

# The Changing Water Cycle Programme

## Implementation Plan (2009-2014)



### 1. Introduction

This *Implementation Plan* details the method of execution of the *Changing Water Cycle Research Programme*, the science of which is laid out in the Research Programme's *Science Plan*. This plan describes the implementation of the main Deliverables in the 5 year research programme and the mechanisms for exploitation of the knowledge gained in these areas to inform policy and societal need for a greater understanding of the implications of the changing water cycle and its impact on the Earth system.

The Implementation Plan is a living document which will be periodically updated to address programme delivery issues such as on-going liaison between projects, science meetings, reporting and general programme coordination activities.

### 2. The Research Programme's Goals

1. To develop an integrated, quantitative understanding of the changes taking place in the global water cycle, involving all components of the earth system – the atmosphere, ocean, land surface and geosphere, cryosphere and biosphere.
2. To improve predictions for the next few decades of regional precipitation, evapotranspiration, soil moisture, hydrological storage and fluxes, focusing on the requirement to quantify and narrow the uncertainty in predictions.
3. To understand how local to regional scale hydrological and biogeochemical processes are responding and will respond to changing climate and land use, together with their consequent impacts on the sustainable use of soil and water.
4. To understand the consequences of the changing water cycle for water-related natural hazards, including floods and droughts, and to improve prediction and mitigation of these hazards.

### 3. Delivering the Research Programme

The above programme Goals will be achieved via four linked Science Themes. These four themes are set out in detail in the programme Science Plan. The science will be delivered through funded interdisciplinary, cross-theme projects, funded cross-theme Working Groups (one per programme Goal) and through science coordination and programme management activities such as targeted knowledge exchange and outreach activities.

The four science themes are:

1. **Land-Ocean-Atmosphere Interactions:** Understanding how feedbacks within the water cycle directly affect hydrological stores and fluxes.

- 2. Precipitation:** Improve our understanding, observations, modelling and prediction of ongoing and future changes in precipitation and evaporation, their variability and impacts, from global to regional and local scales.
- 3. Detection and Attribution:** To quantify and understand causes of changes in water cycle components over periods of record; and to use this understanding to work towards delivering robust prediction of changes in water cycle components.
- 4. Consequences of the changing water cycle:** The implication of change in climate and land use for the assessment of water related hazards to and effects on human and natural systems.

