysis			x	H	H	
Decision Analysis			x	H	H	
Bayesian Methods			x	H	H	
Decision Conferencing			x	H	H	
Discounting			x	L	H	
Environmental Impact Assessment/Strategic Environmental Assessment		x		H	H	
Multi-Criteria Analysis (Scoring and Weighting)		x		M	M	Described in Part 2, Section 2.6.3
Risk-Risk Analysis		x		M	M	
Contingent Valuation: Revealed performance Stated performance		x	x x	H H	H H	
Fixed Rule-based Fuzzy Logic	x	x	x	H	M	Tier 2 or 3 assessments
Financial Analysis			x	M	M	
Partial Cost-benefit Analysis	x		x	H	M	
Preference Scales	x			M	L	
Free-form Gaming	x			M	M	
Policy Exercise	x			M	M	

<sup>6</sup> 'C' refers to the complexity of the tool, and 'D', the data requirements. 'L' is low; 'M' is medium; and 'H' is high.