



Adaptation and Resilience in the Context of Change (ARCC) Network

UKCIP Annual Report 2013

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Executive summary

The Adaptation and Resilience in the Context of Change (ARCC) network seeks to enhance the use, impact and benefit of knowledge and evidence from research on adaptation in the built environment and infrastructure sectors, with the aim of supporting sustainable urban development in the UK. Funded by the Engineering and Physical Sciences Research Council (EPSRC), the ARCC network brings together researchers, policymakers and practitioners, and facilitates joint working opportunities to help expand and accelerate the exchange of information to stimulate innovation and address both current needs and future challenges.

As government develops policies and the private sector invests in programmes to address the risks of environmental change, timely access to the best available research is essential to inform the decision-making process. During 2013, the ARCC network successfully expanded its remit from an original focus on adaptation to a changing climate to include a much more comprehensive coverage of research looking across the range of environmental, technological and socio-economic factors which impact on the performance of our buildings and infrastructure systems.

Responsible for managing the network, the work of UKCIP in 2013 focused on adding value to existing research processes by working across individual projects to enable the effective interpretation and synthesis of research evidence for use by policymakers and practitioners. By providing a knowledge exchange network with dedicated engagement and communication activities, the ARCC network has been successful in promoting dialogue between the academic community and stakeholders to access expertise on both sides to deliver salient and timely outputs.

Key achievements in 2013 included:

- Providing integrated evidence for central government policy initiatives such as the **Adapting to climate change: national adaptation programme** and the **Green Deal**, and consultations on the **Scottish climate change adaptation programme** and the **Sustainable development strategy for the health and care system**.
- Strengthening knowledge exchange between researchers and other key stakeholder groups through collaborations and theme-focused initiatives on topics such as resilient energy systems, the role of social sciences in adaptation and sustainable integrated infrastructure.

- Sharing learning across related programmes and networks through participation in external initiatives and in particular seeking to demonstrate (through case studies) the added value and impact of an overarching knowledge exchange network.
- Initiating work to establish a robust information and data management system to promote access to the full range of research outputs, particularly after completion of individual projects, and to facilitate discovery, understanding and use of information.
- Securing funding from EPSRC to continue the work of the ARCC network for a further four years (beyond January 2014) building on existing capacity and expertise and further enhancing the overall benefits of research investments.

Further information on the ARCC network including events, outputs and details of individual research projects can be found at www.arcc-network.org.uk.



1. Introduction

The performance of the UK built environment and its infrastructure is critical to national well-being, the growth agenda and economic competitiveness and stability. Yet these increasingly complex and interdependent sectors face serious challenges over the next 10 to 50 years and beyond if they are to minimise the risk of systematic failures and disruptions and be capable of responding positively to expected demographic, environmental and technological changes.

To promote sustainable and resilient built environment and infrastructure systems that support economic prosperity, policymakers and practitioners at the national, regional and local levels need:

- access to knowledge, data and practical tools drawing on research outputs from across the academic community;
- opportunities for facilitated knowledge exchange to better inform and focus research, practice and evidence-gathering activities; and
- the means to inform the production of targeted research outputs such that the resulting knowledge can be mobilised and effectively integrated into the decision-making process.

The Engineering and Physical Sciences Research Council (EPSRC) and, more broadly, the Living with Environmental Change (LWEC) partnership, have invested heavily in high-quality, pioneering research on adaptation and resilience in the built environment and infrastructure sectors. Since 2009, this has included the ARCC network which was established to help maximise and accelerate the impacts and benefits of EPSRC-funded research in the built environment and infrastructure sectors by enabling the effective uptake and use of evidence, knowledge and potential solutions from across the research landscape. The network has played a central role in providing an over-arching integrating network capable of engaging researchers and stakeholders and working with them to help shape and meet their requirements in a timely manner.

The overall aim of the network is to support researchers and stakeholders by:

- developing and delivering integrated evidence on adaptation and resilience to inform current and emerging policy and business decisions and investments;

- building a vibrant and innovative stakeholder and researcher community to respond to evolving evidence needs and research requirements in a timely manner;
- supporting end-users in accessing and applying evidence and outputs from research within their own policies, decisions and practices.