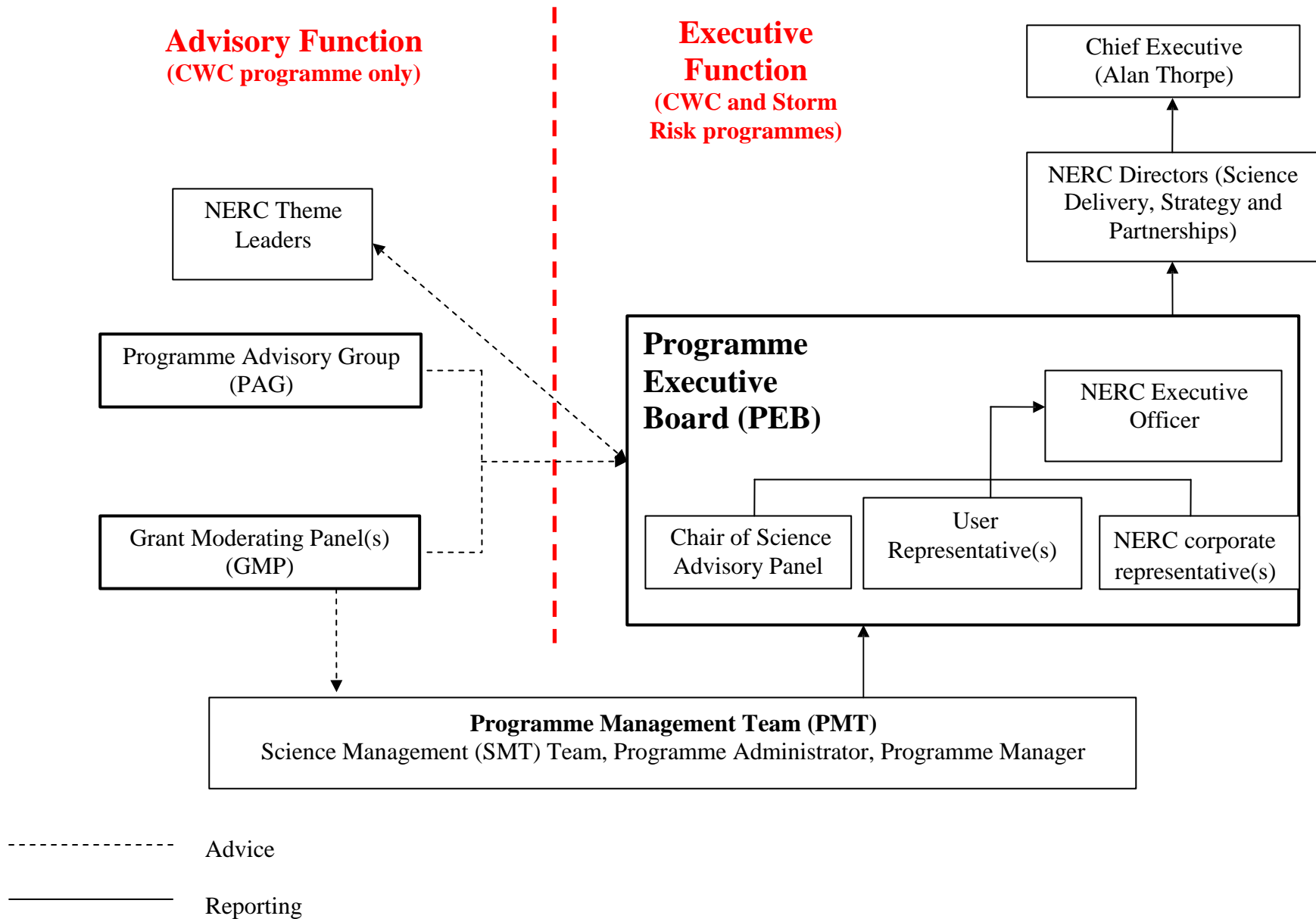
The programme will be delivered via two main grant rounds (see Sections 5.2-5.5) addressing cross-theme and cross-goal projects. To foster cross-theme working and delivery against the programme goals, cross-Theme Working Groups (see Section 5.3) will be funded to promote integration and ensure delivery of the programme aims. These groups will act with the remit to take forward integration and synthesis of the outputs from the theme-based research projects in order to deliver the outcomes specified by the programme's Goals. Funded science project participants will be required to participate in these working groups, which will also include relevant stakeholders (see Section 5.3). Thus, theme grants will deliver specific science outputs for the programme and, working collectively through the Working Groups, will ensure delivery of the programme's goals and outcomes.

#### **4. Programme Management**

Figure 1 provides a map of the inter-relationships between the different elements of the programme management structure. The roles and responsibilities of these groups are detailed below (p.3).

The management of the Changing Water Cycle programme will be combined, in part, with that of the NERC 'Storm Risk Mitigation' programme. The Executive Function will be shared, with a single Programme Executive Board (PEB) that includes representatives from the partners of both programmes. The two Programmes' Advisory Groups will be separate but have common representation via at least one member. The Programme and Science Management Teams will be shared, running both programmes.

**Figure 1: CWC Programme Governance Structure**



#### **4.1 Programme Executive Board (PEB)**

The *Changing Water Cycle Programme* will be managed by NERC Swindon Office. The PEB will be chaired by NERC and include the chair of the Programme Advisory Group and a representative of any co-funders and stakeholder/user groups.

