

Climate Services Science: Capacity Scoping Workshop

Egrove Park, Oxford

03-04 November 2011

Purpose: To bring together a community of users and researchers that are interested in contributing to knowledge and practices related to the provision of climate services, to inform decision making (vulnerability, risks and adaptation), and to explore the nature and scope of research and other activities that are needed to develop and deliver credible and relevant climate services.

Participants: Representatives of users of climate information, of producers and purveyors of climate information, of the climate impacts, risks and adaptation research community, and of related social sciences that underpin the development and delivery of climate services to inform decision making.

Objectives:

- Develop a common understanding of the nature and scope of 'climate services science' and shared terminology.
- Develop a common view of the landscape of 'climate services science' from research to users that exists and that is needed (identify strengths and gaps). Who are the players (researchers, government departments/agencies, other providers, and users)? What are key nodes?
- Develop an understanding of the structures and mechanisms needed to support and build momentum within this landscape of 'climate services science'.
- Identify knowledge gaps and broad areas of users' needs and research that is required.
- Begin to develop a multi-disciplinary research (natural, physical and social sciences) research community with an engaged user community (capable of working together to develop and deliver 'climate services' to inform decision making).

Outcomes of workshop:

Understanding of what is and is not included.

It was recognised that reaching an agreed definition of climate services and climate services science would require some further considerations and the engagement of others. The workshop discussions did provide an opportunity for participants to voice their views. This included:

Climate services – climate information and expertise/knowledge to support/inform decisions and policy-making processes. Climate services involve more than just providing descriptions of the climate as there is a need to support 'climate smart' decision-making and this is not just about provision of products, but also includes providing and sharing knowledge and expertise. Participants also noted that:

- There is a spectrum of information and knowledge required to support the targeted decision-making processes (e.g., information on climate, socio-economics, land-use, risk, vulnerability and adaptation). Need for further consideration as to what is included under climate services (e.g., is adaptation information included?).
- There is a spectrum of services that could be included from generic (e.g., observations, forecasts and future climate information that is freely available) to bespoke services

(tailored to meet specific needs). Need to understand where the UK is going in terms of providing climate services and where is/should be the dividing line between freely available and bespoke climate services).

Climate services science – generating and communicating knowledge and practices to support development and provision / delivery of climate services, including that related to:

- Utility (relevance) of climate services;
- Enhancing accessibility;
- Knowledge Exchange; and
- Understanding of what is needed to support climate services in the UK recognising the links to international services and sciences.

The following areas were suggested as being in or out of scope of climate services science:

| Suggested as being included | Suggested as being out of scope |
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| How information is developed for use by decision makers; what services are needed; how should climate services be presented; how to improve the relevance of climate services; and how to engage and communicate with the various communities involved? How are decisions made using climate (and other) services, including recognising that knowledge and information needs of decision makers and researchers vary? | Fundamental climate science, including that directed at reducing uncertainties |
| Making climate services politically neutral | Climate impacts, vulnerability and risk research |
| Provision of decision-relevant information about uncertainty and its role in decision making | Assessments of the accuracy of climate predictions |
| How to better support (establish and maintain) co-creation of climate services | Not just about climate scientists and much more than simply more joined up thinking |
| Research frameworks for decision making and how climate information can be input into these frameworks | |
| Understanding users perspectives of information and their climate services needs | |
| Supporting users needs through the provision of information at different temporal and spatial scales and in different formats | |
| What defines/determines a 'good' climate service? | |

Identification of an appropriate term for 'climate services science' around which the community can rally - No alternative term was identified during the workshop

Identification of where there are gaps in the knowledge/evidence base

Information and support gaps identified during the workshop included:

- Structure, coordination and clarity of purpose of climate services and delivery of those services

