



Scotland's centre of expertise connecting climate change research and policy

ClimateXChange
Centre of Expertise on Climate Change

Annual Report 2013-14

Contents

1. EXECUTIVE SUMMARY	2
2. EXTERNAL CONTEXT.....	3
3. INTERNAL CONTEXT	4
4. OUTPUTS AND OUTCOMES	5
4.1 Supporting Policy and Practice.....	5
4.1.1 Stakeholder Engagement	5
4.1.2 Policy relevant outputs	8
4.1.3 Impact on policy	11
4.1.4 Benefits to other stakeholders.....	14
4.2 Collaboration and Multidisciplinary Working.....	16
4.2.1 Collaborations.....	16
5. PROGRESS REPORTS ON ACTIVITIES.....	19
5.1 Energy	19
5.2 Forestry	20
5.2.1 Woodland expansion.....	20
5.2.2 Forest adaptation.....	20
5.3 Natural Environment.....	21
5.3.1 Peatlands.....	21
5.3.2 Biodiversity	21
5.4 Agriculture	22
5.5 Built environment.....	23
5.6 Economy	23
5.7 Cross-Cutting Activities.....	24

1. EXECUTIVE SUMMARY

ClimateXChange's overarching aim is to provide objective, independent, integrated and authoritative research that responds to Scottish policy challenges. We measure our success by the imprint of our work on policy outcomes and the capacity we build across the research and policy communities. To achieve these outcomes, ClimateXChange (CXC) has evolved into a renowned knowledge exchange centre at the policy-research interface.

This report covers our third year in operation and demonstrates an impressive portfolio of engagement and achievement.

CXC's work has informed policy across a range of Scottish Government topics. We are fostering collaboration in an ever wider network of Scottish research and higher education institutions. We have built a network of partnerships across the UK, for example with key partners such as the Met Office, the Committee on Climate Change and the UK Energy Research Centre.

CXC researchers are sought after for conferences and policy round tables. Our operational model is widely referenced as an exemplar by those engaged with knowledge exchange at the science-policy interface. We have built even closer links with the Strategic Research Programme and with CREW, ensuring complementarity and effective use of resources.

The Scottish Climate Change Adaptation Programme has made use of a range of CXC briefs and reports. Our work on adaptation indicators continues to play an important role in assessing progress across all sectors, and we are developing adaptation demonstrations, particularly in forestry.

We have delivered a range of assessments on renewable energy, from economic benefits for communities and equalities in the renewables sector, to community engagement. CXC researchers are analysing the life cycle emissions of various energy technologies. We are collaborating with other research centres to bring world class energy research to a Scottish policy audience.

Our peatlands work is breaking new ground on assessing the carbon and other benefits of peatlands restoration. And we are a central partner in delivering assessments and options for climate impacts relating to the Scotland Rural Development Programme.

Our work on biodiversity at risk and climate adaptation for Scotland's woodlands has been influential in framing policy development and implementation.

The Centre has, in the space of three years, proved itself to be a valued, trusted and constructive partner for the Scottish Government and its agencies. To support our further evolution, we are developing more refined metrics to measure our impact. We continue to evaluate our processes to deliver even better value for money.

2. EXTERNAL CONTEXT

The key external driver for CXC continues to be the Scottish Government's commitment to delivering the requirements of the Climate Change (Scotland) Act 2009. There has been a degree of divergence between the UK and Scottish Governments on energy and climate policy, with the UK Government scaling back its support in some areas. The Scottish Government's commitment remains strong, despite the missed annual emissions reduction target for 2011. In 2013 it published the second Report on Proposals and Policies (RPP2) and the draft Scottish Climate Change Adaptation Programme (SCCAP). These documents set the context for all of CXC's work.

Publication of the SCCAP triggers the requirement for an independent assessment of progress against the SCCAP within two years. Currently, the Committee on Climate Change's Adaptation Sub Committee (ASC) is the body responsible for providing that assessment, which must be informed by robust evidence. As such, CXC is ideally placed to contribute. This fact is recognised by the Scottish Government which has asked CXC to deliver a set of adaptation indicators to inform the assessment. CXC has responded flexibly to reconfigure resources and work plans to fulfil this requirement.

The RPP2, plus emerging IPCC guidelines on accounting for carbon in wetlands, represent a strong driver for improving our ability to accurately estimate emissions reductions from peatland restoration. Recognition of the wider benefits of peatland restoration in other key policies, such as the 2020 Challenge for Scotland's Biodiversity, also ensures that demand for CXC's peatlands work remains high.

On energy, the implications of Electricity Market Reform, renewed commitments to community energy and the development of a Heat Generation Policy Statement underline the need for research and evidence to inform policy. CXC has responded rapidly to Call-down requests and has provided ongoing support to policy teams. We have developed a strong relationship with the UK Energy Research Centre (UKERC) as it enters its Phase 3, and have plans to formalise those links.

The 2014-2020 Scotland Rural Development Programme (SRDP) is currently being finalised. CXC has responded to the need to better understand where SRDP options have the greatest potential carbon abatement impact. We have refocused work and redeployed resource into a project that is geo-targeting SRDP climate options.

The substantive lead for CXC in the SG changed from RESAS to the Office of the Chief Economic Adviser (OCEA) in late 2013. We have engaged well with OCEA analysts, including to set our course for energy related research into the next year and to understand where CXC can best add value in the run up to RPP3. We have responded to wider general awareness of CXC amongst SG teams by providing OCEA and key policy teams with regular updates on the status of all projects of interest.

