UK Climate Impacts Programme

Expressed preferences for the next package of UK climate change information

Final report on the user consultation

December 2006

Executive summary

1. The UKCIP02 climate change scenarios have been used to inform decision-making across a broad range of stakeholder organisations.
2. The next package of climate change information for the UK, called UKCIP08, will primarily differ from UKCIP02 in that information on anticipated climate change for the UK will be presented in probabilistic terms.
3. This will mean that uncertainty is better quantified, providing climate change information in a form that is more suited to risk-based decision-making
4. As UKCIP's stakeholder community grows, so too does the range of their needs. As such, this consultation was designed to improve understanding of these needs. The consultation consisted of a web-based survey alongside a series of meetings and workshops.
5. The consultation clearly demonstrated that different users have very different needs. Design of the climate change information (and delivery mechanism) cannot assume a uniform audience, and to the user the package should appear only as complex as necessary.
6. The consultation highlighted that the UKCIP02 climate change scenarios have been used for a variety of purposes, including detailed impacts modelling, infrastructure design, policy-making, awareness-raising and communication. It is important that UKCIP08 offers the same or greater flexibility in how climate change information is presented and can be used.
7. The move towards probabilistic information is generally welcomed by users, particularly where it provides greater information on uncertainties. However, some concerns were raised regarding the ability of UKCIP08 to provide clear, simple and understandable messages which will continue to be required by a large proportion of users.
8. UKCIP08, with probabilistic presentation of results, will require a fundamental shift in the way people use climate change information to make and support decisions. This represents a significant challenge for the presentation and delivery of the information, and places great importance on the role of the accompanying documentation, training and guidance.
9. The results of this consultation will be used to inform the structure and format of UKCIP08, as well as the development of the user interface, weather generator and supporting documentation and guidance.
10. Further details about the development of UKCIP08 can be obtained from www.ukcip.org.uk/scenarios/ukcip08.

Summary of results

- A majority of respondents had used the UKCIP02 climate change scenarios, most commonly accessing them through the summary report, technical report or electronic maps.
- There is a wide spectrum of user needs and the UKCIP02 scenarios have been employed for a broad range of uses. These can be crudely divided into those associated with specific research, policy or design decisions, and those associated with general awareness-raising and communication.
- The clear presentation of the UKCIP02 climate change scenarios, particularly the language and maps were said to make them easy to use.
- Spatial resolution, treatment of uncertainties, the format and issues regarding obtaining of the UKCIP02 scenarios were all cited as barriers to their use.
- A slight preference for 30-year time-slices.
- A strong preference for using 1961–1990 as the baseline period.
- A slight preference for having aggregated results for administrative 'regions' (the English regions and devolved administrations) and river catchments.
- Considerable interest in using future daily time-series, though a general lack of experience in using weather generators to produce this information.
- A preference for visualising modelled climate change scenarios as pre-prepared PDF graphs and maps, as well as the underlying information, for both individual 25 x 25 km grid squares and larger aggregated areas.
- A majority of respondents use current-day weather and climate information in their decision-making.
- A majority of respondents have some degree of awareness about the vulnerability of their sector or organisation to present-day future climate risks, though few thresholds are known.
- Most respondents to the web-based consultation require climate change information on a timescale of the next 20–50 years. Participants at meetings and workshops indicated a preference for nearer-term climate change information (next 10 years or less).
- Further analysis reveals that different 'user groups' can be described based on how climate information is used. For some responses to the web-based consultation, preferences from each user group differ significantly from the overall totals. These include preferences for spatial aggregation and delivery of probabilistic climate change information.

1. Background

The UKCIP02 climate change scenarios have been used to inform decision-making across a broad range of stakeholder organisations. The UKCIP02 report is frequently referenced, its maps and graphs are reproduced in a variety of documents and presentations and the underlying datasets have been used to support climate change impacts and adaptation work in a wide range of sectors.

UKCIP02 users are tackling increasingly complex problems and many of them have highlighted the need for new products and formats. Defra is funding the development of the next package of climate change information, to be released in 2008 as "UKCIP08". Work on this has been underway for several years at the Hadley Centre under the working title "UKCIPnext".

UKCIP08 will differ primarily from UKCIP02 in that information on anticipated climate change will be presented in probabilistic terms. This will mean that uncertainty is better quantified, providing climate change information in a form that is more suited to risk-based decision-making.

A summary of the main differences between UKCIP02 and UKCIP08 for the UK is given in **Appendix 1**.

Defra is leading the delivery of UKCIP08, and have convened a Steering Group to ensure fitness for purpose of the final product. UKCIP, under its current contract (2005–10), will:

- provide guidance to Defra, and to collaborating research partners, on the development of the new package of climate change information, covering both stakeholder needs and suggestions for data presentation and delivery;
- devise a plan for the roll-out of the new climate change information, to include dissemination and training.

2. The consultation process

The consultation process has involved two main activities, which address both of the above objectives:

(a) The UKCIP team has organised several consultation meetings and workshops to establish user feedback on format, presentation and delivery of climate change information. In the interest of making UKCIP08 information easy to use and to evaluate its utility, participants were asked to consider how they would like to see this information presented and what features are important to them. A full list of meetings and workshops (including definitions on acronyms) is given in **Appendix 2**. Many of these workshops have been written up and are available through the UKCIP08 pages of the Scenarios Gateway (www.ukcip.org.uk/scenarios/ukcip08).

