# UKCIP08 Data Delivery Package: User Requirement

**Version History**

| Version Number | Who? | Date | Notes |
|---|---|---|---|
| 0.1 | Ag Stephens (AS) | 01/02/07 | First Draft |
| 0.3.0 | AS | 01/04/07 | Sent out for internal review |
| 0.3.2 | AS | 10/04/07 | Included comments from Gobe Hobona, Stephen Pascoe, David Sexton and Geoff Jenkins. |
| 0.4.3 | AS | 30/10/07 | Incorporating user feedback from test version |
| 0.9 | AS | 06/11/07 | Finalised and ready for sign-off |
| 0.9.5 | AS | 18/11/07 | Incorporated feedback from Steering Group |
| 1.0 | AS | 20/11/07 | Final Version signed-off. |

**Circulation**

Stage 1: The UKCIP08 team and Steering Group – for review

Stage 2: Publicly visible on the wiki

**Contents**

## *Introduction*

The purpose of the UKCIP08 Data Delivery Package (DDP) User Requirement document is to describe the core requirements that will be realised by the project. This provides a baseline requirement and will be a key resource in designing the system. The document has been informed by:

- the SID3 proposal document
- discussions, and documents, generated within the project team
- input from stakeholders: documents and discussions from Defra, UKCIP, the UKCIP08 Steering Group and the MOHC
- user feedback, from:
    - the UKCIP User Consultation process
    - the UKCIP08 User Interface Questionnaire
    - the UKCIP08 Users' Panel meetings
    - the feedback received on the test version of the User Interface
- the CEER0606 Weather Generator Project Team

For brevity there is no inclusion of general information about the project. These are available from the project web site at:

http://proj.badc.rl.ac.uk/dcip/wiki/UkcipDdp

This document presents a list of high-level requirements that are then broken down into many statements. These are flagged as "essential", "desirable (high priority)" or "desirable (low priority)" requirements. There are also some requirements that are specifically listed as "out of scope", the intention being to highlight issues that have been raised by users and need to be explicitly recorded as not being feasible. All statements are written in plain English to ensure that this document is accessible to stakeholders and users.

### *System Overview*

The DDP will be constructed from a collection of components as shown in figure 1.

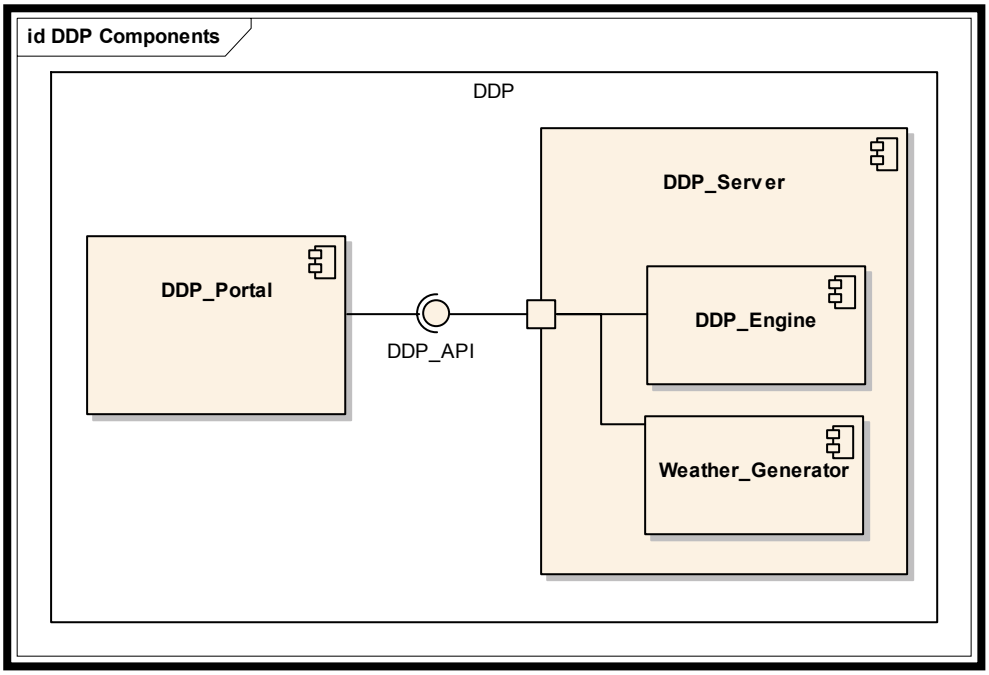


**Figure 1.** Simple view of DDP Components.

### *Terminology*

In this document the terms below have the following meanings:

