



**ClimateXChange**  
**Centre of Expertise on Climate Change**

**End of Programme Narrative Report 2011-16**

## Table of Contents

<b>1</b>	<b>EXECUTIVE SUMMARY</b>	<b>3</b>
<b>2</b>	<b>EXTERNAL CONTEXT</b>	<b>4</b>
<b>3</b>	<b>INTERNAL CONTEXT</b>	<b>5</b>
<b>4</b>	<b>OUTPUTS AND OUTCOMES</b>	<b>6</b>
<b>4.1</b>	<b><u>Energy</u></b>	<b>6</b>
4.1.1	Stakeholder engagement	6
4.1.2	Policy relevant outputs	7
4.1.3	Impact on policy	8
4.1.4	Benefits to other stakeholders	10
4.1.5	Collaborations	11
<b>4.2</b>	<b><u>Transport</u></b>	<b>12</b>
4.2.1	Stakeholder engagement	12
4.2.2	Policy relevant outputs	12
4.2.3	Impact on policy	12
4.2.4	Collaborations	13
<b>4.3</b>	<b><u>Forestry</u></b>	<b>14</b>
4.3.1	Stakeholder engagement	14
4.3.2	Policy relevant outputs	15
4.3.3	Impact on policy	16
4.3.5	Collaborations	17
<b>4.4</b>	<b><u>Natural Environment</u></b>	<b>18</b>
4.4.1	Stakeholder engagement	18
4.4.2	Policy relevant outputs	19
4.4.3	Impact on policy	20
4.4.4	Collaborations	21
<b>4.5</b>	<b><u>Agriculture</u></b>	<b>22</b>
4.5.1	Stakeholder engagement	22
4.5.2	Policy relevant outputs	23
4.5.3	Impact on policy	25
4.5.4	Benefits to other stakeholders	26
4.5.5	Collaborations	26
<b>4.6</b>	<b><u>Adaptation</u></b>	<b>27</b>
4.6.1	Stakeholder engagement	27
4.6.2	Policy relevant outputs	28
4.6.3	Impact on policy	28
4.6.4	Benefits to other stakeholders	29
4.6.5	Collaborations	30
<b>4.7</b>	<b><u>Capacity Building and Societal Change</u></b>	<b>31</b>
4.7.1	Stakeholder Engagement	31
4.7.2	Policy relevant outputs	32
4.7.3	Impact on policy	33
4.7.4	Benefits to other stakeholders	33
4.7.5	Collaborations	34
<b>5</b>	<b>List of acronyms</b>	<b>35</b>

## 1 EXECUTIVE SUMMARY

After five years in operation ClimateXChange (CXC) has become a trusted research partner for the Scottish Government and its agencies as they develop and implement policies on adapting to the changing climate and the transition to a low carbon society.

We have delivered 123 individual projects, though the real value of our work comes from the genuinely collaborative approach to project scoping and co-production of knowledge that we have developed from lessons learnt from setting up the Centre. Close working relationships with a range of Scottish Government policy teams have allowed us to pre-empt research needs as well as to proactively propose research and engagement work where we have seen an emerging need.

A substantial number of our projects have delivered evidence that has underpinned major policy documents on both mitigation and adaptation, for example the second Report on Proposals and Policies (RPP2) and Scotland's Climate Change Adaptation Programme (SCCAP). CXC continues to input excellent evidence and research into policy cycles both on a Scottish and a UK level.

Policy demand has driven the changes made to the CXC model through the programme period. The current model – focused on a co-produced multi-disciplinary research programme and knowledge brokering, and based on our learning from engaging with the policy and research community – differs significantly from the structure set up in 2011. The original structure had three workstreams – 'adaptation', 'mitigation' and 'risk and uncertainty' - with multiple-workstrands within each. This model lacked coherence overall as the workplans were generated by the researchers themselves without real engagement with the policy customer.

The CXC Directorate purposefully made changes to this model and instituted a project-based structure managed through the Secretariat. Those changes have enabled a body of work which is better focussed upon critical policy questions and better coordinated to the relatively short timescales of policy decision making.