#### **4.2 Programme Advisory Group (PAG)**

A Programme Advisory Group (PAG) will advise the PEB on the delivery of the *CWC Programme*. The PAG will consist of national and international experts, including representation from end users and some original members of the Science Plan Writing Group. It will be chaired by a scientist familiar with the *CWC Programme* and the operations of NERC. The PAG will work closely with the Science Management Team, and the Programme Administrator. The PAG will be appointed by NERC by Q4 2009/10.

The **key responsibilities** of the PAG (working with the SMT) will be to:

- f* advise on all aspects of the Changing Water Cycle programme to ensure that the scientific issues identified in the Science Plan are being addressed
- f* monitor and advise on the progress of projects against programme objectives as necessary to ensure delivery of the Changing Water Cycle programme
- f* identify the key results and messages from the programme to convey to the user community
- f* advise on managing the risks to the programme

Members of the PAG may also participate in Grant Moderating Panels, along with other independent experts (including members of the NERC Peer Review College) to evaluate the proposals and make funding recommendations to NERC

#### **4.3 Grant Moderating Panel (GMP)**

A Grant Moderating Panel (GMP) will have the responsibility of assessing research proposals, both in terms of quality of proposed science and their ability to deliver the requirements of the *Changing Water Cycle Programme*. It will consist of national and international experts in the field, representatives nominated by any co-funders and at least one member of the NERC Peer Review College. These assessments will inform the PEB's decisions on the award of funding to deliver the programmes objectives.

#### **4.4 Programme Management Team (PMT)**

There will be three important processes involved in programme management: that of science co-ordination, knowledge exchange co-ordination and programme administration, and these roles will work closely together to provide effective management of the programme. The PMT will include a programme administrator who will be based at the NERC Swindon Office and will be responsible for overseeing the administrative aspects of the programme: administering the grants process, and overseeing the SMT (see Section 4.5).

#### **4.5 Science Management Team (SMT)**

The SMT will be commissioned at the level of up to 2 FTE (one lead plus support function) in the initial phase of the programme; that is, until the two main Announcements of Opportunity are published and allocated funds awarded. Thereafter the PEB will review and recommend the level of effort required for the post. The SMT will be responsible for the day-to-day management and coordination of the programme, working closely with the Programme Administrator based in the Swindon Office. Both will report to the NERC Executive Officer, also based in the Swindon Office.

The SMT will continue to develop the implementation plan (this document), plus a data management plan. The SMT will also be responsible for the development and implementation of the Knowledge Exchange Plan and resourced to deliver it. They will collaborate with all scientists in the programme in the coordination of KE and liaise closely with users and stakeholders to ensure the successful delivery of the KE plan.

The SMT will work to ensure coordination between the different science components of the Changing Water Cycle programme. In addition, the SMT will also take responsibility for the coordination and management of the NERC [Storm Risk Programme](#) and integration between the common elements and groups of the two programmes.

The SMT will organise annual meetings, as well as workshops to facilitate interaction across the programme. The SMT, together with the Programme administrator, will administer the awards process, feeding back information to unsuccessful candidates and, where necessary, negotiating modifications to the work plan and/or finances of successful applications.

The SMT will also be responsible for the monitoring and reporting on behalf of the whole programme, including annual reporting and the completion of output performance measures (OPMs). In addition, the SMT will maintain an overview of the scientific progress made against the programme's goals and objectives. An important activity in this regard will be facilitation and support of the cross-theme Working Groups. The SMT will liaise with all programme participants, facilitate the development of the community and develop the links between this programme and international collaborators.

The SMT will act as secretariat for the PAG and PEB, arranging meetings, setting agendas, taking minutes and actions, and overseeing completion of actions in a timely manner.

The SMT will be responsible for the maintenance of the Changing Water Cycle and Storm Risk web sites. It is anticipated that the research highlights from the programmes will be included on the web sites.