**"BADC"** is the British Atmospheric Data Centre.

"**MOHC**" is the Met Office Hadley Centre.

"**NCL**" is Newcastle University.

**"UEA"** is the University of East Anglia.

**"DDP"** means the entire DDP system (i.e. the outer boundary in figure 1).

**"DDP Portal"** means only the web-based user interface to the DDP.

**"WG"** refers to the UKCIP08 Weather Generator.

In the requirements and desirables sections the terms below have the following meanings:

**"Must"** indicates an essential requirement that must be realised.

**"Should"** indicates a desirable that is of high priority if there is scope to include it.

Desirables of lower priority are listed under the Desirables section and not in the Requirements section.

Those issues considered out of scope are listed in the Out of Scope section.

# Requirements

This section outlines the requirement specification as follows:

1. High-level requirements are listed for the:
    a. DDP
    b. DDP Portal
2. Detailed requirements are then listed for the:
    a. DDP
    b. DDP Portal

### *High Level Requirements*

The high level requirements are split into those relating to the DDP as a whole and those relating specifically to the DDP Portal.

### DDP High Level Requirements

| | |
|---|---|
| **REQT-1.** | The DDP **must** provide a clear set of methods (i.e. an Application Programmable Interface, or API) that can be called from external client applications. Initially, the DDP Portal will be the only client. |
| **REQT-2.** | The DDP **must** provide a clearly defined wrapper to the externally produced Weather Generator (WG) software. This **must** allow seamless transition of (i) MOHC data from the DDP into the WG and (ii) output data from the WG back into the DDP. |
| **REQT-3.** | The DDP **must** provide a range of data outputs including probabilistic data, location-specific time series and gridded model output. |
| **REQT-4.** | The DDP **must** be able to interact with underlying MOHC gridded data. |
| **REQT-5.** | The DDP **must** provide a set of input/output, selection, extraction and statistical functions to enable the required interaction with the MOHC probabilistic datasets. |
| **REQT-6.** | The DDP **must** provide a visualisation suite that produces the required plot types and is capable of producing publication-quality plots. |
| **REQT-7.** | The DDP **must** provide adequate documentation, error-handling, logging, access control and reporting tools to facilitate improvement and analysis. |

## DDP Portal High Level Requirements

**REQT-8.** The DDP Portal **must** present a user interface that allows public access to the DDP functionality (as defined in the DDP API).

**REQT-9.** The DDP Portal **must** provide scientific and technical information to users as to guide their usage and interpretation of UKCIP08 products.

**REQT-10.** The DDP Portal **must** provide adequate documentation, error-handling, logging, access control and reporting tools to facilitate improvement and analysis.

### *Detailed Requirements*

The detailed requirements expand the high level requirements into a set of more specific sub-requirements. These are categorised as being general to the DDP or Portal-specific. The current split between general DDP requirements and Portal-specific requirements do not set down rules for where individual solutions must be implemented. In the final design it may be that some solutions are implemented in a different part of the system for efficiency or practicality. Such implementation issues should have no impact on the end user.

## DDP Detailed Requirements

**REQT-1.** The DDP **must** provide a clear set of methods (i.e. an Application Programmable Interface, or API) that can be called from external client applications. Initially, the DDP Portal will be the only client.

**REQT-1.1.** The DDP **must** provide a clearly defined API that only exposes the functionality to be made available to external applications.