Energy and adaptation are policy areas that have increased in priority through the period. This has been reflected in the number of projects, the number of researchers involved, and in the network of partners. CXC is a link to research networks on a UK, European and international level, and as such provides value far beyond our own membership and project outputs.

There has been substantial interest in the CXC model and how it has evolved. The renewed global commitment to action on climate change made at Paris generates new challenges for policy and research in Scotland and internationally. The current pressure on public spending, renewed political commitment to climate mitigation and the Public Bodies Duty reporting coming into force are increasing demand for CXC's input into decision making processes.

## 2 EXTERNAL CONTEXT

The external context for CXC's work has changed most markedly with the signature of the Paris Climate Change Agreement. The renewed global ambition that Paris signals, and the way in which that is already being taken up in Scotland will undoubtedly stimulate a new series of policy challenges and research questions to which CXC will seek to respond in the next programme.

In the first programme period, CXC responded to external changes on both the mitigation and the adaptation side of our remit. On mitigation, the main external driver for CXC was – and remains – the strong commitment to achieving dramatic emission reductions made by the Scottish Parliament in passing the Climate Change (Scotland) Act 2009. In CXC's second year, the requirement on the Scottish Government to produce the second Report on Proposals and Policies (RPP2) generated a series of complex research questions. CXC provided much of the evidence underpinning for RPP2.

In 2014, the Scottish Government's climate change analytical team moved from RESAS to OCEA. CXC's sponsor within Government became OCEA, with RESAS retaining responsibility for CXC's budget. In balancing the interests of OCEA and RESAS, CXC has benefited from a broader perspective on our work. The level of policy demand for energy research grew particularly following the introduction of OCEA's sponsorship role. Although we had already begun realigning resources to ensure good coverage of energy, 2014/15 marked a step change in demand for energy research and our ability to service that. We are now very well positioned for the next phase as a trusted science partner on both land use and energy mitigation research. We stand ready to feed world leading research and evidence into the development of Scotland's energy strategy and the energy efficiency National Infrastructure Priority.

On adaptation, the first UK Climate Change Risk Assessment (CCRA) was published early on in CXC's first phase. This triggered the drafting of the Scottish Government's response: the first Scottish Climate Change Adaptation Programme (SCCAP). CXC was directly involved in supporting policy officials across a range of sectors in interpreting the CCRA for Scotland. We worked with the climate change policy team to ensure the SCCAP drew on international best practice on adaptation planning and the latest research on adaptation monitoring and evaluation.

The adaptation policy cycle continues into CXC's next phase, with the second CCRA due in January 2017 and a second SCCAP required a year after that. CXC has built close collaborative relationships with policy leads on adaptation, including in the agencies, and with the new National Centre for Resilience, and is the Scottish policy community's go-to scientific partner on adaptation.

### 3 INTERNAL CONTEXT

CXC was initially structured around a programme of research in three workstreams, with a Directorate made up of workstream leads, three co-Directors and a Secretariat. Each workstream contained multiple workstrands, all heavily biased towards land use research and environmental science. In its first year, CXC's Commissioning budget (managed by the Secretariat) was £25,000 and was deployed to fill gaps in the expertise provided in the three workstreams.

At the end of our first year of operation, the Directorate initiated reviews of CXC's work and governance, and of our portfolio of Post Doc Fellows (PDRFs). We identified opportunities to improve the efficiency of our work in meeting policy knowledge requirements. In response, the Directorate and Secretariat, with the support of RESAS, substantially reshaped CXC's governance and research structure. The Steering Group was stood down. Our Policy Director instead started attending meetings of the Climate Change Delivery Board, allowing us to gain insight into forthcoming policy questions and to inform the Board of research requirements that could be met by CXC. Research project teams replaced our previous workstreams to focus on producing agreed policy-relevant deliverables within set timescales. Our portfolio of PDRFs was adjusted to meet our developing research priorities, including an increased focus on energy and transport, as described in the External Context section above. For the next Programme our Directorate has been re-structured to be closely aligned with the project resources sitting underneath it, and thus even better able to oversee CXC's research.