Over the past five years the remit and role of the network has evolved significantly. Originally, work involved coordination of an initial group of 14 research projects and their stakeholders, and focused on responses to the impacts of climate change and potential adaptation strategies. As more research was commissioned to support policy and practice requirements, this expanded into a much broader knowledge exchange network centred on a rolling portfolio of 27 research projects. Responding to stakeholder requirements for a synthesis of information across the range of socio-economic, environment and technological factors (including climate change) which affect our built environment and infrastructure, the network now works with all relevant EPSRC-funded research projects to ensure that decision makers are informed by the best possible evidence from across the research landscape.

UKCIP at the University of Oxford provides the central coordination and management role for the ARCC network. This annual report summarises the knowledge exchange work carried out across the network during 2013 and the impact and benefits to researchers and stakeholders. More information on network activities and details of individual research projects can be found on the ARCC network website¹.



2. The network community

The ARCC network encourages participation by all researchers and other stakeholders with an interest in fostering resilience and sustainability in the built environment and infrastructure sectors. The focus is on UK activities but includes engagement with international academics and practitioners with interests relevant to the UK.

Over the past four years, the network has expanded to reflect the increasing interest in learning from and contributing to research. There are now around 250 researchers and a similar number of stakeholders that are directly involved in the network either through individual projects or via involvement in overarching network activities. Beyond this is a much broader audience of end-users interested in high-quality scientific evidence on resilience and adaptation issues within the built environment and infrastructure sectors. The ARCC newsletter was re-launched as a monthly e-newsletter in 2013, and now reaches 600 individuals from a wide range of organisations including academia, central and local government, professional institutions, business, other delivery bodies with related work and international colleagues. The understanding and reach of information and outputs has been further broadened by working with related networks (such as Adaptation Scotland, the Modern Built Environment KTN, CIRIA) to include news of ARCC events in their newsletters and websites.

Recognising that both researchers and stakeholders have widely varying levels of expertise, requirements and capacity to engage, activities during 2013 promoted engagement at various levels ranging from keeping in touch with developments (e.g. through the newsletter) through to complex co-production of specific outputs. Flexibility within the programme of network activities was also essential to seek and take advantage of new opportunities to add value in a rapidly changing policy and practice environment and to respond to requests for specific work from projects and /or stakeholders.

Throughout 2013, the challenge was to expand the network from a specific suite of projects and their stakeholders to engaging with a much broader community looking beyond climate change. Progress has been achieved by targeting specific stakeholder groups (e.g. regional stakeholders following on in part from collaborative work with ClimateUK) and working with other networks and groups with related interests (e.g. the Environment Agency's Infrastructure Operators Adaptation Forum).

Regular contact with EPSRC has ensured that new research projects working in relevant fields are identified as funding is agreed, and individual discussions with project principal investigators have been crucial in demonstrating the value of the network to research teams and in exploring links and synergies with potential benefits across the network. During 2013, particular emphasis was placed on initiating engagement with projects from two new EPSRC initiatives with clear links to the aims of the ARCC network:

- Two new centres set up as part of the Government's National Infrastructure Plan to catalyse and inform the national debate about the future of the UK's infrastructure (joint funding with ESRC):
 - » iBUILD: Infrastructure Business Models, Valuation and Innovation for Local Delivery
 - » ICIF: International Centre for Infrastructure Futures
- Innovative solutions to flood risk. This EPSRC Sandpit resulted in three research projects and an overarching Flood and Coastal Erosion Risk Management Network (FCERM_Net) being funded.

2.1 The role of the management unit within the network

The facilitation role carried out by UKCIP aims to add value to individual project outputs and to maximise and accelerate the impact and benefits of research by:

- promoting stakeholder and researcher participation and collaboration across projects;
- broadening engagement, knowledge exchange opportunities and targeted dissemination; and
- facilitating the further exploration of evidence needs.

For knowledge exchange to be successful, there is a need to engage both researchers and other stakeholders in the co-production, interpretation and integration of evidence. Experience gained by the network in previous years has shown that coordinated engagement and facilitated dialogue among stakeholders and researchers, initiated early and sustained throughout the overall research process, ensures expertise on both sides can be used to deliver relevant outputs for policy and practice.