**REQT-2.** The DDP **must** provide a clearly defined wrapper to the externally produced Weather Generator (WG) software. This **should** allow seamless transition of (i) MOHC data from the DDP into the WG and (ii) output data from the WG back into the DDP.

**REQT-2.1.** The DDP **must** provide an API to the WG functionality. The definition and development of this API involves collaboration between the two projects. The functionality must include configuration of WG jobs such as the selection of a random seed and run duration.

**REQT-2.2.** The DDP **must** provide access to WG output data for selection and download.

**REQT-2.3.** The DDP **must** allow sampling of probabilistic data as input to the WG based on guidance from MOHC and WG scientists.

**REQT-2.4.** The DDP **must** provide access to WG outputs on a daily time frequency.

**REQT-2.5.** The DDP **must** provide access to WG output on an hourly time frequency.

**REQT-2.6.** The DDP **must** provide some capability for the user to select the calculation of specific Derived Indices from WG output.

**REQT-2.7.** The DDP **should** provide additional functionality for post-processing WG output based on guidance from the MOHC, WG project and user feedback.

**REQT-3.** The DDP **must** provide a range of data outputs including probabilistic data, location-specific time series and gridded model output.

**REQT-3.1.** The DDP **must** provide access to MOHC UK probabilistic data for the key periods defined by the UKCIP08 Steering Group (i.e. 30 year-periods in the 21st century).

**REQT-3.2.** The DDP **must** provide access to the MOHC marine (sub-surface, storm surge and sea level rise) products.

**REQT-3.3.** The DDP **must** provide access to the MOHC marine air probabilistic outputs.

**REQT-3.4.** The DDP **must** provide access to MOHC probabilistic outputs on the following time frequencies:

- monthly
- seasonal
- annual

**REQT-3.5.** The DDP **must** output raw data products in an ASCII format (CSV [comma-separated variables] preferred).

**REQT-3.6.** The DDP **must** output raw data products in ESRI Shape file format where appropriate.

**REQT-3.7.** The DDP **must** output raw data products in NetCDF-CF file format.

**REQT-4.** The DDP **must** be able to interact with underlying MOHC gridded data.

**REQT-4.1.** The DDP **must** interface transparently to the software components provided by the LINK system and BADC core functionality.

**REQT-4.2.** The DDP **must** provide access to, or link to services that, deliver selections from 4D gridded model datasets (such as multi-level marine data).

**REQT-4.3.** The DDP **must** be able to manipulate the UKCIP02 (which will be identified as UKCIP08) gridded observational dataset to deliver absolute values in projections of climate variables.

**REQT-4.4.** The DDP **must** be able to handle the 25 x 25 km rotated grid used by some MOHC products.

**REQT-5.** The DDP **must** provide specific input/output, selection, extraction and statistical functions to enable the required interaction with the MOHC probabilistic datasets.

**REQT-5.1.** The DDP **must** be able read and interpret MOHC probabilistic data.

**REQT-5.2.** The DDP **must** be able to select user-specified subsets from MOHC probabilistic data, via:

- filtering criteria (e.g. variable, scenario etc.)
- appropriate sampling methods

**REQT-5.3.** The DDP **must** be able to calculate PDF distributions from the CDF probabilistic data provided by the MOHC.

**REQT-5.4.** The DDP **must** be able combine the MOHC probabilistic data with the UKCIP02 (to be known as UKCIP08) observational data.

**REQT-6.** The DDP **must** provide a visualisation suite that produces the required plot types and is capable of publication-quality plotting.

**REQT-6.1.** The DDP **must** provide graphs and maps of probabilistic data showing **climate change** for selected variables for a given time period, location, probability level and emissions scenario. For example, the change in maximum temperature for emission scenario A1B in the period 2050-2080 for a bounding box over Southern England at the 90% probability level compared to the baseline period (1961-1990).

**REQT-6.2.** The DDP **must** provide graphs and maps of probabilistic data showing the **absolute values** equivalent to those in REQT-6.1.

**REQT-6.3.** The DDP **must** provide image metadata along with image outputs that inform the user of the underlying request. This may be provided as annotations on the image and/or in a separate text file.