(b) A web-based consultation was also undertaken over the summer of 2006. An online consultation (see form in **Appendix 3**) was established on the UKCIP website and was open for responses from 9 June until 1 October 2006. The web-based consultation was advertised in UKCIP e-news (July and September) and publicised by the UKCIP team at events and meetings. Emails publicising the web-based consultation were sent to all registered users (i.e. licence holders) of the UKCIP02 climate change scenarios and other key UKCIP stakeholder contacts. In total, 130 responses were received and a list of respondents is given in **Appendix 4**. The results are presented in **Section 3**, and all comments received are listed in **Appendix 5**.

This report presents the findings of both consultation activities. The structure of the report reflects the questions included in the web-based consultation form (**Appendix 3**), but this is supplemented with outcomes from individual consultation meetings and workshops where appropriate.

The content of the consultation (i.e. the questions asked) related to decisions about the structure, format and delivery of UKCIP08. Decisions relating to the modelling methodology and process are excluded from this consultation. Many modelling decisions have necessarily already been made by the Hadley Centre, including those informed by discussions at Steering Group meetings. Details of these have been (and will continue to be) publicised in the Steering Group section of the UKCIP08 web-page (www.ukcip.org.uk/scenarios/ukcip08).

3. Summary of consultation responses

3.1 Lessons learnt from UKCIP02

- **A majority of respondents had used the UKCIP02 climate change scenarios, most commonly accessing them through the summary report, technical report or electronic maps.**
- **There is a wide spectrum of user needs and the UKCIP02 scenarios have been employed for a broad range of uses. These can be crudely divided into those associated with specific research, policy or design decisions, and those associated with general awareness-raising and communication.**
- **The clear presentation of the UKCIP02 climate change scenarios, particularly the language and maps were said to make them easy to use.**
- **Spatial resolution, treatment of uncertainties, the format and issues regarding obtaining of the UKCIP02 climate change scenarios were all cited as barriers to their use.**

The UKCIP02 climate change scenarios will continue to provide the latest information on anticipated climate change for the UK until UKCIP08 is available in 2008. Thinking about what aspects of the UKCIP02 scenarios made them easy or difficult to use provides a good starting point for thinking about user preferences for UKCIP08.

3.1.1 Use of the UKCIP02 climate change

Respondents to the web-based consultation were asked whether they had used the UKCIP02 climate change scenarios. The majority (68%) responded that they had used UKCIP02. Most users of UKCIP02 had employed the Summary Report (70%), with approximately equal numbers of respondents having used the Scientific Report (61%) and electronic maps (60%). Around one third (36%) of UKCIP02 users had accessed the underlying datasets.

Table 1a. Responses from the web-based consultation

Have you used the UKCIP02 climate change scenarios?		
Total responses	**130**	
Yes	88	68%
No	42	32%
Shorter "Summary" Report	62	70%
Longer "Scientific" Report	54	61%
Electronic maps	53	60%
Raw datasets (licence holder)	32	36%

Participants at several of the consultation events (**Appendix 2**) were also asked if they had heard of or used the UKCIP02 climate change scenarios.

Table 1b. Responses from consultation events

	No – Never heard of them	**No – but aware they exist**	**Yes – reports or maps**	**Yes – underlying datasets**
APF launch event	3 (8%)	10 (26%)	25 (66%)	
SNIFFER workshop	0 (0%)	22 (49%)	20 (44%)	3 (7%)
SECCP workshop	0 (0%)	2 (6%)	25 (78%)	5 (16%)
CABE workshop	1 (4%)	7 (26%)	15 (56%)	4 (15%)
ARSPS workshop	5 (13%)	8 (21%)	20 (51%)	6 (15%)

Overall respondents were generally aware of the UKCIP02 scenarios and in most cases had used them in one form or another. This makes them well placed to evaluate the strengths and weaknesses of how the UKCIP02 scenarios were presented.

The web-based consultation additionally asked respondents how they had used the UKCIP02 climate change scenarios. One group of responses related to specific areas of research, reports or strategies which included consideration of climate change impacts or adaptation. These responses tended to use words such as **project**, **study** or **report** (17 occurrences), **data** or **datasets** (14), **research** (13), **models** or **modelling** (9) and **strategy** (7).

A second group of responses related to the use of the UKCIP02 climate change scenarios as a tool for communication, education and awareness-raising. These responses tended to use words such as **inform** or **informing** (15 occurrences), **presentations** (11), **awareness** (9), **colleagues**, **staff** or **management** (7), **advice** or **advise** (5), **communication** or **illustration** (4), **educational** or **teaching** (4) and **audiences** (3).

3.1.3 Strengths of the UKCIP02 climate change scenarios

When asked about what made the UKCIP02 climate change scenarios easy to use, the UKCIP02 report was praised for its overall presentation in 27 responses. The report was considered to be "a clear and concise accompanying document", written "in simple language", which is "easy to relate to lay persons who do not have scientific backgrounds". Words such as **clear** and **easy** were frequently used (8 and 10 occurrences, respectively). The existence of two separate reports – a shorter summary report and a longer scientific report – and their availability online were also identified as positive aspects of UKCIP02.

> *"Having the 'simple' version is great for quick reference, with the knowledge that the 'full' version is there as back-up"*

The maps were mentioned in 21 responses, with comments including that they are "very useful to portray changes", "easy for people to understand" and "an essential aid to communication". The use of different emissions scenarios was deemed useful by 7 respondents, for example as it "correctly ensures that decision makers are aware that there is variability and - crucially - that we can overall influence these outcomes".

Access to the underlying datasets was thought to be important by 11 respondents, with 4 mentioning the utility of GIS-format output. The support available from UKCIP staff was also highlighted as a good aspect of UKCIP02.

3.1.4 Weaknesses of the UKCIP02 climate change scenarios

When asked about what made the UKCIP02 climate change scenarios difficult to use, three main themes appear dominant. The first theme related to the 50 x 50 km grid resolution used to present the scenarios. This was considered "too coarse" by 15 respondents, making it "difficult to bring down to local enough level to apply it to local communities". A further 3 respondents commented that changes at a regional scale would have been of more use than individual grid squares.