3. INTERNAL CONTEXT

As CXC has matured, the Directorate and Secretariat have recognised the need to better track and manage progress across the portfolio of work. A project-based approach was adopted, with work grouped into bounded projects. We have retained the cross-sectoral themes of adaptation and mitigation and continue to foster broader collaboration across disciplines and institutions. A project focus allows better reporting through the Secretariat of progress and the status of deliverables. We restructured the website to reflect this shift, making it much easier for stakeholders to engage with our work.

Between March and May 2013 the Directorate implemented a number of changes to streamline and make CXC's planned work portfolio more effective. This built on earlier work to evaluate CXC's impact and value for money. This has allowed us to make clearer linkages between the funding coming in to CXC and the policy-facing outputs being generated.

We secured an uplift in the discretionary Commissioning Budget to £250,000.

A more robust Project Management System now tracks progress across the spectrum of CXC's work, and corrals information under project headings. This has been coupled with the development of impact metrics to assess our outcomes in terms of influence on policy, the capacity we build across research and policy stakeholders, and the extent to which our model is replicated and looked to by knowledge exchange activity in the policy-research interface.

The Directorate undertook an assessment of CXC's PDRFs – looking at their contribution to CXC's wider objectives, the extent to which they deliver the evidence sought by the policy community to date, and their potential to deliver in future. On the basis of this assessment, the Directorate made recommendations to RESAS about the future of the portfolio of CXC PDRFs. This included which posts should have their funding extended to the end of the 5 year funding period, which posts should not be extended and where there was scope to create new PDRF posts that support CXC's developing priorities. Thus we have taken advantage of the opportunity afforded by the break in funding after 3 years to reconfigure to better deliver to CXC's purpose.

In autumn 2013, the Directorate reviewed CXC's governance structures. The Directorate questioned the usefulness of the Steering Group as constituted in terms of policy horizon scanning. In discussion with RESAS, it was decided that the Steering Group should be wrapped up and that CXC's Policy Director should instead attend meetings of the Climate Change Delivery Board to gain an insight on CXC's behalf into forthcoming policy questions and, where appropriate, to float ideas for research that could be undertaken by CXC.

4. OUTPUTS AND OUTCOMES

4.1 Supporting Policy and Practice

4.1.1 Stakeholder Engagement

General

1. RACCE members' introduction to CXC

CXC's Policy Director and Secretariat hosted a visit to CXC by the Rural Affairs, Climate Change and Environment Committee of the Scottish Parliament. The MSPs and Parliamentary staff were briefed on CXC and provided with examples of CXC's work. They were particularly interested to learn about how CXC delivers insights into the policy process. Several MSPs, the Committee Clerks and members of SPICE requested, and now receive, regular updates on CXC's activities and outputs.

Energy

2. Unconventional gas seminar

This information session was run jointly by CXC, the Royal Society and the Royal Academy of Engineering for Scottish Government policy teams. The seminar raised awareness amongst policy teams of the 2012 joint academies report by the Royal Society and Royal Academy of Engineering, and the work being undertaken by Glasgow and Strathclyde Universities on unconventional gas, including under CXC.

3. Energy policy workshops

Two half day workshops - [*Energy and the publics: attitudes, behaviours and policy*](#) and [*Energy System in Transition: Technology, Infrastructure and Investment*](#) were hosted in partnership with the UK Energy Research Centre. The first event presented recent research findings on attitudes, behaviours and governance at individual and community-levels. The second discussed recent analysis by leading UK energy researchers, and considered ongoing research, policy and strategy challenges. Leading researchers, policymakers, business and third sector stakeholders considered effective policies for demand reduction and decarbonisation for Scotland and the UK.

Forestry

4. Woodland biodiversity meeting

CXC researchers from the James Hutton Institute and Forest Research presented the CXC Woodlands project at the Biodiversity and Woodland Ecosystems meeting in March 2014 at Silvan House. Participants included members of the Scottish Government, the Welsh Government, Forestry Commission Scotland, Forest Enterprise Scotland, RSPB, SNH, Oxford University, Natural Resources Wales, the James Hutton Institute, Forest Research, and the Royal Botanic Garden Edinburgh. Discussion focused on current and

emerging issues in woodland policy and management, and the research needed to address these.

Natural Environment

5. Workshop on peatland research priorities

CXC hosted [this workshop](#) in February 2014 with the aim of identifying the key knowledge gaps in the development and implementation of land use policy regarding peat. The workshop brought researchers together with representatives from SNH, SEPA and the Scottish Government. A key outcome of the workshop was an agreement to establish a cross-sectoral group to champion and bring together peatland policy and research.

6. Scottish Wildfire Forum

The Scottish Wildfire Forum was re-launched in October 2013. CXC researchers from the University of Dundee introduced CXC's Adaptation Indicators project to Forum members. CXC continues to be represented at SWF meetings to integrate the implementation of wildfire prevention/management/policy into the CXC Adaptation Indicators where appropriate and to promote the need to collate data which can inform both our work and policy delivery.

7. Workshop on Bayesian approaches to risk assessment

This workshop was part of CXC's work with SNH on assessing climate change risks to notifiable features. It allowed CXC members from the James Hutton Institute to introduce SNH staff to the concept of Bayesian modelling techniques and explored their potential use by SNH to identify and prioritise risks.