All projects have their own pathways to impact; the work of the ARCC network seeks to enhance this by fostering cross-project engagement and integration. During 2013, specific efforts focused on integrating evidence and information on the broader aspects of adaptation and resilience to support future sustainable urban development (beyond consideration of just climate change), expanding the current network approach to encompass a wider portfolio of relevant research and stakeholders, and initiating work to ensure access and availability of research outputs.



3. Meeting evidence requirements

A key objective of the ARCC network is the provision and integration of credible and salient knowledge and information to ensure stakeholders have access to the best available evidence in a timely manner. During 2013, the network expanded to provide a single, focused source of information on adaptation and resilience in the built environment and infrastructure sectors, and was instrumental in engaging researchers and stakeholders in the provision of integrated evidence to inform specific policies and practice.

3.1 Underpinning evidence for the National Adaptation Programme

Published by the Government in July 2013, the National Adaptation Programme (NAP) report sets out what government, businesses and society are doing to become more resilient to a changing climate². This responds to the climate change risks and opportunities identified by sector in the Climate Change Risk Assessment published the previous year. The ARCC network engaged with Defra and individual projects throughout the process of developing the NAP to identify where information from across the research portfolio could support current and planned actions to mitigate the risk of climate change. As a result, the NAP report emphasises both the role of the network in promoting evidence and knowledge across the built environment and infrastructure sectors, and identifies where individual research projects have a direct role in helping business and industry access the skills, knowledge and tools from academia to help understand and manage climate change risks.

In conjunction with the NAP, Defra also published an update³ on progress being made in taking forward actions in the Climate Resilient Infrastructure: Preparing for a changing climate report. This includes the need to learn from and share experiences of adaptation from other countries, particularly in the infrastructure sector, and the work of the ARCC network is identified as a key element in delivering this knowledge into the future.

² www.gov.uk/government/publications/adapting-to-climate-change-national-adaptation-programme

³ www.gov.uk/government/publications/climate-resilient-infrastructure-preparing-for-a-changing-climate--3

3.2 Responses to Consultations

Responding to formal consultations provides a very specific and targeted mechanism for applying the findings and insights from across the ARCC network to the policy-making process.

- **Response to the Scottish Climate Change Adaptation Programme Consultation** (September 2013). This focused on the policies and proposals addressing risks within the ‘buildings and infrastructure’ theme. As a result, UKCIP/ARCC network was subsequently invited to provide oral evidence to the Scottish Government Rural Affairs, Climate Change and Environment Committee.
- **Response to the Sustainable Development Strategy for the Health and Care System** 2014–2020 Consultation (NHS England and Public Health England, May 2013). A joint response was prepared with two research projects working in this area (BIOPICCC and DeDeRHECC⁴).
- **Review of Government planning and policy guidance** (March 2013). The ARCC network comments were integrated within a broader response from UKCIP with particular emphasis on the proposed guidance for adaptation.

3.3 Synthesising advice for the Green Deal programme

In 2012, synthesised evidence from across relevant projects (SNACC, CREW, LUCID⁵) had been used to agree with the Department of Energy and Climate Change (DECC) the text of a guidance note for Green Deal providers on the need to avoid the risks of overheating associated with inappropriately-insulated homes. The DECC team were focused on the launch and delivery of the Green Deal, and thus the publication of the guidance note was delayed, although the network produced its own guidance note⁶ in early 2013, to coincide with the launch. Further work to enable the publication of the original guidance note through DECC is expected to continue during 2014.

More positively, the ARCC network was invited to participate in an initiative on overheating led by the Zero Carbon Hub, which has provided an opportunity to share research outcomes with a new community. This new group brings together government departments, researchers and built environment organisations with the aim of resolving the issue of overheating, and providing policymakers and practitioners with the knowledge needed to design buildings resilient to higher temperatures. The invitation to participate in this group both recognises the work the network has already done in synthesising research to inform the overheating debate, and provides an opportunity to further influence industry, regulations and markets.

⁴ BIOPICCC: Built infrastructure for older people in conditions of climate change, DeDeRHECC: Design and delivery of robust hospital environments in a changing climate.