**REQT-6.4.** The DDP **must** provide plots of:

- Maps of climate change or absolute values
- Probability Density Functions (1 or more per graph)
- Cumulative Distribution Functions (1 or more per graph)
- Plume plot showing probability spread of change in 1 variable against time (showing set probability levels such as 10% 50%, 90%)
- Scatterplot of joint-probabilities of 2 variables

**REQT-6.5.** The DDP **must** provide a set of options that allow the user to alter the style and content of a given plot. For example:

- Selection of colour or greyscale
- Change of plot format
- Adjustment of axis limits (where appropriate)
- Change of Image size

**REQT-6.6.** Publication-quality versions of all dynamically generated plot types **must** be provided by the DDP.

**REQT-6.7.** The DDP **must** provide image products in the following formats:

- PNG
- Postscript
- Adobe PDF

**REQT-6.8.** The DDP **should** provide image products in the following formats:

- JPEG

**REQT-6.9.** Plots of probabilistic data for the UKCIP08 scenarios **should** include, where appropriate, an option of indicating what the UKCIP02 scenarios predicted.

**REQT-6.10.** Ideally the DDP plots **should** use consistent colour ramps. For each colour ramp the mapping of colour to value **should** always calibrated the same for a given variable (e.g. temperature at 25°c is always the same shade of orange).

**REQT-6.11.** The DDP **must** provide a "Print" button or an explanation of how to print from the Results page.

**REQT-7.** The DDP **must** provide adequate documentation, error-handling, logging, access control and reporting tools to facilitate improvement and analysis.

**REQT-7.1.** The DDP **must** provide appropriate documentation to enable installation, administration and usage.

**REQT-7.2.** The DDP **must** ensure that all errors are handled in a manner that is informative to users.

**REQT-7.3.** The DDP **must** be able to log all user extractions.

**REQT-7.4.** The DDP **must** provide the appropriate level of access control. This will be defined by the UKCIP08 Project Management Group.

**REQT-7.5.** The DDP **must** be able to report to users and the system administrator when extraction jobs have completed or failed.

## DDP Portal Detailed Requirements

**REQT-8.** The DDP Portal **must** present a user interface that allows public access to the DDP functionality (as defined in the DDP API).

**REQT-8.1.** The Portal **must** include a *Request Builder* component that allows the user to build up a DDP request (for dynamic data/images) based on a similar concept to that used in the test User Interface (see Figure 2).