Agriculture

8. Food security and GHG mitigation seminar

This seminar engaged policymakers from a wide range of Scottish Government teams to address how Scotland may achieve a balance between food security and climate change mitigation. CXC experts from the University of Aberdeen and the Rowett Institute of Nutrition and Health presented the key challenges to be addressed. Participants from the Scottish Government identified the need for greater cross-policy collaboration on food security and mitigation issues.

9. Workshop on carbon sequestration in grassland

CXC jointly hosted this stakeholder workshop with the Scottish Government's Agriculture and Climate Change Team, bringing together CXC researchers (James Hutton Institute, SRUC and HEIs), agricultural consultants and industry bodies, to identify existing knowledge around the role that agricultural soils may play in achieving the Scottish Government's emissions reduction targets. The workshop explored the potential of agricultural industries to become carbon neutral as well as issues around soil carbon calculation and trading.

The workshop identified research areas that should be considered for the next Strategic Research Programme funding period.

10. International Conference on Sustainable Intensification in Agriculture

Members of CXC from SRUC and the University of Aberdeen organised and presented work at a conference that highlighted the climate change interactions and implications of sustainable intensification. CXC members presented [key note lectures and papers](#). Over 200 experts and policy makers from 30 countries tackled themes including food security and food waste, greenhouse gas mitigation, adapting to climate change, and the social, economic and physical constraints that can make changing behaviours so difficult. The success of the conference has created such a legacy that some of the international attendees are planning to organise a second conference in this series, proposing it as a biannual event.

4.1.2 Policy relevant outputs

Energy

1. Report: Community benefits from offshore renewable developments

CXC reviewed examples from the UK and overseas of where communities and community groups benefit financially from offshore renewable energy projects. The case studies [identified in this report](#) have provided the Scottish Government with lessons on how such models might be employed to benefit communities and community groups in Scotland. Delivered by the University of Strathclyde. Contact: Sue Kearns.

2. Report: Legal compensation frameworks for wind farm disturbance

By reviewing existing UK and Scottish legislative frameworks, [this report](#) identifies the current legal avenues available to householders seeking compensation for disturbance caused by wind farms and any associated loss of property value. The analysis has contributed to policy teams' ongoing thinking and may assist the Scottish Government in identifying best practice or alternative approaches to compensating householders. Delivered by the University of Edinburgh. Contact: Sue Kearns.

3. Briefing note on public perceptions on fracking in the UK

This briefing note summarised and assessed current knowledge about the UK public's perceptions of unconventional gas extraction by hydraulic fracturing. The report was delivered to the Scottish Government's Working Group on Unconventional Gas. A CXC member currently sits on the Working Group and is undertaking subsequent research to inform the group's work on this subject. Delivered by the University of Strathclyde. Contact: David Ritchie.

Forestry

4. Report: Future options for forest carbon markets in Scotland and the UK

[This report](#), delivered to the Forestry Commission, identifies the potential for Scottish forest owners to benefit from the carbon value of their forests through carbon markets. The report recognises that opportunities for UK forest owners to participate in forest carbon markets are currently limited and presents Scottish policymakers with a range of options for improving access to markets. Delivered by the University of Edinburgh and the James Hutton Institute. Contact: Pat Snowdon.

5. Briefing note: A simple guide to ecosystem services

[This brief](#) provides policy teams with a succinct introduction to the concept of ecosystem services. It also gives an overview of how the value of ecosystem services may be accounted for in measuring the positive and negative impacts of policy and practice. The guide was prepared in the context of research into the co-benefits of carbon mitigation in forestry. It will assist policymakers to reduce the risk of unforeseen consequences by applying

ecosystem services approaches to policy development. Delivered by the University of Aberdeen. Contact: Maida Ballarini/Chris Nixon.

Natural Environment

6. Monitoring climate change adaptation – risks to biodiversity

We have published an indicator card reporting on the climate change risk to biodiversity that 'generalist species will be more able to cope with climate change than specialist species' using the example of snow bed species. We are now publishing a second card, reporting on the biodiversity risk that 'species will be unable to track changing climate space' using the example of lichens and ancient woodlands. Delivered by the University of Dundee and Royal Botanic Garden Edinburgh. Contact: Mary Christie

7. Wetlands GHG accounting: assessment of the IPCC 2013 Supplement Guidelines

CXC have provided an assessment of the IPCC's proposed "2013 Supplement to the 2006 Guidelines: Wetlands", which will enable Scotland to report GHG emissions from both wetland drainage and peatland restoration activities. The report reviews the emission figures provided in the new Guidelines and compares these figures with emission figures from earlier briefings provided to the Scottish Government. The report identifies differences in the emissions factors quoted, considers whether the IPCC Tier 1 emission factors are appropriate for use in Scotland, and whether improved emission factors could be developed for Scottish peatlands. Delivered by the James Hutton Institute. Contact: Liam Kelly.

8. WISE Peatland Choices - A decision support tool for peatland restoration in Scotland

CXC is developing the [WISE Peatland Choices](#) decision support tool to assist in identifying areas where peatland conservation and restoration may be most desirable. The tool will assist Scottish policy makers and land managers to achieve the best outcomes from Scotland's peatland targets. The tool is currently available for testing and comment. Delivered by the James Hutton Institute. Contact: Neil Ritchie.