⁵ SNACC: Suburban neighbourhood adaptation for a changing climate, CREW: Community resilience to extreme weather, LUCID: The development of a local urban climate model and its application to the development of cities.

⁶ www.arcc-network.org.uk/overheating/practical-guidance/

3.4 Access to information and data

Difficulties in identifying and accessing research information particularly after the end of an individual project have been identified within the network as a major barrier to the continued exploitation of existing research. Recognising this, the ARCC network is looking to establish a robust and efficient system for capturing and disseminating project outputs (both qualitative and quantitative) and for supporting the discovery, uptake and use of these outputs by stakeholders. An ARCC information and legacy officer was appointed in December 2013 to develop and implement an information management strategy for the network taking into account the wide range of outputs being produced, the EPSRC research data policy framework and existing initiatives in this area. This major new area of work builds on a small scoping study carried out earlier in the year with Climate UK (April to July 2013) that identified several possible approaches and their relative merits.



4. Strengthening knowledge exchange

UKCIP works with research, policy and practice communities and seeks to understand both emerging evidence requirements and the latest scientific findings. By identifying and facilitating opportunities to foster the two-way flow of information between research and stakeholders, the network has been able to enhance the update, use and impact of research outputs and therefore maximise the benefits from research investments.

4.1 Collaboration with the Infrastructure Operators Adaptation Forum

To help ensure infrastructure assets and services are resilient to natural hazards and prepared for the future climate, the Environment Agency established the Infrastructure Operators Adaptation Forum (IOAF) to provide a platform for communication between infrastructure operators and government. As part of its remit to help link the application of science to infrastructure planning, the IOAF invited the ARCC network to present their work to the Forum (Sept 2013) and to engage more fully with its members (~30 infrastructure operators and government departments). As a result, research outputs from across the network are more visible to a wider audience with the potential for joint working in the future and enhanced uptake of results. Importantly, this collaboration has also led to agreement for an ARCC network science-policy/practice dialogue⁷ on infrastructure interdependencies which will be initiated in spring 2014 and will form a major strand of the on-going network programme.

4.2 Theme focused initiatives

A key aspect of the work of UKCIP is to encourage and facilitate collaboration and the exchange of ideas across research activities associated with the ARCC network. In some cases, these activities result in tangible outputs of direct use, in other cases the value is on having the opportunity and space to exchange experiences and ideas with a view to improving the research and research process in the future.

4.2.1 Adaptation to climate change and social science

Adaptation in the built environment and infrastructure tends to focus on hard engineering solutions, but it is equally important to consider human and social factors that contribute to successful adaptation. A number of research projects within the network include work packages looking at the social science aspects of adaptation. A workshop (February 2013) was held to capture experiences and to explore challenges to incorporating social science methods and approaches within research focused on the built environment and infrastructure sectors. 15 researchers from 8 projects plus several representatives from research groups new to the network discussed areas within ARCC best suited to social science methods and approaches, considered how these areas can be developed further to improve overall research and identified barriers to achieving this.

4.2.2 Methods for thinking about the future

Held in November 2013, this workshop involved 22 participants from 11 projects who took the opportunity to discuss issues related to how researchers can support society's transition to a desirable future. Sessions focused on how the use of 'futures' can support communication and engagement with climate change, the methodological issues that researchers need to consider prior to finalising their approach to the use of futures and how best to address issues such as risk and uncertainty.

4.2.3 Resilient energy systems

Previous experience within the network has shown that many stakeholders have little time to engage with individual projects, and that coordinated efforts throughout the research process led by the network and involving both researchers and stakeholders can help promote the provision of coherent and consistent messages on a range of cross-project issues.

Within the ARCC network, four projects focus on adaptation and resilience in the energy sector (ARIES, ARCoES, ITRC and RESNET⁸). These projects are now mid-way through their research programmes with interesting results emerging. Building on previous coordination meetings, the network facilitated two workshops in July 2013. The first was between the researchers and aimed to ensure a common understanding of on-going research and explore synergies and overlaps. The second was a joint meeting with key stakeholders which provided an opportunity to discuss early results and to ensure the research and planned outputs continued to reflect users' needs.