- Lack of connectivity with many groups working independently – do we need ‘person’ between / working with the providers and users?
 - Driven by availability of funding and link to the culture of research and funding
- Awareness of users’/decision makers needs’ and of what climate services are providing and can provide
 - Big gap between climate information that is provided and information users need
 - Information and knowledge gap between observations, forecasts, and climate scenarios and projections
 - Assessing which is an appropriate source of information – moving from using what they know/think is available rather than what they need (using what is available in the time they have to act)
 - Where to go for, and how to access, credible and reliable climate information
- Capacity for and means of reviewing climate services that are available (where does responsibility reside?)
 - Standards, quality control, quality assurance of climate services – quality stamp for good advice (for consultants, universities, etc.)
 - Standards for data, metadata and technical interfaces
 - Approved sources of information in one place – signpost to smaller number of places
 - Legal liability and climate service provision
- How to put users at the heart of climate services and climate services science (level of engagement necessary)
 - Availability of funding to support coproduction, capacity builders and stakeholder engagement – focus of knowledge exchange more on communications and dissemination than on coproduction.
- Language barriers – knowledge providers and end users live in different worlds
- Uncertainty in decision making – perception that uncertainty is a barrier
- Relatively low priority of climate considerations in many decision making processes
 - Limited pull from users for climate information
 - Lack of awareness among potential end-users of the climate issue in the context of their decisions – not seen as an urgent/important question.
 - A lack of policy (or even regulatory?) drivers for users to consider climate in decisions
- Limited understanding of the climate services market
 - What is the nature of the market, including emerging markets?
 - How to market climate services into decisions that require, but currently do not include climate information?
 - Who are purveyors of climate information? No (limited or relatively limited) purveyor coordination – is this needed?
 - Understanding and defining freely available and bespoke climate services.
 - Evidence-based communication strategies to support market development.
- Climate science community ability to support climate services
 - Ability of climate science community to deal with/address user needs
 - Model developers do not necessarily focus on improving user-relevant climate information
 - Availability of funding to support climate science to improve climate services

Means of addressing the identified gaps

- Climate science capacity gap – users need to be better coordinated to bring needs forward to climate science

- Need for demonstration projects/programmes/activities that
 - Bridge gaps between providers and users
 - Demonstrate how existing and new climate information can improve decision-making
- Development and dissemination of best practice guidance – how do we do it?
 - Learn from research projects where a research question is posed and the necessary multi-disciplinary research team is assembled
 - Use ARCC model for research calls (end-user engagement), including having individuals with overview who can integrate across sectors of research community
- Incorporation of the best practices from communication and decision-making science into climate service provision/activities
- Climate services research and funding
 - Does climate service science need a funding pot dedicated to cross-research council science?
 - Need for funding research that is interdisciplinary (e.g. economics / natural / social science)
 - Connections among research areas needed to support climate services – need for mechanisms to bring different disciplines together and to inform them of knowledge gaps. Recognises that the required research may fall between the remit of the research councils – challenge for LWEC?
 - BIS to define potential for multi-disciplinary research (and get research channels working together).
 - Mechanism to allow/enable research councils to work together – on interdisciplinary research
- Registries of climate services activities, results, portfolios and quality

Insight into user requirements for climate services (policy, business, NGO) and what is driving the demand towards developing and delivering credible and relevant climate services

Expressed needs for climate services:

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| Different users have different needs, cannot assume a uniform users' community. Climate data and information presented with needs of different audiences in mind (e.g., planners, politicians, policy makers, decision makers, engineers, natural scientists or social scientists) | Driven by an awareness of end-to-end users' needs. Co-production of services |
| Fora for discussion with other users – enable users to share experiences | Ability to map climate information along with other sources of spatial information relevant to users' decisions |
| Partnerships between providers and end-users are vital – information supply chain | Information on what the climate information means for me / my organisation / business objectives |
| Descriptions of climate are necessary, but insufficient – require decision-relevant information that can support adaptation decision-making | Reliable baseline information on current climate and hazards (e.g., rainfall for FEH-type capability, drought atlas, rainfall and temperature daily data) |
| Flexibility required in how climate information is | Future information (e.g., true extremes, 10-year |