9. SNH Trend Note: Modelling the impact of climate change on birds

CXC continues to work with SNH to monitor how Scotland's wildlife and notifiable features are changing over time. CXC produced a [Trend Note for breeding farmland birds](#), which was published on SNH's website in October 2013. The Trend Note identifies targeted management regimes which, if applied at an appropriate scale, may benefit farmland birds. Delivered by the University of St. Andrews, the James Hutton Institute and BioSS. Contact: Mary Christie.

Agriculture

10. SRDP impacts on carbon mitigation in Scotland

CXC reviewed the impact of the agri-environment options of the Scotland Rural Development Program in relation to greenhouse gas emissions. [This report](#) presents the Scottish Government with an assessment of the climate impact of current SRDP options and potential additional benefits that may be targeted in the next programme funding period. Delivered by SRUC. Contact: Jonathan MacLure/Susan Turpie.

11. Implications of climate change on animal health

CXC researchers have been engaging Scottish Government policy teams on the implications of climate change on animal health. This has included presentations to the Minister, Paul Wheelhouse MSP, on 'Liver fluke environmental & animal health issues' (Jan, 2014) and wider public/policy engagement. A briefing has also been prepared for the Agriculture & Climate Change Policy Team of Scottish Government, on subject of 'Liver fluke - environmental and animal health issues' (May 2013). Delivered by the Moredun Research Institute. Contact: Antje Branding.

Built Environment

12. Workshop Report: Climate resilience for the Scottish built environment

CXC brought together practitioners, policy makers and academics working in the built environment sector to explore what enabling measures are required in order to create a resilient built environment in Scotland. CXC produced a [workshop report](#) synthesising expert recommendations, which was presented to the Scottish Government and workshop attendees and discussed at a further meeting with the Scottish Government policy lead. Delivered by Heriot-Watt University. Contact: Jim McGonigal.

General

13. ISM Behaviours Tool

The CXC Secretariat and researchers contributed to the final stages of development of the Scottish Government's [ISM Influencing Behaviours toolkit](#). We have been involved in facilitating both training workshops and policy change processes. Delivered by the Secretariat. Contact: Jackie Horne.

4.1.3 Impact on policy

Adaptation Policy

1. Monitoring the Scottish Climate Change Adaptation Programme (SCCAP)

CXC's adaptation indicators research has been drawn on extensively to support development of the SCCAP. Through an initial [series of briefs](#) (for example, *Principles and Features of a Good Adaptation Strategy*) CXC researchers established a good working relationship with SCCAP policy leads. CXC's indicators framework document was used by sector teams to help them develop an initial set of objectives and metrics for annual reporting.

CXC has brought forward its indicator work and widened its focus to ensure that CXC's indicators will underpin the independent assessment of the SCCAP. Delivered by the Royal Botanic Garden Edinburgh and University of Dundee. Contact: Susan Wallace.

2. Equalities impact assessment of the SCCAP

CXC undertook an Equalities Impact Assessment of the proposed measures to be included in the SCCAP. In providing an assessment of these measures, CXC (Crichton Carbon Centre) produced a matrix of the policies and proposals to be included in the Programme. This matrix presents the policies and proposals in a way that clearly shows the spread of different policy types and how they fit together. This was used by the policy team to help rationalise the draft SCCAP document and make it more coherent. Delivered by the Crichton Carbon Centre. Contact: Susan Wallace.

Energy

3. Report: Community energy in Scotland – the social factors for success

[This report](#) identifies the social factors which influence the success of community energy projects through the various stages of development, from idea to operation. The findings are assisting the Renewables Routemap Team to identify measures to promote the uptake and secure success of community renewable energy projects, and by Local Energy Scotland to support their programme of service improvements. The Renewables Routemap Team has commissioned subsequent research through CXC to explore further policy options. Delivered by the University of Edinburgh. Contact: Sue Kearns.

4. Equalities impact assessment of gender and other diversity issues in the Scottish renewables industry

In March 2013 the Renewables Routemap team asked CXC to develop and deliver an equalities monitoring methodology for the Scottish renewables industry. CXC researchers designed a methodology and [produced a report](#) based on voluntary disclosure on gender and other equality and diversity issues in the Scottish renewables industry. The report was included in the 2013 update to the 2020 Renewable Routemap for Scotland and the

methodology will now be used for annual reporting by the Scottish Government. Delivered by the Crichton Carbon Centre. Contact: Sue Kearns.

5. Review of separation distances for onshore wind farms

Upon request from the Planning Division, CXC commissioned [a report](#) to examine the evidence base for the existing 2km separation distance between houses and wind farm developments, currently required by the Scottish Planning Policy (2010) (SPP). This report was provided in September 2013 and informed the Scottish Government's Position Statement on progress towards a revised SPP, to accompany laying of the proposed NPF3 in Parliament. In a post-enquiry response questionnaire, the policy lead said "the report has provided a good evidence base, which will be used to provide Ministers with final policy options for decision in July 2014". Delivered by the University of Dundee. Contact: Graham Marchbank.

Natural Environment

6. Evidence to Rural Affairs, Climate Change and Environment Committee (RACCE)

CXC has contributed to policy development by providing evidence to the RACCE committee of the Scottish Parliament. CXC's Science Director presented evidence to the Committee's 12th meeting. This evidence informed the Committee's consideration of the importance of peatlands for carbon mitigation. The same meeting of the Committee considered the evidence presented by CXC in our *Potential Abatement from Peatland Restoration* report, which was referenced by the Minister for Transport, Infrastructure and Climate Change in his letter to the meeting convener.