The second theme was the issue of uncertainties, which featured in 13 responses, and which was felt to make the scenarios difficult to use for decision-making. These responses spanned both the "inherent uncertainty" associated with climate modelling but also a perceived "lack of easily accessible uncertainty information and advice on which models to use". Five responses indicated that probabilities were either lacking or would improve the situation.

"I realise it would be inappropriate to do so, but it is frustrating that no 'prediction' is available for actual use in routine studies requiring a number to apply. For example, how much mean sea level rise in 100 years? It could be anywhere between a few centimetres and a metre or more. What is a coastal engineer supposed to do in design of a seawall?"

The third theme related to the process of obtaining and using the scenarios, and in particular the underlying datasets, which featured in 12 responses. Some comments were about locating the information, including "difficult to access", "difficult to find the information I required" and "getting hold of the particular data I wanted was complicated and difficult". Other comments related to the problems with the format of the datasets, including "the very large files which had to be downloaded to extract a few sites", "not compliant with users' software", "non-standard suffixes" and "mapping from the grid to the actual location". Comments have also been received about inconsistencies between the published maps and the underlying information available through the UKCIP website, leading to an inability to reproduce maps and graphs displayed in the reports.

Other difficulties included the lack of specific weather variables, difficulties reading changes from the maps, limited information on extreme events and near-term changes, the registration procedure and the (over-)use of technical terminology.

3.2 Presentation and delivery

- **A slight preference for 30-year time-slices.**
- **A strong preference for using 1961–1990 as the baseline period.**
- **A slight preference for having aggregated results for administrative 'regions' (consisting of the English regions and devolved administrations) and river catchments.**
- **Considerable interest in using future daily time-series, though a general lack of experience in using weather generators to produce this information.**
- **A preference for visualising modelled climate change scenarios as pre-prepared PDF graphs and maps, as well as the underlying information, for both individual 25 x 25 km grid squares and larger aggregated areas.**
- **A preference for PDF graphs rather than CDF graphs.**

Much of the web-based consultation was targeted at seeking views on the presentation and delivery of UKCIP08.

3.2.1 Time-slice duration

Respondents were first asked about their preferred time-slice duration. In the UKCIP02 scenarios, average changes are reported for time-slices of 30 years. This means results are presented for 'the 2020s', 'the 2050s' and 'the 2080s', representing the periods 2011 to 2040, 2041 to 2070 and 2071 to 2100, respectively.

Table 2a. Responses from the web-based consultation

UKCIP08 scenarios will be presented as climate change values averaged over pre-defined future time-slices up to 2100. What is your preferred time-slice duration?		
Total responses	**128**	
20-year time-slices	44	34%
30-year time-slices	50	39%
No preference	10	8%
Other	23	18%

A similar question was asked at some of the consultation events (**Appendix 2**).

Table 2b. Responses from consultation events

	10-year time-slices	20-year time-slices	30-year time-slices	No preference	Other
SNIFFER workshop	9 (29%)	2 (6%)	4 (13%)	1 (3%)	15 (48%)
SECCP workshop		2 (11%)	13 (72%)	0 (0%)	3 (17%)

Overall, there appeared no clear preference for time-slice duration. In the web-based consultation, 44 respondents (34%) preferred 20-year time-slices and 50 respondents (39%) preferred 30-year time-slices. Various other suggestions were put forward including 10-year time-slices (8 responses) and a combination of 10-year and 30-year time-slices (6 responses), for example as a "moving 30-year time-slice". Three responses mentioned the importance of proceeding beyond the year 2100 to ensure that the scenarios present information for 100-years from present.

3.2.2 Baseline climate

Respondents were asked what period they would like to see used as the climate 'baseline'.

Table 3a. Responses from the web-based consultation

UKCIP08 scenarios will be presented in terms of climate change from a baseline. What is your preferred baseline climate period?		
Total responses	**129**	
1961–1990	83	64%
1971-2000	31	24%
No preference	7	5%
Other	8	6%

A similar question was asked at some of the consultation events (**Appendix 2**).

Table 3b. Responses from consultation events

	1961–1990	1971–2000	No preference	Other
SNIFFER workshop	14 (78%)	1 (6%)	2 (11%)	1 (6%)
SECCP workshop	17 (94%)	1 (6%)	0 (0%)	0 (0%)

Responses to both the web-based consultation and from participants at consultation events indicate a clear preference for retaining 1961–1990 as the baseline period, to be consistent with the UKCIP02 climate change scenarios. However, responses also indicated that care would be needed to ensure that the 'baseline' climate is not misinterpreted as 'current' climate, and that a

quantification or commentary of observed climate changes from 1961–1990 to present would be helpful.

3.2.3 Spatial aggregation

Respondents were shown maps illustrating different types of spatial aggregation and asked what spatial aggregation of climate change information would be most useful to them. It was emphasised that aggregation as a post-processing step (i.e. once the information has been released) will not be possible.

Table 4a. Responses from the web-based consultation

In addition to the 25km grid cells, UKCIP08 scenarios can be presented as probability distributions for a limited number of aggregated spatial areas. What is your preferred type of spatial aggregation?		
Total responses	**130**	
Individual 25km grid cells	65	50%
Political boundaries	11	8%
Administrative 'regions'	44	34%
River catchment areas	28	22%
Met Office climatological districts	18	14%
No preference	3	2%
Other	17	13%

A similar question was asked at some of the consultation events (**Appendix 2**).