A sum of money (sufficient for 1 FTE) will be kept back to fund integration and synthesis activities over the course of the programme. The details of how this synthesis role will work will be decided by the PEB with advice from the cross-theme Working Groups and the PAG as the programme develops, but may be achieved through an extension of the SMT's role.

The SMT will be appointed by NERC by the end of 2009.

#### ***4.6 Open call component***

The open call component of the Changing Water Cycle Programme (including science grants and cross-theme working groups) will be overseen by the PMT and projects will report regularly (on a schedule to be determined, but at least once a year) on progress through NERC's Reporting and Outputs Database.

#### ***4.7 Risk management***

The PAG, together with the SMT, will be responsible for managing the risks to the overall programme. In the event that a project develops a problem with delivery that cannot be solved by the PI and his or her team, the SMT and/or members of the PAG will, at the request of the PEB, discuss options with the PI for how these can be addressed to ensure the delivery of the science over the lifetime of the programme.

## 5. Programme Activities

### 5.1 Programme Timeline

	FY09 Q3	FY 09 Q4	FY 10 Q1	FY10 Q2	FY10 Q3	FY10 Q4	FY 11 Q1
AO Round 1							
Science Management Group and Programme Advisory Group in place							
AO Workshop India							
Workshop UK							
Deadline Round 1							
Workshop – UK PIs							
AO Round 2							
AO S. Asia collaborative funding Round							
Outline Bid deadline Round 2							
Deadline Round 2							

### 5.2 Round One

To deliver the themed research, an open ‘Research Programme’ Announcement of Opportunity will be made for proposals to address the themes/sub-theme questions. A workshop will be held on 3<sup>rd</sup> February 2010 to address the scope of the programme, the call for projects and allow those intending to submit proposals to get together, form collaborations, discuss ideas with NERC and CWC Programme Advisory Group representatives and formulate multidisciplinary links. Attendance at the workshop will not be a prerequisite for proposal submission, nor guarantee funding.

The full proposals will be internationally peer-reviewed and final funding recommendations made by a moderating panel, consisting of a sub-set of members from the Programme Advisory Group (PAG) plus independent experts. Depending on the number of proposals received, there may be a sifting stage where the top proportion will be invited to the moderation panel stage. PIs will be given the opportunity to provide a written response to Peer Reviewer feedback prior to the moderation panel. Final funding recommendations will be made by a Grant Moderating Panel (GMP). PAG members and others directly involved in proposals being considered will be excluded from sitting on the GMP to avoid vested interest issues. It is anticipated that funded proposals would start by early 2011.

It is anticipated that around four or five projects will be funded with the £5m budget for Round One. Projects will be encouraged to be inter-disciplinary, cutting across more than one theme (/set of sub-themes) and potentially addressing more than one programme goal. Projects will also be brought together by the programme coordinating body and the cross-theme Working Groups following the awarding of funds. ANNEX 1 provides an overview of the cross-cutting deliverables. Projects should address issues related to the geographical focus set out in the programme Science Plan (South Asia-focused projects will be invited separately, see Section 3.3). Awards made by NERC will have conditions attached that

ensure that the funded projects contribute in a timely manner to the CWC deliverables. Specifically, funded proposals will be up to 3 years in duration unless cases for different durations are given and accepted by the GMP, and awardees will be expected to participate in the relevant cross-theme Working Group (see Section 5.3).

Applications must include an Impact Plan which, amongst other issues, could relate the work being done in the project to societal impact, policy-related outcomes and KE coordination and management. Applicants should form links with relevant users in order to maximise the effective transfer of project outputs. The Impact Plan can also indicate any added value made to the project through collaboration and alignment with other UK and International activities.

International collaborations and partnership funding will be encouraged and should be explored and developed prior to proposal submission (n.b. international collaborators will benefit from access to data, but will not receive NERC funding). Sections 5 and 6 of the Science Plan provide further information on potential for collaboration and alignment.