RACCE also heard evidence provided by CXC Directorate member, Professor John Rowan in October 2013, to inform its consideration of the Scottish Government's draft Climate Change Adaptation Programme.

7. Report: Potential abatement from peatland restoration

A [series of CXC reports](#) assessing the net potential GHG abatement benefits from peatland restoration in Scotland was used by policy officials preparing the second Report on Proposals and Policies (RPP2). As indicated at the time by the policy lead, CXC's report fed directly into the development of RPP2, providing those managing the inventory with a clearer sense of the abatement potential of Scotland's peatlands. CXC's reports have also been used by SNH in their analysis of the abatement potential of peatland restoration for the National Peatland Plan (under development). Delivered by the James Hutton Institute. Contact: Neil Ritchie, Des Thompson.

8. Scotland Rural Development Programme (SRDP) Targeting Project

The SRDP Targeting Project was established to ensure that funding under the agri-environment-climate and forestry schemes in the 2014-20 SRDP is directed to the commitments with the greatest potential to deliver policy outcomes and value for money. The Scottish Government asked CXC to form

a climate change sub-group, to produce spatial targeting maps and criteria for SRDP options with a potential climate impact. These outputs are feeding directly into the development of options for the 2014-2020 SRDP. Members of CXC also sit on the project Steering Group, which will report final recommendations to the Implementation Group. Delivered by SRUC and the James Hutton Institute. Contact: Susan Turpie.

Transport

9. Transport Scotland Road Asset Management Plan: perceptions of transport disruption surveys

Transport Scotland requested support from CXC in formulating survey questions to be used in identifying road users' attitudes towards disruptions in travel due to severe weather. This CXC project informed Transport Scotland's 'Perception of the trunk road network' report – published in September 2013. The survey is enabling Transport Scotland to track public perceptions of disruption due to weather events, understand how this is changing and therefore whether adaptation measures need to be changed. This will inform Transport Scotland's policy planning and adaptive management. Delivered by the University of Aberdeen. Contact: Stephen Thompson.

4.1.4 Benefits to other stakeholders

General

1. Cinema Sark art/science collaboration

Inspired by the Ecosystem Services Modelling undertaken by CXC, [Cinema Sark](#) flows from six months of filming, discussions and collaboration between video artist John Wallace and CXC Science Director, Professor Pete Smith.

Cinema Sark uses video, found sound, archive materials and interview audio to explore connections between the Sark's ecosystems and the people who live and work in them.

John Wallace has been awarded a bursary by Creative Arts Scotland to further develop this collaboration.

Energy

2. Community energy research and stakeholder workshop

The CXC Secretariat hosted a stakeholder workshop in November 2013, bringing together Scottish Government, academics and community energy charities (Local Energy Scotland, Community Energy Scotland, SCENE). This workshop provided an overview of current research and identified knowledge gaps. Local Energy Scotland are using the issues identified during this workshop, as well as those presented in CXC's report *Community energy in Scotland: the social factors for success* to inform their delivery of Community and Renewable Energy Scheme (CARES) grants. The workshop's outputs also informed participant organisations' future research planning.

Forestry

3. Demonstrating adaptation - climate ready forestry workshop – October 2013

This [workshop](#), held in October 2013, focussed on the key climate change threats facing Scotland's forests. It provided an opportunity for the forest sector from across Scotland to share experiences of adapting to climate change, to consider best practice, and to identify key knowledge gaps. Participants were presented with the experiences of forest managers at Queen Elizabeth Forest Park, the first site in Scotland's Climate Ready Forest Network. The workshop was hosted in partnership with Forest Research and Forestry Commission Scotland and was attended by a range of forest practitioners, managers, planners, forest owners and policy advisors. The Climate Ready Forest Network is being further supported by web resources, videos and literature.

Agriculture

4. Guiding the Agricultural Industries Action Plan

CXC researchers from SRUC continue to engage/advise the [Agricultural Industries Action Plan](#), including participating in industry workshops and preparing headline results on how to mitigate GHG emissions from agriculture. The aim of the Action plan is to identify routines to “tackle climate change by reducing... greenhouse gas emissions by three million tonnes of CO₂ equivalent per year from 2018-2022 from English agriculture.” The Action Plan group has links with initiatives in the devolved administrations, including “Farming for a Better Climate” in Scotland. Contact: Antje Branding, Jane Salter (Agricultural Industries Confederation)

Built Environment

5. Adaptation best practice workshops

CXC, in collaboration with the Initiative for Carbon Accounting (ICARB), held three workshops aimed at sharing best practice knowledge among practitioners in the built environment sector. The workshops focussed on the themes of Solar Design; Thermal Comfort and Climate Ready Design; and, Resilient Construction. The workshops were attended by a range of practitioners, who gained knowledge of current best practice adaptation measures.

4.2 Collaboration and Multidisciplinary Working

4.2.1 Collaborations

Adaptation Policy

1. Adaptation Indicators

CXC is developing a set of indicators to assess how adaptation is making a difference in Scotland through our [Adaptation Indicators Project](#). Academics from the Royal Botanic Garden Edinburgh, Forest Research, the University of Dundee and the James Hutton Institute are working together to produce a suite of indicators that will inform the independent assessment of the Scottish Climate Change Adaptation Programme (SCCAP) being produced by the Adaptation Sub Committee (ASC) of the UK Committee on Climate Change. CXC is also collaborating with the UK Met Office to produce a summary of climate information for the headline cards. CXC has brought in expertise from non-member HEIs as part of the wider project team. In particular, CXC is working with the Marine Alliance for Science and Technology for Scotland (MASTS), using CXC's methodological framework and applying this to the marine environment.