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| presented and can be used. Ability to interrogate the information in a variety of ways depending on the user's objectives | events and longer, spatial and joint dependence between variables, end-user derived variables and derived metrics, annual maximum rainfall (daily and hourly), monthly/seasonal rainfall with inter-annual variability, wind, solar energy, heat wave and cold wave) |
| Ability to integrate climate information from a number of different sources. | Ability to access climate information via existing channels – not needing to be part of an exclusive community |
| Clear, simple and understandable (hierarchical) information – access to what is needed not just what is available | Users may not know what they want/need at the start of the engagement process |
| Easily accessible services with information available at various scales (local to global), variety of time scales, clearly identified uncertainties – common platform for data and information (including images) | Mode of delivery – tailoring services from end-users' perspectives, time series not just PDF, web-based, apps for PDAs |
| Accompanying documentation, training and guidance | User forum – web-based, user-provider engagement |
| Decision-relevant information on uncertainty and likelihood – enables a risk management approach | Climate summaries and trends related to known thresholds, variability and extremes for UK (and Europe) – related to requirements to inform adaptation decisions |
| Information that gives the climate services credibility | Climate summaries, trends and projections / scenarios for droughts, water availability, river flow (specific rivers) |
| Climate information at the European scale (up to global) rather than just limited to the UK | Climate summaries, trends and projections / scenarios for extremes (temperature and precipitation), storms and wind |
| Historical and current climate information, along with future climate (next 10 years or less, next 20-50 years and next 50-100 years) | Information on different variables and relationships between them (dependencies) |

Understanding of the ambitions of the UK research community and user community in terms of research that should underpin 'climate services science' – at UK, Euro and International levels – and what their roles are in supporting these ambitions

Users' Community Ambitions

Participants identified attributes that, from a user's perspective, would be associated with 'successful' climate services. With respect to the services provided, participants called for relevance to users' needs and capabilities; credibility and reliability of service and service providers; transparency of development and delivery; accessibility; multiple/hierarchical and flexible formats; services that are adaptable to meet differing needs; timeliness; supported with guidance, case studies and metadata; and some form of quality assurance and quality control. Linked to these requirements, participants also identified the need to value climate services and proposed enhancements from the perspective of relative contribution to better informing decisions and raised the possibility of a regulator in providing guidance/benchmarks.

There was also an expressed desire for a greater awareness by providers and researchers of users' needs (mechanisms for linking researchers, providers and users), for recognition of the legitimacy and diversity of users' needs and for interdisciplinary research to support development of climate services to meet users' needs.

In addition to these attributes and needs, the participants suggested:

- A multi-disciplinary approach to climate services science would help services to be better fit for purpose
- Need for mechanisms to support engagement / networks involving the right people and not closed or limited membership
 - Raise awareness of supply and demand for climate services , including identifying need and potential for improvements to services – identifying where to go next
 - Co-evaluate the effectiveness of the climate services and the process (engagement) with the users
 - Discussions related to QA/QC
 - Institutional structures well funded to allow and support the required user-provider engagement
- Need for mechanisms to support development of skills needed to work in interdisciplinary and multi-sector space
- Including within research the requirement for identifying and realising pathways to impacts (end-user engagement in research and dissemination) – supported by RCUK

UK Research Community Ambitions

From the perspective of the research community, participants identified the following characteristics as being synonymous with successful climate services and a supportive climate services science programme:

- Demand for the climate services on offer and for improvements from users
- Desire for 'excellence with impact' (relevance) and academic excellence
- Engaged climate services community (researchers, providers and users) and comfort across this community with this engagement
- Knowledge and other services co-produced and evaluated through the engaged climate services community
- Overarching programme with spectra of climate services supported from generic to bespoke and involving pure to applied climate services science
- Communication and dissemination aspects of climate services and climate services science are highly valued and supported
- Supported by multiple funding streams from both public and private sector with clarity about responsibilities for delivery and funding
 - Sufficient to support learning and development of relationships
 - Recognising the different types of funding needed for baseline and project activities
- Standards for service quality and appropriate use (regulations, certification) established and implemented
- Support for development and maintenance of the required multi-disciplinary research community (including Postdoctoral, PhD, Masters and undergraduate programmes), as well as targeted skill and knowledge development in relevant degree and continuous professional development programmes (representative of the end-user communities)