Projects funded will be expected to:

- f* comply with standard NERC reporting requirements
- f* contribute to the programme's *Knowledge Exchange* activities as defined in the programme KE Plan
- f* comply with the programme's media policy
- f* comply with the programme's data management policy (sufficient budget (ca.5%) should be written into projects for this)
- f* collaborate with other participants in the *Changing Water Cycle Programme (at least in part via cross-theme Working Groups – Section 5.3)*
- f* identify collaborations with other national and international programmes where appropriate.
- f* include milestones and deliverables to ensure the science outputs are delivered effectively

Round One will adhere to the following timetable:

Dec 2009	Announcement of opportunity
3 <sup>rd</sup> Feb 2010	Workshop
April 8 <sup>th</sup> 2010	Full bid deadline
July 2010	Panel meeting

Following the award of projects, a workshop will be held to bring all the PIs together, coordinate activities and build the basis of the cross-theme Working Groups. Attendance from project PIs will be compulsory. The workshop will:

- f* give PIs a chance to present their project plans;
- f* enable the CWC programme advisory board and science management group (see Section 8) to advise on links between projects;
- f* start to identify additional programme activities that would complement and build on the awarded projects;
- f* through all of the above, build the basis of cross-theme Working Groups and define their activities for which additional programme funding will be made available.

### **5.3 Cross-Theme Working Groups**

To foster cross-theme working and ensure delivery of the main interdisciplinary programme goals, cross-theme Working Groups will be funded to promote integration across all programme funded projects.

The cross-theme working groups will include all relevant project awardees, but will also be open to relevant stakeholders and key national and international experts outside the CWC programme (at the discretion of the working group). NERC (and other funders) already support a significant amount of research relevant to the Changing Water Cycle programme, through both National Capability and Responsive Mode, as well as other Research Programmes. The cross-theme Working Groups will provide a mechanism for bringing these various research efforts together under the same umbrella, enhancing the information, knowledge and resources available to both. These groups are also envisaged as a way of bringing stakeholders and end users into the programme from the start to aid in the LWEC philosophy of co-design, co-production and co-delivery and to fully integrate across programme activities, working towards the four high-level programme goals.

The basis for the Working Groups will be established at the workshop for awardees following the confirmation of funded programme science projects. Funded science project participants will be required to participate in these groups. Thus, theme grants will deliver specific science outputs for the programme; working collectively through the Working Groups, they will ensure delivery of the programme's goals and outcomes. Funds will be available for the Working Group activities and the groups will be expected to bid for these funds by outlining the activities they will undertake and the added value they will bring in delivering the programme in an interdisciplinary and coordinated way.

### **5.4 Round Two**

*AO Published: 2010/11*

Round Two will have two parallel opportunities:

- 1) Projects to address outstanding gaps that remain in the delivery of the Science Plan following award of grants from Rounds One. The AO will necessarily be more directed and specific in the projects it invites. *Approx. Budget: £2.0 – £2.5M.*
- 2) Projects to address the regional-focus of South Asia. *Approx. Budget: £2.0 - £2.5M.*

Funding up to a matched amount is being secured for activity directed at South Asia through RCUK India from the Indian Department of Science and Technology and/or the Indian Ministry of Earth Sciences. RCUK India has issued a call for tenders for a short mapping project on water-related research in India. This will be delivered by Spring 2010 and will better inform the UK as to the relevant activities in India and where to go to pursue collaboration.

For the South Asia focussed funding stream of Round Two, partnerships with Indian researchers will be required. Projects will be expected to address regional issues (particularly those tackling issues directly relevant to the Indo-Gangetic Plain catchment) that fit within the programme's global context, whilst still addressing the CWC research themes; for example, projects reflecting the global research activity on monsoons (within CLIVAR and



GEWEX), the need to understand the potential teleconnections of the Indian Monsoon and weather patterns in Northern Europe and the influence of Himalayan glacial meltwater variation on South Asian water supply.