2. Demonstrating adaptation in practice

CXC continues to work with a range of stakeholders to showcase adaptation to climate change. This year, CXC (Heriot-Watt University) has worked with Forestry Commission Scotland (FCS) to develop [a number of films](#) demonstrating how climate change might affect Scotland's forests, and providing guidance on how to increase resilience to climate change threats. The films are hosted on the FCS website.

CXC is also working with stakeholders to develop 12 demonstration case studies, showing current examples of adaptation in Urban Resilience, Forestry and Land Management. These are being displayed on the [weADAPT Case Study map](#).

Energy

3. Citizens' juries on onshore wind farms

This [project](#) is coordinated and part-funded by CXC and brings together non-CXC researchers from the University of Edinburgh, University of West of Scotland and Queen Margaret University in collaboration with CXC members in the Secretariat and University of Strathclyde. The research uses a citizens' jury approach to look at how we can find new ways of involving citizens when making decisions about complicated issues that may affect them. The project team has planned and delivered three separate citizens' juries of two days each. The social science project is producing a first report in April 2014 and a complete report for policy makers in autumn 2014. Several joint journal articles and conference papers are also being produced.

Forestry

4. Woodlands research

CXC's ongoing woodlands project builds on existing work in the RESAS Strategic Research Programme (SRP), specifically the work on soil carbon and woodland expansion for multiple benefits, by focusing on the implications of different woodland planting scenarios in different areas of Scotland for net Global Warming Potential. Institutional collaboration includes (a) the James Hutton Institute, which is providing soils and climate datasets, biophysical and economic modelling expertise, and project coordination, (b) the University of Aberdeen, which is providing soil carbon modelling expertise with the ECOSSE model, and (c) Forest Research, which is contributing woodland biomass and carbon modelling expertise.

Natural Environment

5. Biodiversity risk assessment

This project looks at how to develop an assessment of the risks posed to [Scotland's Notifiable Features](#) by a changing climate. It has been developed jointly by CXC and staff from SNH. This is a collaborative project involving input from researchers in BioSS, the James Hutton Institute, the Universities of Aberdeen, Edinburgh and Glasgow, and from SNH staff. This assessment will enable prioritisation of conservation action with respect to adapting to/mitigating the effects of climate change on notifiable features in Scotland.

6. Biodiversity modelling

CXC's ongoing biodiversity modelling work involves collaboration between researchers at St Andrews University, BioSS, the British Trust for Ornithology (BTO) and staff from SNH. Collaboration between these institutions has been essential in developing the SNH's [Trend Note](#) on Breeding Farmland Birds in Scotland and subsequent work relating observed trends in abundance to weather variables.

Agriculture

7. Scotland Rural Development Programme Targeting Project

CXC has formed a climate change sub-group, producing spatial targeting maps and criteria for SRDP options with a potential climate impact. The sub-group consists of the Secretariat, James Hutton Institute and SRUC. CXC is also a member of the project Steering Group, working with the Scottish Government, SNH, SEPA, CREW, RSPB and others to develop targeting recommendations for 2014-20 SRDP.

8. Linking Strategic Programme researchers to Met Office research

Researchers from Strategic Research Programme, CREW and CXC attended and presented results at a workshop on joint working with the Met Office (November, 2013). Researchers discussed how the science on

climate/weather impacts being undertaken in Theme 3 can be used to guide policy. The workshop was attended by ~20 delegates working in biodiversity, water, climate, soil and animal sciences. The workshop provided opportunity for interaction, discussion and brainstorming. The collaboration with the Met Office will be taken forward in 2014/15 with exchange visits and joint projects.

Built Environment

9. Climate adaptation for the built environment

As part of an evolving collaboration between CXC researchers and others working on adaptation in the built environment, CXC researchers presented [CXC's Adaptation Indicator Project](#) at the University of Dundee-hosted event *Urban Indicators: Transformation and Climate Proofing - Bridging the Policy/Practice Divide*. CXC researchers are also collaborating with a range of practitioners and researchers on a scoping study on urban raingardens and a project on the urban heat island effect and green infrastructure.

Economy

10. Economic modelling

Researchers at the Fraser of Allander Institute and James Hutton Institute have complementary skills in relation to economic modelling. Over the past reporting year there has been a significant effort to increase interactions between the modelling teams to ensure that modelling capability across CXC economics is beyond that which would be achieved working individually. This modelling capability has been used for CXC's research report *The current economic scale of community and locally owned renewable energy in Scotland and projections to 2020*, due for publication in May 2014.

5. PROGRESS REPORTS ON ACTIVITIES

5.1 Energy

CXC's energy related work has been primarily delivered through the Call-down service or co-developed in response to the needs of Scottish Government policy teams and public bodies. Distinct research projects have been undertaken for policy teams including the Renewables Routemap Team and Planning Division. Work is also currently under way for the Climate Change Energy Research Team, Energy Efficiency and Low Carbon Economy Unit, OCEA and SEPA.