Table 4b. Responses from consultation events

	Smaller than 25 x 25 km grid squares	**25 x 25 km grid squares**	**Admin. 'regions'**	**National boundaries**	**River catchments**	**Other**
APF launch event			29 (38%)	23 (30%)		25 (32%)
SNIFFER workshop		18 (30%)	19 (32%)	0 (0%)	12 (20%)	11 (18%)
SECCP workshop		18 (32%)	18 (32%)	2 (4%)	7 (13%)	11 (20%)
CABE workshop	16 (24%)	15 (22%)	26 (39%)	4 (6%)	2 (3%)	4 (6%)
ARPSP workshop	11 (20%)	22 (40%)	5 (9%)	0 (0%)	6 (11%)	11 (20%)

Based on all responses, there seems to be a slight preference for climate change information being aggregated into administrative 'regions' (defined as the nine administrative regions of England and the devolved administrations of Northern Ireland, Scotland and Wales; Figure 1a). This corresponds with the comments that regional-scale climate change information would be more useful than grid squares (see **Section 3.1.4**). The next most popular preference was generally river catchment areas, though several comments noted the need to discuss

appropriate catchment size. One solution suggested in several responses is the use of river basin districts (RBD) as defined by the Water Framework Directive (Figure 1b). This would divide the UK into 15 catchment areas, though some (such as 'Scotland') are large and may need further division into sub-basins.

(a) *(b)*

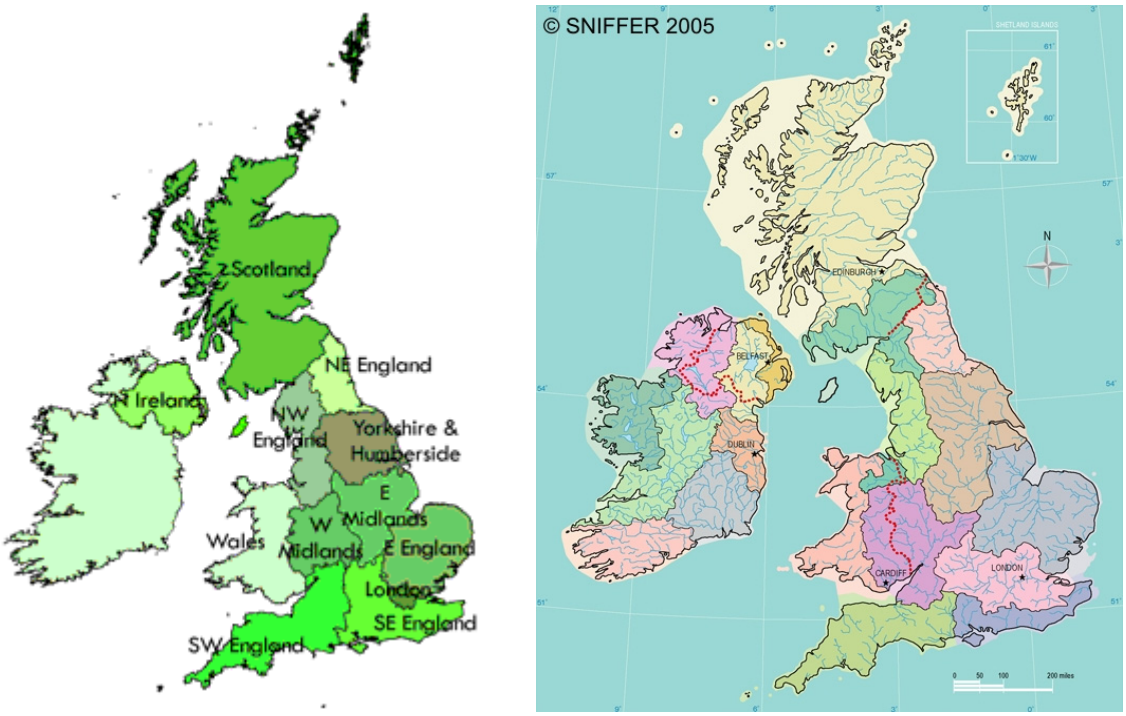


Figure 1. Maps showing (a) administrative 'regions' of the UK and (b) river basin districts for the UK and Ireland.

Suggestions for other spatial aggregations included those based on counties, local authority areas, landscape designations, geology and agro-climatic zones.

3.2.4 Daily time-series information

The next two questions in the web-based consultation both related to daily time-series information. First, respondents were asked whether they would use daily time-series information, if it was available. Only 50 (38%) of respondents said that they would.

Table 5a. Responses from the web-based consultation

UKCIP08 scenarios will present probabilistic information on changes in monthly, seasonal and annual average climate means, as well as on changes to extremes. If it was available, would you also use daily time-series information?		
Total responses	**130**	
Yes	50	38%
No	80	62%

Next, respondents were asked whether they had used weather generator output before. This is because daily time-series output in the next package of UK climate change information will be provided via a 'weather generator' tool. The majority of respondents (84%) had not used a weather generator before (including 62% of those who said they would be interested in using daily time-series information in the previous question), emphasising the important role of guidance and training in supporting appropriate use of the weather generator tool.

Table 5b. Responses from the web-based consultation

Daily time-series are likely to come from a 'weather generator' (subject to funding). Have you used weather generator output before?		
Total responses	**130**	
Yes	21	16%
No	109	84%

A related question was used at the consultation events (**Appendix 2**), which asked participants for their preferred level of temporal detail for climate change information.

Table 5c. Responses from consultation events

	Sub-daily	Daily	Monthly	Seasonal / Annual	Extreme events[1]
CABE workshop	9 (15%)	7 (12%)	5 (8%)	19 (32%)	19 (32%)
ARPSP workshop	10 (8%)	15 (19%)	15 (19%)	27 (34%)	13 (16%)

Responses at these events generally support the idea that daily (and sub-daily) climate change information is required by a relatively small proportion of the user community and that, for many users, monthly, seasonal or annual changes are sufficient. It also highlighted the importance placed on presenting expected changes to the frequency and magnitude of extreme events.