The UK Changing Water Cycle Programme will hold a joint workshop with RCUK India (including potential ESPA-aligned elements) in February 2010 to bring the communities together, with funding then available downstream for resulting projects. An open, but strategically focused Expression of Interest call will be issued for 10-15 participants to attend the workshop in February 2010. Applicants for the workshop will have to outline their relevant area of expertise, any current overseas collaborations and links, their personal rationale for being involved in the workshop and in what area they would submit a collaborative research proposal in line with the AO for collaborative research proposals.

Attendance at the workshop does not automatically enable project bids to be submitted or guarantee funding. Conversely, absence from the workshop does not preclude bidding into the subsequent round. The workshop will facilitate networking, relevant discussion and enable researchers to share ideas on key research questions relevant to both countries.

#### **Round Two Assessment Process:**

The two fundings streams for Round Two will be assessed separately, but both will involve an Outline Bid stage whereby applicants will submit a 2-side concept note outlining:

- Type of proposal
- Title of proposal
- List of participants including, as appropriate: lead institution, eligible partners, other partners, actual and expected
- Scientific objectives and deliverables
- Other objectives and deliverables if relevant, for example: training, capability development, facilities, products, exploitation, dissemination, user uptake
- Outline of research proposed
- Funding sought from NERC
- Co-funding (proposed and secured).

The concept notes will be evaluated by an assessment panel (including representatives from the PAG) according to set criteria which will be fully defined in the AO, but particularly focusing on fit to call. Invited applicants will then submit full bids which will be evaluated in line with the process detailed in Section 3.1: Full proposals will be internationally peer reviewed and the PIs enabled to respond to the peer review comments before being moderated by a final Grants Moderating Panel. This panel will include independent experts as well as members of the Changing Water Cycle PAG. The assessment criterion of 'fit to call' will be strictly adhered to in Round Two and applications may be rejected on the basis of not addressing the specific questions/issues detailed in the Announcement of Opportunity.

Representatives from the projects funded under Round Two will then join the relevant cross-theme Working Groups to continue to interlink activities and outputs.

## **6. Science Plan**

The *Science Plan* for the *Changing Water Cycle Programme* is available as a separate document on the NERC website and should be read prior to submitting a proposal.

## **7. Partnerships and Collaboration**

Collaborations between UK scientists, research institutions, disciplines and other national and European programmes will be strongly encouraged, where appropriate, in order to deliver more effectively the UK programme's *Goals and Themes*.

Partnership funding to enable collaborations between UK and Indian researchers is being secured via RCUK. A figure of ~£2M, to match a similar contribution from the CWC programme, is proposed over the lifetime of the programme through the Indian Dept of Science and Technology (similar remit/funding mechanisms to a Research Council), the more strategic, 'top-down' funding of the Indian Ministry of Earth Sciences and also RCUK India themselves.

Other partnerships will be sought, particularly from relevant UK governmental departments (Defra, DFID) providing both direct funding and in kind contributions. The Changing Water Cycle is a *Living With Environmental Change* (LWEC) accredited programme.

## **8. Knowledge Exchange**

The main aim for Knowledge Exchange (KE) in the *Changing Water Cycle Programme* will be to facilitate the communication and application of the science delivered from this programme to a variety of users including policy makers and industry (e.g. water and insurance). This will be achieved through various activities coordinated by the SMT; for example, policy placements within Government Departments and production of policy relevant information such as updates, briefings and summaries. Each Cross-theme Working Group will be encouraged to have a KE strand to their activities. Other key KE activities will include:

- f* Engagement with the relevant referenced user groups of key stakeholders from the inception of the programme (RCUK India, EA, Defra, DFID, etc.). This will be used as a mechanism to ensure the relevance, user-friendliness and outreach of the research delivered from this programme throughout its lifetime.
- f* Development of a media policy, press releases and media activities.

A Knowledge Exchange plan will be developed as part of the role of the SMT, who will work closely with users, stakeholders and partners to ensure the successful implementation of activities.