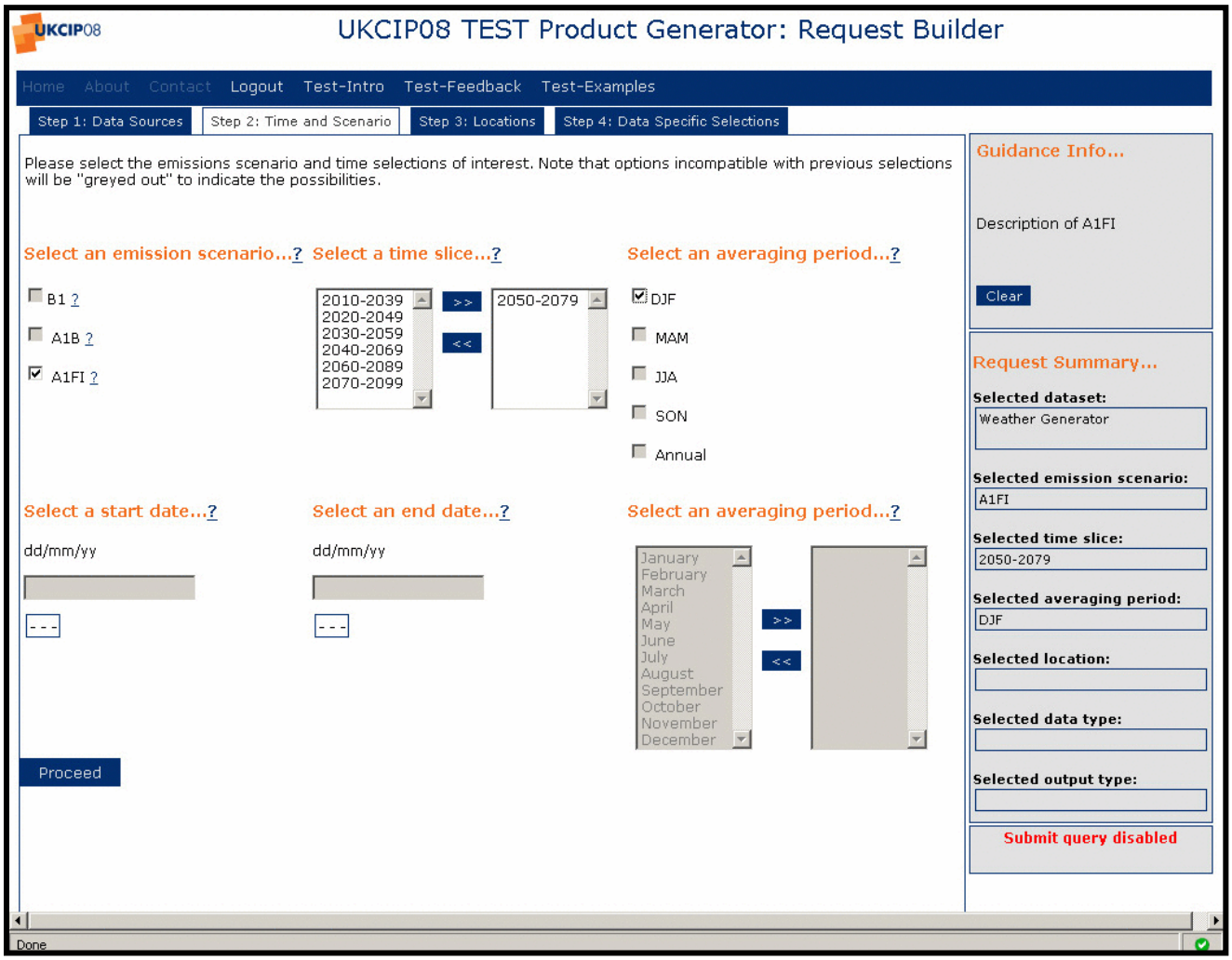


**Figure 2.** Example of Request Builder screenshot used in the test User Interface.

**REQT-8.2.** The Portal **must** evaluate the user request and return information including:

- the feasibility of granting the request,
- an indication of response time (since this is very difficult it may be more useful to indicate position in the queue or the degree of progress towards completion),
- the expected volume of output data,
- the consequences of a set of choices on further selection options and
- potential sources of further information.

**REQT-8.3.** The Portal **must** be able to resolve any inconsistencies in a user selection without displaying an error page. Users **must** be informed of any inconsistencies and provided with the opportunity to re-select a more appropriate option. Where single and/or multiple selections are available the reasons for these **must** be clearly indicated to the user.

**REQT-8.4.** The Portal **must** provide the user with the ability to set up a user request starting from the following selections:

- Data source
- Variable
- Location (for single land locations only)
- Output type (for a limited number of options)

**REQT-8.5.** When a user attempts to submit an incomplete selection the Portal **must** provide a method of clearly displaying which fields require completion (such as displaying in red).

**REQT-8.6.** The Portal **must** be able to accept pre-loaded requests. A pre-loaded request is a partially completed request that can be automatically populated on entry into the system from another web page (such as the UKCIP08 static web pages).

**REQT-8.7.** The Portal **must** provide a simple method of showing tool-tips and quick-help to users such as hovering over aspects of the interface.

**REQT-8.8.** The Portal **must** provide access to information about each of the individual options within a given selection object where appropriate (such as the definitions of each variable listed in a drop-down menu).

**REQT-8.9.** The Portal **must** work seamlessly with the static UKCIP08 website under development by UKCIP. This includes a single log-in and registration system across the two sites.