Following these meetings, research teams were invited to present their findings to the Energy Networks Association. It was also recognised that the use of a consistent set of future scenarios of climate, energy demand, technological development etc. across the projects would help in drawing out consistent messages for use by stakeholders. A workshop on this issue was held March 2014 and the work is now being taken forward within research projects.

4.2.4 Achieving adaptable assets: sustainable integrated infrastructure

Five projects looking at novel cross-utility approaches to meeting long-term service delivery requirements were funded within this EPSRC programme⁹: Land of the MUSCos: Multiple-Utility Service Companies, Undermining infrastructure, All in One,

⁸ ARIES: Adaptation and resilience in energy systems, ARCoES: Adaptation and resilience of coastal energy supply, ITRC: UK infrastructure transitions research consortium, RESNET: Resilient electricity networks for Great Britain.

⁹ www.epsrc.ac.uk/funding/calls/2010/integratedinfrastructure/Pages/adaptableassets.aspx

Transforming Utility Conversion Points and Shock (not) Horror. Recognising their relevance to the ARCC network, a coordination meeting (March 2013) was held with the five projects plus others with overlapping interests, to identify where links and synergies could be established and/or promoted and to discuss possible approaches to synthesising research outputs to enhance the overall impact of the research within practice.

As a result, an overarching Position Paper on the nature and sustainability of infrastructure services in a changing climate was drafted which builds on experiences gained by researchers and in particular responds to the stakeholder challenge of 'if, when and how to integrate utilities in a sustainable and resilient manner'.

4.3 Participation in wider initiatives

The ARCC network works at the boundary between academia and end-users, and provides an effective mechanism for bringing together knowledge and expertise from both areas to external initiatives. This benefits both the network by expanding and broadening engagement, and external activities by bringing in new links and expertise. During 2013, the ARCC network has been invited to give presentations at external events and has attended numerous project meetings and stakeholder engagement events to keep up-to-date with recent developments, to raise the profile of the network and to contribute expertise as appropriate.

4.3.1 LWECC Infrastructure report card

This LWECC report card (due for publication autumn 2014) will provide up-to-date, reliable and accessible information on current and future climate change impacts on the UK infrastructure sector and is aimed at assimilating the evidence needed for the UK's second Climate Change Risk Assessment. Invited to be on the LWECC Working Group, the ARCC network has been instrumental during 2013 in helping to scope the content of the report and in identifying expert authors for the underlying technical papers.

4.3.2 Working with local planners

An invitation to contribute to a training session on planning for climate change adaptation from Norfolk and Suffolk planning officers provided an opportunity to engage with an important group of local and regional policy makers (November 2013), and to explore further where the network can add value. Subsequent contributions to a similar event with planners in Essex have demonstrated the value of contributing to in-depth discussions with key users on specific issues.

4.3.3 ITRC workshop: Visualisation of multi-dimensional data for policy analysis

Many stakeholder-led research projects are now providing complex, multi-dimensional research outputs and the challenge is how to get the message across to various audiences in an appropriate and easily-accessible manner. The Infrastructure Transitions Research Consortium (ITRC) project took the lead in organising this workshop on approaches to visualisation, with the aim of sharing experiences and seeking solutions to this issue. Recognising that many other research projects within the ARCC network have similar needs and relevant skills and experiences, the network collaborated with ITRC to broaden the workshop to include six other ARCC projects with on-going benefits to skills development and knowledge sharing across the network.

4.4 Capturing and sharing learning

The UKCIP team within the ARCC network has gained considerable experience in many aspects of managing a network aimed at bringing together researchers and stakeholders. Whilst this work is focused on adaptation and resilience in the built environment and infrastructure sectors, much of the general expertise gained on aspects such as knowledge exchange and stakeholder engagement processes and evaluating network performance is readily transferable to other sectors, and particularly across the wider EPSRC research portfolio.