3.2.5 Provision and format of information

Respondents were asked to think about which method(s) of delivery and format of information would best meet their needs. Examples of different methods were provided. For each 25 x 25 km grid square, most respondents (48%) thought spreadsheets containing the raw information would be the most useful method of delivery. Other popular methods were pre-prepared PDF (probability distribution function) graphs and maps showing a single value of change (both represented 33% of responses). For larger aggregated areas, spreadsheets containing raw values were thought to be less useful (chosen by 32% of respondents), with pre-prepared PDF graphs (39%) seen as the most useful method of delivery. Again, maps were also thought to be useful (27%). In both cases, PDF graphs were thought to be more useful than CDF (cumulative distribution function) graphs.

[1] "Extreme events" refer to pre-prepared analysis of the anticipated change in the magnitude or frequency of certain extreme events (as was available in the UKCIP02 reports). This information can also be calculated using daily or sub-daily output, but would require users to perform the extreme events analysis themselves.

Table 6. Responses from the web-based consultation

UKCIP08 will produce, for each grid square or pre-defined aggregated area, a distribution of future climate change for a given climate variable, emissions scenario and time-slice. There are several ways in which this information can be delivered in terms of what is provided and what format is used. Which of these methods would best meet your needs?		
Total responses	**130**	
<u>For each 25 x 25 km grid square:</u>		
Pre-prepared PDF graph	43	33%
Pre-prepared CDF graph	12	9%
Single average value	20	15%
Other representative single value (i.e. percentiles)	11	8%
Single value associated with a threshold being exceeded	12	9%
Map showing a single value	43	33%
Spreadsheet containing the underlying probabilities	62	48%
<u>For larger aggregated areas:</u>		
Pre-prepared PDF graph	51	39%
Pre-prepared CDF graph	14	11%
Single average value	15	12%
Other representative single value (i.e. percentiles)	7	5%
Single value associated with a threshold being exceeded	14	11%
Map showing a single value	35	27%
Spreadsheet containing the underlying probabilities	41	32%

3.3 Intended use of climate change information

- **A majority of respondents use current-day weather and climate information in their decision-making.**
- **A majority of respondents have some degree of awareness about the vulnerability of their sector or organisation to present-day future climate risks, though few thresholds are known.**
- **Decisions that are, or will be, based on climate change information relate to both Building Adaptive Capacity (BAC) and Delivering Adaptation Actions (DAA).**
- **Most respondents to the web-based consultation require climate change information on a timescale of the next 20–50 years. Participants at meetings and workshops indicated a preference for nearer-term climate change information (next 10 years or less).**

The remaining questions in the web-based consultation investigated the intended use of UKCIP08. Respondents were asked both about existing climate vulnerabilities as well as decisions they would expect to take that include consideration of future climate.

3.3.1 Use of present-day climate information in decision-making

Respondents were first asked whether they typically used historical or present-day climate information in their decision-making. The majority of respondents (75%) said that they did.

Table 7. Responses from the web-based consultation

In your organisation/sector, do you use historical and/or present-day climate information in your decision-making?		
Total responses	**128**	
Yes	96	75%
No	32	25%

Two subsequent questions asked what sort of decisions these were and what type of information was used. Responses about decisions which involve some consideration of climate information included words such as **planning** (31 occurrences), **management** (17), **resources** (17), **risk** (17) and **design** (16) – all terms that are relatively generic across several different sectors. The most commonly-used words which are more sector-specific refer to decisions involving **water** (24 occurrences), **flooding** (18), **buildings** (9) and **coasts** (8).

Respondents were next asked what climate information they use to make climate-sensitive or climate-dependent decisions. The responses can be broadly divided into those associated with the type of information and those associated with the source of information. Concerning the type of information used, the most commonly-used words in responses included **rainfall** (36 occurrences), **temperature** (31), **daily** (22), **evapotranspiration** including **PET** (16), **wind** (13), **monthly** (8) and **annual** (7). In terms of the source of such information, the most common response was the **Met Office** (49 occurrences) with **UKCIP** (19), **Environment Agency** (8) and **CIBSE** (4) also mentioned on several occasions.

3.3.2 Vulnerability to present-day climate risks

Amongst respondents, there appeared to be a relatively good level of understanding of vulnerability to present-day climate risks. In total 91% of responses indicated some level of awareness, either based on the respondent's own organisation or based on the client for which the respondent was undertaking work. It was notable that several responses (13%) emphasised that while their organisation had some broad understanding, it was at a relatively early stage and needed developing.

> *"Some parts of the organisation (a County Council) are aware of the risks, others are not. There is no comprehensive awareness of impacts or adaptation plan for our estate and services. Individual service functions (e.g. highways) may be generally aware of climate-related impacts (e.g. tarmac melting in heatwaves) but are not comprehensively or consciously studying the full range of impacts or planning to adapt. Other functions will vary between 'very aware' and 'totally unaware'."*

Other respondents indicated that they had a very good or detailed appreciation of how climate impacted on their organisation's activities (38%), across a wide range of sectors. Of these, limited or no knowledge of specific thresholds was mentioned by around one fifth (20%).

Analysis of keywords reveals that vulnerabilities associated with **flooding** (18 occurrences) were most frequently cited, with **temperature** (13), **wind** (9), **rainfall** (8) and **sea-level rise** (4) also mentioned on several occasions.