**REQT-8.10.** Spatial selections **must** be accessible via clickable map-interfaces such as in figure 3.

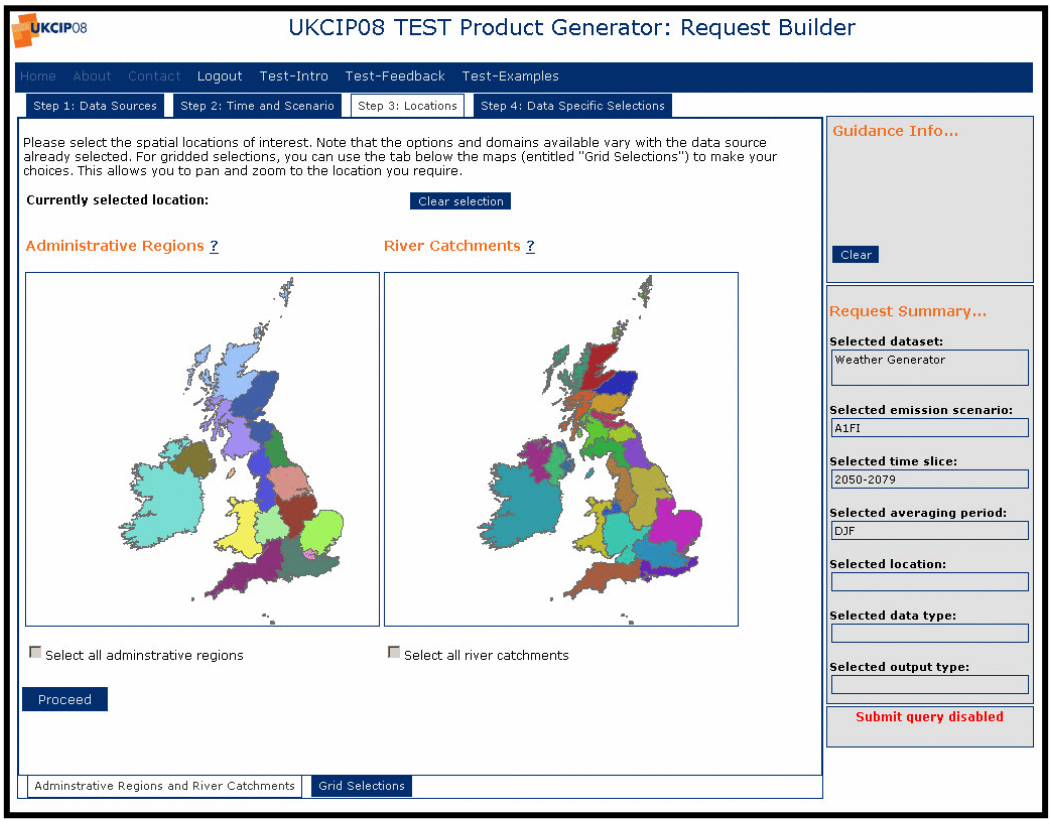


**Figure 3.** Example of clickable map-interface used in the test User Interface.

**REQT-8.11.** Spatial selections **must** be available via the categories agreed by the UKCIP08 Users' Panel (i.e. UKCIP08 "Regions", "River Basins" and 25 x 25 km Grid Boxes) for climate changes over land, and by MCCIP (Charting Progress Regional Reporting Areas, to be known as "Marine Regions") for a selection of climate variables for climate changes over the sea (see REQT-3.3).

**REQT-8.12.** The Portal **must** provide a gazetteer service that allows the mapping of latitude/longitude, Ordnance Survey coordinates, place name, or postcode to resolve a location.

**REQT-8.13.** The Portal **must** be designed to be fully visible on a display resolution 1024 x 768 pixels or greater.

**REQT-8.14.** The Portal **must** be functional on the following Internet Browsers:

- Microsoft Internet Explorer 6
- Microsoft Internet Explorer 7
- Mozilla Firefox
- Mac Safari

**REQT-8.15.** The Portal **should** be able to provide access to all selections to build a request on one page. This might not be a feasible due to the complexity of some request pathways.