4.4.1 Demonstrating impact of a network

Enhancing the impact of research beyond that achievable by individual projects is the primary aim of the ARCC network. However, disentangling the effect of the network's performance from that of individual projects or actions by stakeholders is a complex problem. In practice, it is often the combined efforts of all parties that leads to the greatest impact, but assessing the different roles and contributions can help identify where overarching networks such as ARCC can add value to the overall process. Working with Ian Cooper of Eclipse Research Consultants (to August 2013), a series of case studies was developed with projects and stakeholders to capture those activities and approaches where the network has been particularly effective in enhancing impact¹⁰:

- Effective dissemination: Cascading knowledge through third party networks;
- Mobilising research to support related initiatives: working with other networks and programmes to share expertise and research;
- Sustaining engagement: drawing on experiences from three sequential research programmes and the value of coordinated and long-term research;
- Synthesising information for decision-makers: working across research projects to provide comprehensive evidence for use by policymakers; and
- Working with professional institutions to better target the provision of evidence.

4.4.2 Sharing experiences with other projects and networks

The network has links, both formal (through membership of steering groups etc.) and informal (through personal contacts), with a number of other related stakeholder-led research programmes and networks (e.g. the Flooding And Coastal Erosion Risk Management Network, the Transforming Energy Demand Through Digital Innovation Network and the iGLASS project (Using interglacials to assess future sea-level scenarios). Through such links, the network both contributes to the pool of UK expertise on effective knowledge exchange and stakeholder engagement processes and learns from the experiences of related initiatives.

4.5 Targeted communication and dissemination

Effective and timely communication and dissemination of information across the network is necessary to better engage the wider research community and the full range of potential end-users. The overall aim is to improve the visibility, awareness and understanding of the research and to promote the uptake and use of research outputs.

¹⁰ www.arcc-network.org.uk/network-in-action/

4.5.1 LWECC Policy and Practice Notes

The ARCC network is affiliated to the much broader cross-funding agency LWECC programme. This new series of Policy and Practice Notes (PPN) has been initiated by LWECC to draw out conclusions and recommendations from across LWECC research and to present key findings in non-technical language for specific public, private and third sector audiences. Recognising the value of such a series in reaching a broader audience than has previously been possible, the ARCC network has worked with LWECC and the BIOPICCC and DeDeRHECC¹¹ research teams to synthesise and translate evidence and information from these projects. The PPNs were distributed to several hundred named individuals in the national and local health and emergency planning sectors,¹² and were publicised at the events, in the trade press and via online networks:

- **LWECC PPN #6.** 'Ensuring resilience in care for older people'. Looking at how services can continue to support the well-being of older people and be resilient to extreme weather events. With the BIOPICCC project
- **LWECC PPN #7.** 'Avoiding summer overheating while saving energy in acute hospitals'. Looking at alternative ways of providing safe temperatures in hospitals whilst also saving energy and costs. With the DeDeRHECC project

4.5.2 ARCC website, newsletter and social media

The ARCC website provides a single portal for information on EPSRC-funded research on adaptation in the built environment and infrastructure sectors. Organised by theme, the website is constantly being developed to provide an up-to-date and comprehensive source of evidence and knowledge from research across the UK, plus details of forthcoming events, reports from past activities and links to relevant organisations. With 4700 users and 2200 page views over the past year from an increasingly broad range of organisations, the website provides a central resource for information on network activities and details of individual projects.

To respond to requests for more regular updates, a new monthly newsletter, ARCCnews, was launched in December 2013 and is distributed electronically to approximately 600 recipients, both in the UK and abroad. Although a very recent change, informal feedback to date suggests that the content and timing of this newsletter provides a welcome additional route to reaching the wider network community with news of both network activities and the work of individual projects. The ARCC twitter feed also provides a useful rapid dissemination route, particularly used by researchers (currently 160 followers and expanding steadily).

The challenge for the future is to develop these dissemination routes to meet the needs of both specific target audiences and the broader network community. On-going analysis of current traffic is being used to identify which areas/approaches are currently the most useful and where additional effort is needed to maximise potential use.

¹¹ BIOPICCC: Built infrastructure for older people in conditions of climate change, DeDeRHECC: Design and delivery of robust hospital environments in a changing climate.

¹² www.lwec.org.uk/resources/policy-and-practice-notes



5. Developing the community

During 2013, the priority was the strategic broadening of the network community to help guide the involvement of new researchers and stakeholders, to make them aware of resources available and to facilitate opportunities for continued engagement. Mapping of existing and potential new stakeholders was strengthened to help identify their emerging needs and how best to develop the network to support them.