Information researchers (providers) needed from users related to better understanding of:

- Users' decision spaces (sectors where needs are greater, where are vulnerabilities / risks high, drivers of concern, risk appetite and timeframes for decisions/ policies)
- How climate information fits into users' decision-making processes

- Where users currently access climate services
- Nature and scope of current and future users' needs (foresight)
- Users' current and changing technical capacity to ingest climate services
- Capacity (including funds) and willingness to be engaged in developing and delivery of climate services and in climate services science
- Breadth of users those engaged represent and how better to engage the spectrum of users

In terms of meeting users' needs, the research ambitions identified by participants can be categorised as:

- Better understanding diverse users' needs and where and how those needs could be met
- Improving delivery of climate services
- Improving effectiveness / relevance of climate services; and
- Valuing climate services and establishing standards for climate services.

In delivering these, participants indicated that a multi-disciplinary approach to climate services science is essential.

Participants questioned whether we had the capacity to identify and understand users' needs and whether there is sufficient capacity to respond to those needs. They also recognised that in targeting research at meeting users' needs, there is a need to include extracting relevant climate services from seasonal and decadal forecasting, from a better understanding of variability and extremes, and from a better use of observational information.

It was also suggested that funds should be directed at building the infrastructure required to support climate services and climate services science, including a network of researchers and users, knowledge exchange efforts, engagement mechanisms and supportive databases (decision-relevant climate information, impacts, vulnerabilities and adaptation indicators) that are interoperable, comparable and consistent). The funding available should also support users' engagement, including funding activities to enhance their capacity to participate and to support their contributions to climate services science (co-production, evaluation and dissemination).

An understanding of the climate services and climate services science landscape within the UK, including linkages with European and other international activities

Participants were broken into three groups (each involving a mixture of users, purveyors and providers) and asked to map their understanding of climate services science community within the UK by identifying who they saw as existing players, nodes of activities and links to international activities. To further inform their mapping, a number of short presentations were given describing related activities and interests. These include presentations by Adam Corner (social psychology, Cardiff University), Richard Wood (NERC Climate Theme), Peter Stephenson (ESRC), Chris Hewitt (UK Met Office Climate Services), Glen Watts (EA and climate services), Ruth Hughes (JPI Climate) and Roger Street (CIRCLE2).

The three groups each produced a map of their combined understanding of the organisation involved in climate services and from where climate services were accessed (see results at <http://www.ukcip-arcc.org.uk/content/view/623/9/>). Although different presentations, there are a number of common messages.

- Broad and diverse set of organisations involved in climate services within the UK, including research organisation, funders (of science and services), providers of bespoke services (consultancies and universities), providers of public good services, media and technical and delivery services, including archive and data information

- Diverse nature of where users are seeking and accessing climate services, based on their knowledge of potential sources and relative to their needs and their understanding of their needs
- European and other international linkages are also quite diverse, including in the delivery of climate services (data /information and delivery), related research
- Diverse scales (local to global) at which users required information and that producers were offering climate services both within the UK and internationally

Some questions that were raised during the development and presentation of these maps that will require further consideration are:

- Role of media in communicating and disseminating climate services and means of bringing the media in as a partner in delivering climate services rather than seeing them as an adversary
- Understanding the investment and potential for investment within the community engaged in climate services
- Rationale behind nature and scope of climate services provided and for investments being made in climate services (or the lack of investment) by providers, users and funding agencies
- Rationale behind users decisions and preferences related to where they access climate services

Structures and mechanisms to support and build momentum within this ‘climate sciences’ community with the aim of enhancing the delivery of climate services to inform decision making and the effectiveness of the UK’s contributions to climate services science

The workshop participants explored what actions they believed were needed to support climate services in the UK, including mechanisms and structures they believed were needed to develop and deliver climate information to support decision making through two linked activities. The first was consideration of responses to a pre-workshop request for views (14 participants responded).