## **9. Data management**

NERC requires that research programmes implement a data management scheme which covers practical arrangements during the programme and subsequent long-term availability of the data set. In line with the NERC data policy (<http://www.nerc.ac.uk/research/sites/data/policy/>) the data from the Programme will be lodged with the appropriate NERC Designated Data Centre.

NERC puts an obligation upon PIs to ensure that data management is undertaken in a suitable way. A well structured identification system is essential for data collection and experimental sample labelling. The SMT will assist the PIs with the overall data management and a NERC Data Centre representative can be available to attend grant management meetings as required.

Individual proposals should state data collection plans, staff responsibilities and data quality. Sufficient budget for this (suggested ca.5%) should be written in to grant applications. The funded project PIs (with assistance/guidance from the SMT and Programme Executive

Board) will be responsible for agreeing the Programme's data management plan with the data centres and overseeing data management, including regular meetings with, and annual reporting by, the data centres. They will also negotiate a data management policy between collaborating nations, when appropriate. To raise the profile of the *CWC Programme* and that of the funders, there will be a requirement on all scientists who use the data and/or products to acknowledge the Research Programme, NERC and other co-funders in all presentations, papers, publications, etc.

**Annex A:** This table identifies how each of the four programme themes can deliver against each of the programme goals, within the context of the 5-year programme.

<b>Programme Goal</b>	<b>Theme 1</b>	<b>Theme 2</b>	<b>Theme 3</b>	<b>Theme 4</b>
To develop an integrated, quantitative understanding of the changes taking place in the global water cycle, involving all components of the earth system – the atmosphere, ocean, land surface and geosphere, cryosphere and biosphere	Understand feedbacks associated with increasing CO <sub>2</sub> , changing soil moisture patterns and ocean properties (impacting on atmospheric water vapour)	Evaluation of current P/E datasets.  Understanding P-forming physical processes (to improve model parameterisation)  Role of large-scale circulation in $\delta P/E$	Identification and understanding of changes in all components of the water cycle over last century	Developing knowledge of how the consequences of changes in the water cycle impact on other earth system components
To improve predictions for the next few decades of regional precipitation (P), evapotranspiration, soil moisture, hydrological storage and fluxes, focusing on the requirement to quantify and narrow the uncertainty in predictions.	Improved representation of appropriate feedbacks in models	Quantification of role of P in uncertainty	Provision of evaluation methods of model (climate, hydrological) hind-casts. Provision of guidance on future reliable extrapolations.	Predict changes in soil and groundwater flow quantity and paths, soil moisture and groundwater storage patterns, agricultural impacts and coupled feedbacks
To understand how local to regional scale hydrological and biogeochemical processes are responding and will respond to changing climate and land use, together with their consequent impacts on the sustainable use of soil and water.	Improved understanding of feedbacks will underpin better assessment of response and interaction of biogeochemical cycles to future changes, leading to improved assessments of impacts and possible adaptation strategies.	Assessment of influence of P via coupling atmospheric to land/biogeochemical models; varying complexity/scale	Water cycle responses to changing climate, land cover, land/water management and sustainable use of soil and water resource.	Soil structure and chemistry impacts, flow paths in soil/groundwater, changes weathering, erosion, nutrient cycles, water quality. How these might amplify local and regional climate change impacts.
To understand the consequences of the changing water cycle for water-related natural hazards, including floods and droughts, and to improve prediction and mitigation of these hazards	Improved understanding of conditions which lead to the persistence of regional precipitation anomalies (in particular, the persistence of droughts)	Understanding flood/drought cycles	Provision of more accurate uncertainty estimations (and spatial and temporal variation) to inform process/model predictions	Flood and drought impacts, water quality hazards, ground stability, wildfire susceptibility, soil erosion, critical thresholds in water-related environmental processes with major consequences, rapid responses, early warning systems