While our overall resources were reduced in our second year of operation, greater time was allocated to small, flexible research teams within key partner organisations. Capacity to draw on a wider pool of expertise was maintained through the commissioning budget. That budget was increased to £250k in 2014 and will increase again to £500k in the next Programme. As a result, CXC is better able to ensure cross-institutional working involving MRPs and HEIs on the basis of distinct projects. Larger, Secretariat-managed projects have achieved greater outcomes and impacts by enabling resources to be focused on explicit policy objectives. As our relationships with policymakers have evolved we been able to co-develop work that feeds directly into policy formulation.

A richer approach to sharing knowledge between experts and policy teams has developed over our first five years by drawing on a network of partners outwith our own membership. Through collaborative working and roundtable events we have purposefully engaged key centres of knowledge including RCUK Energy Programme Demand Centres, UKERC, UKCIP, Met Office Hadley Centre, ARCC, LWEC and the CCC. These relationships continue to strengthen, providing further insights and opportunities for impact as we enter the next Programme.

## 4 OUTPUTS AND OUTCOMES

### 4.1 Energy

Our work on energy over the past five years has informed policymaking across the areas of renewable energy, heat, energy storage, unconventional gas, energy efficiency and consumer behaviours. In 2015 we responded to an increased demand for energy research from Scottish Government by establishing four new post-doc positions focussed on energy policy, markets and energy system modelling. We continue to respond to the Scottish Government's local energy agenda by examining the social and economic impacts of low carbon local energy systems and ownership models.

#### **Supporting Policy and Practice**

##### **4.1.1 Stakeholder engagement**

###### 1. UK Energy Research Centre: Seminar Series

CXC has built a strong relationship with the UK Energy Research Centre. This relationship enabled us to co-host a series of seminars, bringing leading UK academics to present Scottish audiences with the latest research on energy technology, infrastructure and innovation. Seminars presented by Professor Jim Skea CBE, Professor Jim Watson and a number of other experts have been attended by a total of more than 150 delegates, representing Scottish Government, regulators, local government, and industry bodies. Seminar topics have included [Innovation, technology and infrastructure investment](#), and [attitudes and behaviours](#). Engagement with UKERC will lead to a heat-focussed mini conference during the next programme.

###### 2. Engagement with OCEA: energy systems modelling and analysis

In October 2014 CXC energy researchers met Scottish Government OCEA and energy policy staff to map CXC's research capability on energy systems modelling and analysis, and the Scottish Government's research needs. This gave OCEA a solid understanding of CXC's capability, enabling CXC and OCEA to agree a work plan for CXC's energy post doctoral fellows. CXC fellows and their supervisors have since met regularly with and worked alongside OCEA analysts. This ongoing engagement is enabling CXC's research to be tailored to meet policymakers' evolving needs and will shape the post-doctoral and commissioned research under the next programme.

###### 3. Energy-economy-environment modelling: engagement series

CXC economists and Scottish Government staff met regularly in a series of meetings organised through 2014. These meetings gave OCEA and the Renewables Policy Team staff a greater understanding of CXC's work on multi-

sectoral, energy-economy-environment modelling. CXC economists provided staff with an overview of CXC's capacity to model the economic and environmental impacts of policy interventions related to resource productivity, renewable energy and carbon mitigation. CXC's work plan has been adapted to further align future research with Scottish Government priorities as a result of this engagement. Engagement with the Scottish Government's Renewables Policy Team initiated a significant multi-institutional project for CXC, which will assess the economic impact of initiatives supported through the Local Energy Challenge Fund. This project will continue into the next programme.

4. Unconventional Gas Extraction in Scotland - An update for Policymakers, Planners and Regulators (2014)

This [event](#) was the result of collaboration between CXC researchers and SEPA in developing the [Life-cycle assessment of GHG emissions from unconventional gas extraction in Scotland](#). The project revealed the need to provide Scottish policymakers, regulators and planners with an update on a number of recent research and policy developments relating to unconventional gas extraction in the Scotland. Over sixty participants including from Scottish Government, Local Government, industry, community groups and campaigners attended the event. Participants benefited from the presentation of CXC's report, as well as recent work undertaken by the British Geological Survey, DECC and the Scottish Government's Independent Expert Scientific Panel on Unconventional Oil and Gas.