These responses were then used to inform deliberations during the workshop that resulted in identification of the following activities and timelines were identified. In terms of timing, the following were identified as needing urgent action (requiring action soon).

| Identified Activities, Structures and Mechanisms | Timing Considerations |
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| Demonstration (evidence) of the end-to-end value of climate services with well qualified strengths, robustness and weaknesses. Users and researchers (physical and social scientists) developing and providing case studies | Need for early action – targeted demonstration projects. Soon |
| Climate services to support CCRA 2017 (set of tools for risk and decision analysis by a range of users, dynamic and adaptable). Addressing users needs related to ARP, DAPs and NAP | Design the required outcome and plan consistent with supporting the CCRA 2017 |
| Interdisciplinary research programme on UK climate services , including the necessary RC support, research coordination, engaged users and research community, and sufficient size and funding to be seen as viable. ESRC to identify / map social science expertise required | Planning and focussing the research programme and commitment within LWEC. Urgent |
| An ‘open-access’ information hub / knowledge management platform , including mapping of current networks (projects and groups) delivering | Using the outputs of this meeting as a starting point |

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| <p>climate services and related science, and information on users needs. Providing indication of breadth and gaps, synthesising / evaluating activities and building a knowledge management framework</p> <p>Researchers in residence (placement of climate researchers into user organisations) to improve engagement and build the community</p> <p>Need for a service delivery approach (less focus on research) with shared objectives meeting users' requirements for services based on scientific evidence (funding model to support?). Developing a model for climate services and consideration as to who is responsible for delivering climate services and an appropriate bespoke-public good balance</p> | <p>with ongoing updating and enhancements, funding. Soon</p> <p>Secure funding and identify pilots. Soon</p> <p>Developing model for climate services and funding model. Soon</p> |
| <p>Targeted engagement of purveyors, users and providers of climate information/services to support development of the climate services research programme and climate services. Understanding diversity of users' needs and development of climate science community</p> | <p>Building on this workshop , identify appropriate focal point for action and secure funding – this calendar year</p> |
| <p>Special issue of Nature Climate Change focusing on climate services science – interdisciplinary and including perspective pieces from the user community</p> | <p>Discussions with Nature, coordination with call from Nature in early 2013</p> |
| <p>Towards quality assurance of climate services – identifying means and criteria for judging/evaluating climate services. Understanding standards currently in use (including in related fields) and users' perspectives and relate to EU-wide discussions on standards</p> | <p>Need for action in 2012 and linkage to EU (JPI-Climate) related activities</p> |
| <p>Paper (building on this workshop outputs) which articulates a view of what are climate services (in the UK) and who are the climate services community (presented at relevant events in 2012 and shared with participants). Circulate workshop report and hold sessions with wider research community (to build the climate services community)</p> | <p>Secure funding, identify and target relevant meetings in 2012/2013</p> |
| <p>Coordination of different disciplines to facilitate and support decision making – development and testing of decision support resources (including case studies)</p> | <p>Scope the current landscape and build on existing work. Relate to decision context</p> |
| <p>Enhancing user capacity to understand and access climate services, including accredited training courses. Need for an initial scoping study and issue a call for requirement capture and demonstration delivery</p> | <p>April 201X</p> |
| <p>A regulatory environment or 'best practice culture' which encourages / requires / mandates/ consideration of 'weather and climate risks' in decisions / actions. Involvement of regulators, professional bodies, trade organisations, policy makers and economists. Possible pilot within the UK construction industry.</p> | <p>Timing consistent with NAP and its implementation (within 12 months)</p> |

Relationships with European and International Climate Services Initiatives

Although discussed as part of the landscape of climate services and required actions, a better understanding is still needed of the opportunities and benefits of linking / coordinating UK climate services' efforts with relevant European/international initiatives (e.g., JPI Climate and Framework Programme research activities). This understanding should include identifying the scope of UK organisations involvement within EU-funded climate services research, a better understanding of who does/should participate in the various EU/international climate services' initiatives and research



activities and the potential of using this UK participation towards building and informing the UK climate services community.