5.1 Regional engagement with stakeholders in Northern Ireland

Prior to 2013, none of the research projects and very few stakeholders had good links with Northern Ireland, yet much of the research being carried out is of relevance to that region. Working with Climate Northern Ireland, a series of seminars were arranged to help develop a greater understanding of relevant research within the network among stakeholders in Northern Ireland. These seminars (each attended by 20-30 stakeholders from a range of policy and practice backgrounds) have helped establish links and synergies to enhance project outputs, including the consideration of further work, and have promoted greater engagement and dissemination with regional stakeholders.

- **February 2013:** representatives from the ARIES, ITRC and SECURE¹³ projects spoke about their research on urban infrastructure and national systems and discussed outputs to date.
- **November 2013:** researchers from RESNET, CLUES and 4M¹⁴ focused on issues related to energy management and system resilience, and discussed emerging evidence and its potential use.

Further seminars are planned for 2014.

¹³ ARIES: Resilient electricity networks for Great Britain, ITRC: UK infrastructure transitions research consortium, SECURE: UK infrastructure transitions research consortium.

¹⁴ RESNET: Resilient electricity networks for Great Britain, CLUES: Challenging lock-in through urban energy systems, 4M: An Evidence Based Methodology for Understanding and Shrinking the Urban Carbon Footprint.

5.2 Early career researchers

The EPSRC has a strategic aim of developing the leaders of the future, skilled in multidisciplinary research and capable of engaging effectively with stakeholders. Many research projects within the network are training PhD students, and others include researchers at early stages of their career. Expertise within UKCIP means that the network can engage more directly with these researchers and help enhance their professional development in knowledge exchange and stakeholder engagement processes to better realise the impacts of their own research. During 2013, a series of 2-day workshops and interim webinars on a variety of relevant topics were planned with the first event focusing on 'effective communication' scheduled for March 2014.

5.3 Additional opportunities

In addition to the work already summarised in sections 3 and 4, a range of network activities during 2013 sought to take advantage of external opportunities to engage more broadly and with new audiences, including at the international level. The aim was to raise awareness and to facilitate possible future collaborative work. Examples include:

- **Town and Country Planning Association (TCPA).** UKCIP represents the ARCC network in regular meetings of the TCPA Planning and Climate Change Coalition which brings together local authorities, consultants and non-governmental organisations to ensure that the planning system contributes to meeting the challenge of climate change. Such links highlight relevant research from the network and its role in informing the wider policy landscape.
- **Delivery programmes:** Adaptation Scotland and Climate Ready are key national adaptation delivery programmes and the network maintains regular contact with both to exchange information on complementary areas of work, to participate in relevant activities and to ensure work programmes are aligned to maximise benefits and prevent duplication of effort. This on-going interaction also helps ensure that ARCC research is considered in the development of any guidance and advice.
- **Research initiatives:** UKCIP, on behalf of the network, has participated in a number of national and international meetings and conferences both to highlight specific aspects of adaptation by drawing across the research landscape and to demonstrate UK capability in the built environment and infrastructure sectors.
- **International programmes:** A key area of work in 2013 was collaborating with CIRCLE-2, a European network of 34 institutions from 23 countries funding research and sharing knowledge on climate adaptation, to ensure all relevant UK research projects from the ARCC network are included in the CIRCLE-2 database of European adaptation projects¹⁵ and therefore available to a much broader audience.



6. For the future

During 2013, UKCIP was successful in securing significant additional funding from EPSRC to continue the ARCC network for a further four years beyond the current completion date of 31 January 2014. This extension is a reflection of EPSRC's and LWECC's belief in the on-going value of the network and in the benefits to both researchers and other stakeholders. It also represents a significant opportunity for the UKCIP team and the broader ARCC network to develop further cross-project knowledge exchange and stakeholder engagement activities in such a way as to enable the effective interpretation, integration and mobilisation of information from across research into policy and practice, thus enhancing the overall benefits of research investments.