**REQT-8.16.** The Portal **should** keep track of what the user has selected. Ideally a "my DDP" area would be appropriate but other options might be useful such as:

- Remembering the last request
- Checking if the user has any large requests running on the server
- Providing access to previous outputs

**REQT-8.17.** The Portal **should** allow users to save and retrieve their "favourite" selections/operations.

**REQT-8.18.** The Portal **should** provide fast-track access to certain tools and products for users who are familiar with the interface (e.g. a "run WeatherGenerator" link).

**REQT-8.19.** The Portal **should** provide the user with point-and-click access to the data values underlying graphs and maps. This **should** include re-submitting new parameters to the visualisation engine for re-rendering.

**REQT-8.20.** The Portal **must** provide links to the Regional Climate Model (HadRM3-PPE) data held in the Climate Impacts LINK Project archive and the UKCIP08 Observational data provided via the Met Office web site.

**REQT-9.** The DDP Portal **must** provide scientific and technical information to users as to guide their usage and interpretation of UKCIP08 products.

**REQT-9.1.** The Portal **must** present the user with a set of clear options that enable the creation, and execution, of a specific data request.

**REQT-9.2.** The Portal **must** provide scientific and technical information relating to each selection that can be made by the user.

**REQT-9.3.** The Portal **must** link, ideally bi-directionally, to case studies that show examples of how it can be used.

**REQT-9.4.** The Portal **must** provide access to a UKCIP08 site map.

**REQT-9.5.** The Portal **must** provide access to the UKCIP08 Glossary.

**REQT-9.6.** The Portal **must** provide access to a set of Frequently Asked Questions (FAQs) for UKCIP08.

**REQT-9.7.** The Portal **must** interface seamlessly with the other UKCIP08 documentation (including the User Guidance and Scientific Reports).

**REQT-9.8.** The Portal **must** provide a clear description and comparison of the different data types (land/marine, Probabilistic/WG).

**REQT-9.9.** The Portal **must** allow users to submit an enquiry to the Help Desk via a web form or e-mail at any time.

**REQT-10.** The DDP Portal **must** provide adequate documentation, error-handling, logging, access control and reporting tools to facilitate improvement and analysis.

**REQT-10.1.** The DDP Portal **must** provide appropriate documentation to enable installation, administration and usage.

**REQT-10.2.** The DDP Portal **must** ensure that all errors are handled in a manner that is informative to users.

**REQT-10.3.** The DDP Portal **must** be able to log all user extractions.

**REQT-10.4.** The DDP Portal **must** provide the appropriate level of access control.

**REQT-10.5.** The DDP Portal **must** be able to report to users and the system administrator when extraction jobs have completed or failed.

## Additional Desirables of a lower priority

The following list identifies further DDP functionality that is desirable but of low priority.

**DES-1** The Portal **could** allow users to somehow save their specific grid box selections, thereby making them easy to re-use and to locate.

## Out of Scope

The following list identifies further DDP functionality that is desirable but not feasible within the current contract.

**OUT-1** The Portal **will not** provide services for interrogating, sub-setting and manipulating observational datasets used within the DDP.

**OUT-2** The MOHC Regional Climate Model (HadRM3-PPE) ensemble runs used to inform the MOHC probabilistic projections **will not** be available as part of the UKCIP08

site (but will be placed under the LINK site).

## References

1. **UKCIP08 User Interface Questionnaire Results**. BADC (2007):
http://proj.badc.rl.ac.uk/dcip/attachment/wiki/UkcipDdp/Docs/ddp_user_questionnaire_results_v1.0.pdf
. Results document from first Users' Panel questionnaire.

2. **UKCIP User Interface Workshop Outcomes.** UKCIP/BADC (2007):
http://www.ukcip.org.uk/scenarios/ukcip08/userspanel/documents/RichardLambandAgStephens-20070926-v07b-full.pdf . Detailed results and responses to UKCIP08 User Interface test version questionnaire - Richard Lamb (UKCIP) and Ag Stephens (BADC).