> *"Yes, but I think I am a lone voice so far. Recent storm floods have convinced others that I may have a point!"*

3.3.3 Use of future climate information in decision-making

When asked how future climate information is intended to be used, responses included examples of research, policy-making, planning, infrastructure design

and communication activities. These can conveniently be grouped into two types of adaptation decisions: Building Adaptive Capacity (BAC) and Delivering Adaptation Actions (DAA)[2].

BAC involves creating the information and conditions (regulatory, institutional, managerial, etc) that are needed for adaptation.

> *"To help inform both Regional Economic Strategy review work and 'foresight' work to feed into Regional Spatial Strategy and other regional strategies."*
>
> *"Use the information for awareness-raising with the public and clients."*
>
> *"Decisions may be needed on accessions policy, e.g. which kinds of plant can or cannot continue to be maintained…, and which others should be trialled for recommendation to Scottish growers."*

DAA refers to taking actions that will actually help reduce vulnerabilities to climate risks.

> *"Design of buildings to limit peak summertime temperatures and predict hours per year that limiting temperatures will be exceeded."*
>
> *"Which flood defences to build, whether to use managed realignment etc."*
>
> *"Adapting insurance pricing to reflect that future climate may be different to historical weather event data."*

Around 56% of responses to the web-based consultation related to BAC, including education, research, awareness-raising, policy-making and planning. Around 43% of responses could be categorised as DAA, including decisions about issues as diverse as insurance pricing, water resources, building design, plant species and flood defence.

Respondents to the web-based consultation were also asked about the typical time-frame for which they would most require information on future climate.

[2] This is a typology of adaptation responses that has been used elsewhere by UKCIP (e.g. Measuring Progress, 2005) and Defra (e.g. Adaptation Policy Framework, ongoing). Responses to the web-based consultation were subjectively grouped under these two headings, as it was felt to be a useful way of categorising feedback.

Table 8a. Responses from the web-based consultation

For what future time period will you require climate change information?		
Total responses	**128**	
The next 10 years	6	5%
The next 20 years	31	24%
The next 50 years	45	35%
The next 100 years	24	19%
No preference	6	5%
Another time period	16	13%

This indicated that the next 20–50 years was the timescale over which respondents most needed climate change information (59%). Relatively few respondents (5%) cited the next 10 years as important, with greater preference for the next 100 years (19%).

A similar question was asked at some of the consultation events (**Appendix 2**).

Table 8b. Responses from consultation events

	Next 5 years	**Next 10 years**	**Next 20 years**	**Next 50 years**	**Next 100 years**	**No preference**	**Other**
APF launch event			34 (41%)	31 (37%)	17 (20%)		
CABE workshop	13 (85%)	9 (11%)	14 (16%)	14 (33%)	16 (19%)		5 (6%)
ARPSP workshop	44 (37%)	26 (22%)	21 (18%)	20 (17%)	7 (6%)		

These produced a different pattern of responses to the web-based survey, suggesting the most favoured time-scale was over the next 5 years. It should be noted that the question asked was slightly different at the CABE and ARSPS workshops. Workshop participants were asked about the typical planning horizons that operate in their sector (with climate change information not specifically mentioned), which may go some way to explaining the difference (i.e. the majority of decisions are made over short time-scales (5 years or less) within which time climate change information is not considered as important to them).

3.4 Further analysis

- **Further analysis reveals that different 'user groups' can be described based on how climate information is used.**
- **For some responses to the web-based consultation, preferences from each user group differ significantly from the overall totals. These include preferences for spatial aggregation and delivery of probabilistic climate change information.**

Three separate questions in the web-based consultation asked respondents to consider how they use climate information. The first question (Question 3.1) asked respondents what type of decisions they make based on information about historical or present-day climate. The second question (Question 3.3) asked respondents what sort of decisions they expect to be taking that rely on information about future climate for the UK. The third question (Question 3.5) asked respondents how they had used the information provided by the UKCIP02 climate change scenarios. Although each question is slightly different, together they provide an interesting insight into the different uses of climate information.

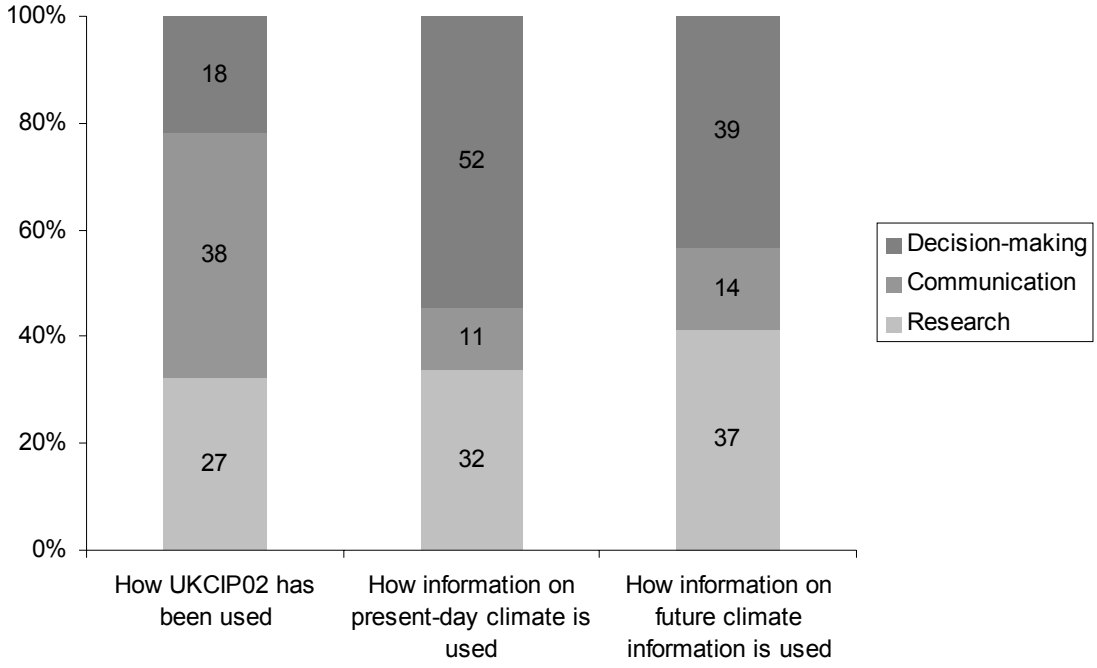
Responses to all three questions were divided into three broad 'user groups', 'researchers', 'communicators' and 'decision-makers'[3]:

- 'Researchers' included uses for academic and applied research, and included activities such as scoping studies, dissertations and impacts modelling.
- 'Communicators' included uses such as awareness-raising, staff briefings, education and presentations.
- 'Decision-makers' comprised any actions that were undertaken on the basis of the climate change information. These include strategy studies, management or action plans, design decisions (e.g. infrastructure or flood defence) or policy formulation.

The results of the classification are shown below. It is interesting to note that the uses stated in the three questions vary considerably[4]. In all three cases, approximately a third of users were 'researchers'. However, the split of remaining users between 'communicators' and 'decision-makers' is not uniform. Information on present-day climate is only used for communication purposes by 11% of users, while 52% used it for decision-making. The pattern of usage of information on future climate is similar, if less pronounced, with 14% of uses

[3] Categorisation was based on a subjective interpretation of the responses given. Where the use was unclear or where the use spanned two or more classes, responses were eliminated from analysis (less than 10%). It is recognised that discrepancies may occur with this classification (e.g. research may later be used for communication and/or decision-making).
[4] The differences are statistically significant at the 95% confidence level.

linked to communication and 39% linked to decision-making. By contrast, UKCIP02 was predominantly used for communication purposes (38%) with only 18% of uses related to decision-making.



Next, the same three-way classification of user groups ('researchers', 'communicators', 'decision-makers') was used to cross-examine responses to other questions to see if user preferences for UKCIP08 varied based on its potential use (compared to the overall results).

The results of this cross-analysis are presented in the following three tables:

- Table 9 examines how user preferences differ from the overall totals based on stated use of the UKCIP02;
- Table 10 examines how user preferences differ from the overall totals based on the stated use of present-day climate information; and
- Table 11 examines how user preferences differ from the overall totals based on the stated *intended* use of UKCIP08.

In each table, the main differences from the overall totals are given for each of the user preferences specifically asked about in the web-based consultation. These are expressed as either greater than (">") or less than ("<") the overall results. Where differences are statistically significant[5], they are presented in black text. Otherwise, differences are presented in grey text.

[5] Tested at the 95% confidence level.

The main results from this analysis are as follows:

- User preferences about time-slice duration **are not significantly different** for different user groups: 'Researchers' tended to have a stronger preference for 30-year time-slices. 'Communicators' and 'decision-makers' tended to have a slightly stronger preference for 20-year time-slices.
- User preferences about the baseline period **are not significantly different** for different user groups: Analysis of the three user groups revealed no significant differences from the overall response for preferences about the climate baseline.
- User preferences about the spatial aggregation of information **are significantly different** for different user groups: 'Researchers' tended to have a stronger preference for information at the scale of individual grid squares. By contrast, a smaller proportion of decision-makers expressed a preference for information for individual grid squares, preferring instead information at the scale of administrative 'regions' or river catchments.
- User preferences about the use of daily time-series information **are significantly different** for different user groups: A greater-than average proportion of 'researchers' responded that they would use daily time-series information. Similarly, a greater-than-average proportion of 'researchers' have used weather generator tools before.
- User preferences about the presentation of probabilistic climate change information **are significantly different** for different user groups: Preferences about how probabilistic information is delivered present a mixed picture, perhaps reflecting the difficulty of users in assessing (in abstract terms) the usefulness of different forms of delivery. Overall, 'researchers' tended to have a stronger preference for the underlying probabilistic information and less requirement for mapped output. By contrast, 'communicators' tended to favour maps as a delivery mechanism, and also showed a greater-than-average preference for other delivery formats (including PDF graphs and threshold exceedance statistics) when the information related to larger aggregated areas. 'Decision-makers' tended to have less preference for the underlying probabilistic information, and instead showed stronger-than-average preference for single values, particularly at the level of individual 25 x 25 km grid squares.
- User preferences about the future period for which climate change information is required **are not significantly different** for different user groups: There was a slight tendency for 'decision-makers' and 'communicators' to require climate change information for a shorter future time-period (~20 years) than 'researchers' (~50 years).

Table 9. User preferences based on stated use of the UKCIP02 climate change scenarios from the web-based consultation

	Overall results[6]	Significantly[7] different from overall results?	'Researchers'	'Communicators'	'Decision-makers'	Not used UKCIP02
Preferred time-slice duration	Table 2a	No	20-year < overall 30-year > overall	20-year > overall	20-year > overall	-
Preferred baseline period	Table 3a	No	-	-	-	1961–90 < overall 1971–00 > overall
Preferred spatial aggregation	Table 4a	Yes	25km grid > overall River catch. > overall	'Regions' > overall	25km grid < overall River catch < overall Other > overall	25km grid < overall MO districts > overall
Use of daily time-series	Table 5a	Yes	Yes > overall No < overall	-	-	-
Use of weather generator	Table 5b	Yes	Yes > overall No < overall	Yes < overall No > overall	-	Yes < overall No > overall
Delivery of 25km grid square information	Table 6	Yes	Map < overall Spreadsheet > overall	Map > overall	PDF graph < overall Single value > overall Spreadsheet < overall	-
Delivery of aggregated area information	Table 6	Yes	Map < overall Spreadsheet > overall	PDF > overall Threshold > overall Map > overall Spreadsheet > overall	Map < overall Spreadsheet < overall	Spreadsheet < overall
Preferred future time period	Table 8a	No	20 years < overall 50 years > overall Other > overall	-	20 years > overall	-

[6] From web-based consultation as presented in the referenced tables in this report.
[7] Significant at the 95% confidence level.