Research undertaken by CXC this year has informed policymakers in the areas of renewable energy, heat, unconventional gas, energy efficiency and consumer behaviours.

Deliverable 1. Renewables (Sept 2013 rating: GREEN; April 2014 rating: GREEN)

- Community energy in Scotland: the social factors for success (Oct 2013)
- Community benefits from offshore renewable developments (May 2013)
- Legal compensation frameworks for wind farm disturbance (June 2013)
- Voluntary disclosure on gender and other equality issues in the Scottish renewables industry (Oct 2013)
- Review of the economic impact of community renewables (delayed (AMBER), now due May 2014)
- Impacts of wind farms on property prices (on track, due June 2014)
- Citizens' juries – onshore wind farms (on track, due Oct 2014)
- Lifecycle emissions and costs of wind energy (on track, due May 2014)
- Wind farm impacts study (on track, due Autumn 2014)
- Community engagement good practice review (on track, due Oct 2014)
- Literature review on energy storage (delayed (AMBER), due May 2014)

Deliverable 2. Planning and Regulation (Sept 2013 rating: GREEN; April 2014 rating: GREEN)

- Review of separation distances for wind farms (Sept 2013)
- Renewables carbon calculator: extending the carbon calculator for windfarms (slightly delayed (AMBER), due July 2014)
- Life-cycle assessment of GHG emissions from unconventional gas (on track, due May 2014)

Deliverable 3. Energy Efficiency (Sept 2013 rating: GREEN; April 2014 rating: GREEN)

- Household energy efficiency behaviours – evidence review (April 2014)
- Advice on the Heat Generation Policy Statement (Dec 2013)
- Energy productivity – international comparisons (additional work requested, due Sept 2014)

5.2 Forestry

5.2.1 Woodland expansion

CXC's woodlands expansion work aims to identify the GHG benefits of conversion to different types of woodland, and assess the impact of woodland expansion on agricultural production, rural livelihoods, and other ecosystem services.

Deliverable 1. Modelling C stock changes (Sept 2013 rating: GREEN; April 2014 rating: GREEN)

- Soil C stock change data & maps; current land use maps; yield maps for four Forest Management Alternatives (May 2013 – April 2014)
- Briefs on: agroforestry's potential mitigation contribution (due May 2014); and, barriers to increased woodland planting on farms (April 2014)

Deliverables 2 & 3. Economic analysis of woodland planting & Scenarios of future land use change and climate change (Sept 2013 rating: AMBER; April 2014 rating: AMBER)

- Delayed due to staff availability. Agricultural economist recently recruited and activities re-prioritised - issues expected to be resolved.

In agreement with FCS, CXC is refining estimates of annual forest cover loss, specifically trees felled for development through planning consents.

5.2.2 Forest adaptation

The forest adaptation project is communicating key learnings on adaptation to the sector, including forest managers and policy leads.

Deliverable 1. Demonstration facility: Queen Elizabeth Forest Park (QEFP) (Sept 2013 rating: GREEN; April 2014 rating: GREEN)

- QEFP launched as an adaptation demonstration facility (Oct 2013)
- Case study on the impacts of adaptation management decisions on ecosystem services in future climate scenarios at QEFP (due Aug 2014)

Deliverable 2. Communication (Sept 2013 rating: GREEN; April 2014 rating: GREEN)

- Webinars, decision support tools, web content and films on FCS, FC, CXC, FR and weADAPT websites (delivered July 2013 - April 2014)

Deliverable 3. Flexible Adaptation Pathways scoping study (Sept 2013 rating: GREEN; April 2014 rating: GREEN)

- Report: Flexible Adaptation Pathways (FAP) for Native Woodlands (Oct 2013); workshop with SNH to discuss applicability (Nov 2013)
- Report: The Potential Use of a FAP Framework (March 2014); follow-up workshop (on track, May 2014)

5.3 Natural Environment

5.3.1 Peatlands

The peatlands project aims to deliver practical tools to support achievement of Scotland's emissions reduction targets and the aims of the 2020 Biodiversity Challenge.

Deliverable 1. WISE Peatland Decisions Tool (Sept 2013 rating: GREEN; April 2014 rating: GREEN)

- Stakeholder workshop with SNH (Sept 2013)
- 1st version of the WISE tool completed; road-testing workshop (Oct 2013)
- Model site condition data (Dec 2013); on-the-ground validation (on track, due 2015)
- Revised tool and report on CXC website (Jan 2014)
- Incorporate uncertainty (delayed to Aug 2014); simplistic fragmentation / connectivity assessment (delayed to Jul 2014) and climate sensitivity (on track, due 2015)

Deliverable 2. Statistics on government spend on restoration measures vs peat carbon stock (Sept 2013 rating: AMBER; April 2014 rating: AMBER)

- Data received late (delayed to April 2014)

In agreement with RESAS, resources were diverted from the above deliverables and one other (a scoped methodology for reporting on WISE as a Mitigation in Action tool - AMBER) to a Call-down request to assess proposed IPCC guidelines for use in GHG accounting of Scottish peatland. This two-part report was delivered on time.

5.3.2 Biodiversity

CXC's work in this topic area is developing risk assessments to enable prioritisation of conservation action for adaptation of notifiable features, and modelling to uncover the effects of weather variables on bird species and communities.