The four year work programme will build on the active network community, expertise and processes already established and aims to increase the capacity of researchers, policymakers and practitioners to understand and seek solutions to issues relating to adaptation and resilience in the built environment and infrastructure sectors. New challenges will involve:

- Broadening the network to include research projects exploring related aspects of sustainability and risk;
- Enhancing engagement opportunities to strengthen the impacts of research within policy and practice; and
- Greater emphasis on improving access to and understanding of research outputs, tools and metadata.

Key priority areas for early 2014 include:

- The next ARCC network Assembly. This major knowledge exchange event will bring together researchers and stakeholders to:
 - » explore policy and practice issues and challenges in the context of using research and contributing to outputs;
 - » showcase recent scientific advances; and
 - » identify evidence needs, future research directions and potential new collaborations.

- A new science-policy/practice dialogue on infrastructure interdependencies to explore what is happening and to better understand the challenges to addressing interdependencies. This will be a joint initiative with the EA's Infrastructure Operators' Adaptation Forum and is designed to bring together those within the policy, practice and research communities who are exploring dependencies and interdependencies in the infrastructure sector.
- Knowledge exchange skills development for early career researchers. A series of workshops and webinars will bring together early career researchers to help enhance their professional skills and develop their expertise in maximising the impact of their research.
- Work to promote the on-going availability, access and use of data, outputs and evidence from across the network. This major new area of work seeks to develop and implement a data and information management strategy for the network (see section 3.4)

Working closely with the EPSRC and the ARCC network Advisory Group (see section 7), UKCIP will continue to explore innovative approaches for expanding the network to maximise and accelerate the uptake, use and impact of research outputs.



7. Project management

7.1 Advisory group

Responsibility for overseeing the strategic development of the work programme rests with the ARCC network Advisory Group. This was re-formed in 2013 to take account of the changing remit of the network and to ensure that different perspectives on adaptation in the built environment and infrastructure sectors are taken into account in the design and delivery of the work programme. The initial meeting was held in October 2013 and included representatives from central government (Defra, Department for Communities and Local Government), infrastructure practice (IOAF), related networks with a business and industry focus (Institution of Engineering and Technology), funding bodies (LWEC, EPSRC) and the research community. The Advisory Group is providing advice and a broad perspective to help ensure the delivery of the network and to evaluate progress on delivering impacts relative to agreed milestones.

7.2 Evaluation

To monitor progress, to help discern whether the network has been successful and to learn from past experiences, a rigorous evaluation framework was established in 2012 with advice from Ian Cooper of Eclipse Research Consultants. This was updated in 2013 to reflect the changing remit of the network and continues to provide a comprehensive framework for monitoring progress against key performance indicators and to demonstrate to EPSRC, LWEC partners and the wider research and stakeholder community evidence of success and an understanding of actions needed to achieve progress in the future.

7.3 Financial statement

Roger Street, Director UKCIP, is the Principal Investigator with responsibility for the overall strategic development and delivery of the project. Other staff (all part-time) have the following responsibilities:

Stephanie Ferguson, communications

Vicky Hayman, Knowledge exchange and coordination support

Fiona Hewer, information and data management (from Dec 2013)

Kay Jenkinson, communications

Anastasia Mylona, built environment sector

Phil Sivell, infrastructure sector

Under the current contract, EPSRC contributes £815,404 and the University of Oxford contributes a further £203,851. Expenditure is on track to meet the profile anticipated in the work programme with sufficient funds available to support planned activities to contract completion on 31 January 2014.



Adaptation and Resilience in the Context of Change (ARCC) Network

Building evidence, sharing knowledge

The ARCC Network brings together researchers and stakeholders involved in adaptation to technological, social and environmental change in the built environment and infrastructure sectors. Funded by EPSRC, we provide a UK-wide network to develop and exchange knowledge and evidence from across the research community to better inform policy and practice.



UKCIP

UKCIP provides the management and support role for the network which aims to enhance the cooperative development of the research projects, and to synthesise and disseminate evidence and outputs to maximise the benefits to all stakeholders.

arcc

ARCC network
UKCIP, Environmental Change Institute
University of Oxford
South Parks Road
Oxford, OX1 3QY

+44 (0)1865 285049
arcc@ukcip.org.uk

www.arcc-network.org.uk

EPSRC

Engineering and Physical Sciences
Research Council