Table 10. User preferences based on stated use of present-day climate information from the web-based consultation

	Overall results[8]	Significantly[9] different from overall results?	'Researchers'	'Communicators'	'Decision-makers'	No use of present-day climate information
Preferred time-slice duration	Table 2a	No	20-year < overall		20-year > overall	-
Preferred baseline period	Table 3a	No	Other > overall	1961–90 < overall 1971–00 > overall Other > overall	-	1961–90 > overall 1971–00 < overall
Preferred spatial aggregation	Table 4a	Yes	-	25 km grid > overall Political bnd. > overall	-	25km grid < overall River catch. < overall
Use of daily time-series	Table 5a	Yes	Yes > overall No < overall	Yes < overall No > overall	-	Yes < overall No > overall
Use of weather generator	Table 5b	No	-	-	-	-
Delivery of 25km grid square information	Table 6	Yes	Map < overall Spreadsheet > overall	-	PDF graph < overall Single value > overall Spreadsheet < overall	-
Delivery of aggregated area information	Table 6	Yes	Map < overall Spreadsheet > overall	CDF graph > overall Map > overall	-	PDF graph < overall Spreadsheet < overall
Preferred future time period	Table 8a	No	20 years < overall 50 years > overall	20 years > overall 50 years < overall	-	50 years < overall 100 years < overall Other < overall

[8] From web-based consultation as presented in the referenced tables in this report.
[9] Significant at the 95% confidence level.

Table 11. User preferences based on stated intended use of UKCIP08 from the web-based consultation

	Overall results[10]	**Significantly[11] different from overall results?**	**'Researchers'**	**'Communicators'**	**'Decision-makers'**
Preferred time-slice duration	Table 2a	No	30-year > overall Other < overall	20-year > overall 30-year < overall	-
Preferred baseline period	Table 3a	No	1961–1990 < overall 1971–2000 > overall	1961–1990 > overall 1971–2000 < overall	1961–1990 > overall 1971–2000 < overall
Preferred spatial aggregation	Table 4a	Yes	MO districts > overall	River catchments < overall	-
Use of daily time-series	Table 5a	No	-	-	-
Use of weather generator	Table 5b	No	-	Yes < overall No > overall	-
Delivery of 25km grid square information	Table 6	Yes	-	PDF graph > overall Map > overall	-
Delivery of aggregated area information	Table 6	Yes	PDF graph > overall Map < overall Spreadsheet > overall	CDF graph > overall Spreadsheet < overall	PDF graph < overall Single value < overall
Preferred future time period	Table 8a	No	-	20 years < overall 50 years < overall	-

[10] From web-based consultation as presented in the referenced tables in this report.
[11] Significant at the 95% confidence level.

4. Next steps

- **The results of this consultation will be used to inform the structure and format of UKCIP08, as well as the development of the user interface, weather generator and supporting documentation and guidance.**
- **Further details about UKCIP08 can be obtained from www.ukcip.org.uk/scenarios/ukcip08.**

UKCIP is aware that many important decisions on UKCIP08 have already been made, and that several further decisions will be taken between now and their release in 2008. The web pages dedicated to UKCIP08 (www.ukcip.org.uk/scenarios/ukcip08) provide Defra, the Hadley Centre and the Steering Group with a platform to communicate decisions taken in a transparent way.

The results of our analysis of the consultation will be used for a variety of purposes:

- to inform Defra and the Hadley Centre regarding preferred structure and format of UKCIP08.
- to inform Defra and the Steering Group about user preferences and needs, when discussing the development of UKCIP08.
- to guide the development of the 'user interface', the mechanism by which UKCIP08 will be delivered to users. This contract is currently being let by Defra under the title "UKCIPnext Data Delivery Package" ("UnDDP"). It is intended to be web-based and freely accessible, and should provide users with the facility to select and download a customised 'view' of the data. Since it is essential that the user interface is designed with user needs in mind, UKCIP has recommended a User Panel to comment on and test the data delivery package and its evolution.
- to guide the development of a 'weather generator' tool, a second contract that is currently being let by Defra. This tool, incorporated within the user interface, will allow users to simulate daily and sub-daily time series of future weather consistent with the probabilistic information that is provided by UKCIP08.
- to inform UKCIP about the potential requirements for and uses of the information, which will help determine the content and format of supporting documentation, training and guidance material.

This consultation report, along with its further consideration informing the development of UKCIP08, will be made available through the UKCIP web-pages.

Where appropriate, individual responses will be made to specific comments (**Appendix 5**).

The production of this consultation report is not meant to imply that this is the final time that user needs will be considered prior to the release of UKCIP08. The process of developing documentation and guidance (as well as developing the user interface and weather generator themselves) is seen as a two-way process, and one for which further consultation will be required once the structure and format of the climate information is finalised and better understood.

Finally, it is important to realise that not all user needs can be met. This is for several reasons: (i) that some of them require modelling output that is judged to be impossible to generate with sufficient scientific rigour; (ii) that different users want varying, and sometime contrasting, outputs; and (iii) that all suggestions cannot be accommodated given the finite time and resources available. Nonetheless, we will try and ensure that the final product meets the majority of common user needs.