Deliverable 1. Risk Assessment Framework (Sept 2013 rating: GREEN; April 2014 rating: GREEN)

- Develop and test basic assessment framework; report to SNH (Sept 2013)
- Integrate uncertainty into climate projections; improve categorisation of biotic features and assessment approach for Earth Science features (on track, due late 2014)

Deliverable 2. Farmland Community SNH trend note (Sept 2013 rating: GREEN; April 2014 rating: GREEN)

- Trend note published by SNH (Oct 2013)
- Incorporate drivers e.g. future climate change into the models of bird species abundance and biodiversity (on track, due 2014)

5.4 Agriculture

The aims of CXC's agriculture work are to improve understanding of the potential impacts on agricultural production and food security of climate change, and to increase knowledge of the mitigation potential in the agricultural sector.

Deliverable 1. Food Security (Sept 2013 rating: GREEN; April 2014 rating: AMBER)

- Food security and climate change mitigation workshop (June 2013)
- Reports: Breeding for Climate Change, focused on the potato and barley industries (June 2013)
- Report: Potential Impact of Future Wind Speeds on Spatial Spread of Crop Pathogens in Scotland (April 2013)
- Report: Assessment of the food safety and animal health implications of climate change effects on crops and livestock (July 2013)
- Risk mapping: estimating the risk posed by sheep pathogens (*Haemonchus contortus*) across the UK under the effects of climate change (On track, due 2015)

The Post-Doctoral researcher modelling the effects of international factors on Scottish food purchase and consumption is moving on in April 2014. In agreement with RESAS, the position will not be filled.

Deliverable 2. Crops and Livestock (Sept 2013 rating: GREEN; April 2014 rating: GREEN)

- Presentations and workshop on carbon sequestration in grassland with Scottish Government and industry (Nov 2013)
- Hosting the Inventory and Measurements Group of the Global Research Alliance which aims to improve greenhouse gas quantification and measurement (Dec 2013)
- Report: Modelling the carbon abatement costs and potential from perennial energy crops; and workshop presentation (Feb 2014)
- Adaptation Indicators for agriculture (on track, due Dec 2014)

In agreement with RESAS, from April 2014 the Moredun Research Institute (MRI) will no longer directly receive funding under CXC, but MRI researchers will still collaborate on projects as appropriate on an ad hoc basis.

5.5 Built environment

CXC carries out a limited amount of built environment research. Our present focus is on providing case studies and analysis of on-the-ground adaptation, to demonstrate adaptation policy in practice in the urban environment.

Deliverable 1. Demonstrating adaptation in practice (Sept 2013 rating: GREEN; April 2014 rating: GREEN)

- Workshop report to provide practitioner and expert views on adaptation for policy makers. Report: Creating an 'enabling environment' for the creation of a resilient built environment in Scotland (May 2013)
- Three workshops to share best practice in adaptation and to build up sector stakeholder groups for future data collection (June 2013)
- Workshop with Planning Aid Scotland and planners to identify key issues in embedding adaptation issues into planning decisions and planning frameworks (Sept 2013)
- Workshop and knowledge exchange on flood re-instatement and loss prevention strategies with stakeholders including the Scottish Flood Forum Glasgow SDP and City of Edinburgh Council (Sept 2013)
- WeADAPT case studies on urban resilience, including urban raingardens and green infrastructure to mitigate the urban heat island effect (on track, May 2014)

5.6 Economy

CXC's economy work supports understanding of the macro economic effects of current and potential low carbon policy changes in Scotland.

Deliverable 1. Call Down Projects (Sept 2013 rating: GREEN; April 2014 rating: AMBER)

- Economic benefits of community renewables (delayed to April 2014)
- Distributional impacts of carbon taxation (slightly delayed, due June 2014)

Deliverable 2. Energy-environment-economy modelling (Sept 2013 rating: GREEN; April 2014 rating: GREEN)

- Presentation at David Hume Institute, "Independence and the market for electricity in Scotland", building on work including that done under CXC (May 2013)
- Hosted workshop: Data requirements for understanding the electricity (including renewables) sector in Scotland. Attendees from Scottish Government, Scottish Renewables and academia (Sept 2013)
- Brief: Understanding employment in low carbon and renewable activities in Scotland (on track, due Aug 2014)
- Joint working between the University of Strathclyde and the James Hutton Institute on a common set of modelling questions, exploring opportunities to share modelling data and expertise (on track, 2015)

- Research on the economic impact of increased household energy efficiency and distributional analysis through disaggregation of household types (on track, due 2015)

5.7 Cross-Cutting Activities

CXC's Adaptation Indicators Project cuts across all topics. The project aims to support monitoring and reporting of adaptation progress in Scotland, and in particular is informing the independent assessment of the Scottish Climate Change Adaptation Programme (SCCAP) being undertaken by the Adaptation Sub Committee of the UK Committee on Climate Change.

In agreement with RESAS and policy leads, the project will develop a full indicators suite for all three themes of the SCCAP in 2014/15. This will mean delaying some more detailed work to produce indicator cards until later in 2015.

Deliverable 1. Adaptation Indicator suite for Scotland (Sept 2013 rating: GREEN; April 2014 rating: GREEN)

- Indicators for the Natural Environment SCCAP theme (on track, May 2014)
- Indicators for the marine sectors (on track, Dec 2014)
- Indicators for the Buildings and Infrastructure Networks SCCAP theme (on track, Dec 2014)
- Indicators for the Society SCCAP theme (on track, Dec 2014)