#### 4.1.2 Policy relevant outputs

1. Energy storage in Scotland (2013 and 2015)

These [two reports](#) reviewed the state of technological and market development in the context of Scotland's energy policy ambitions. They covered thermal energy storage and electrical energy storage respectively. Insights from these reports helped support thinking on integrated energy policy. The author of the report on thermal storage will present this work at the 2016 Scottish Renewables Low Carbon Heat Conference. Contact: Gordon Patterson

2. Assessing the life cycle costs and carbon emissions of wind power (2014/15)

[This report](#) assisted policymakers to understand the potential of onshore and offshore wind to deliver affordable, low carbon energy in Scotland. OCEA staff reported that this study provided a 'frank and clear' assessment of the range of academic estimates of the life cycle costs and emissions of wind energy, and the evidence on which these estimates are based. Contact: Mike King.

3. Comparative study of international energy efficiency interventions (2016)

[This study](#) informed the Scottish Government's work on energy efficiency in the housing sector. The study analysed energy efficiency regulations, schemes, support programmes, incentives and fiscal levers in other European countries, top performing American states and selected countries with relevant experience. The report and findings were presented to Scottish Government staff in a seminar held in April 2016. Contact: Debbie Sagar, Gareth Fenney.

4. Improving Energy productivity in Scotland (2015/16)

This review of Scottish Government and international practice presented an overview of government initiatives that relate to energy productivity in the industrial and commercial sectors. The report identified opportunities for Scotland to improve energy productivity, suggesting potential policy interventions. Contact: Kathie Robertson.

5. Community benefits from offshore renewables: good practice review (2014/15)

[This report](#) explored the methods used in the UK and Europe to distribute the benefits from offshore energy developments. It was delivered to Local Energy Scotland and the Renewables Policy Team, to inform development of advice for developers and communities. The report provided insights into how communities may best be identified, how impact is perceived and how benefits may best be apportioned. Contact: Sue Kearns/Jennifer Ramsay.

6. TIMES Model (2015/16)

OCEA has commissioned a TIMES energy-environment model for Scotland to provide a quantitative understanding of the economy-wide implications for greenhouse gas emissions to 2050 from policy choices on energy and land use. Policy Director (Andy Kerr) was a member of the steering group, helping to advise OCEA as the modelling framework was developed, and providing an ongoing bridge to the wider academic community as the model is applied. Contact: Colin MacBean.

### **4.1.3 Impact on policy**

1. Heat Policy Statement

In 2012, the CXC Secretariat, Directors and researchers engaged with the Renewables Routemap team in the early stages of developing the *Heat Vision for Scotland*. The same team then drafted the framework for 'Heat scenarios for Scotland', which informed the content of the Draft Heat Generation Policy Statement (foreunner of the Heat Policy Statement). Contact: Sue Kearns, Susie LeMiere.

## 2. Secondments – Scottish Government Local Energy and Consents Team

Our Programme Manager was part-time seconded to the Scottish Government's Local Energy and Consents Team for six months over 2015/16. During this time she helped to shape the development of the Energy Strategy and led the drafting of a policy position statement on peatland and energy.

A CXC economist from the Hutton was also seconded part time to the Local Energy and Consents Team in 2015/16. During this time he worked on pumped hydro storage, contributing directly to evolving policy on energy storage.

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

In 2013 the Renewables Routemap team asked CXC to develop an equalities monitoring methodology for the Scottish renewables industry. CXC researchers designed a methodology and [produced a report](#) 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 has been used annually since by CXC to support annual reporting by the Scottish Government. Contact: Sue Kearns.

## 4. Good practice guidance for public engagement for wind farm developments

Evidence from CXC's report on [Wind Farms Community Engagement Good Practice Review](#) stimulated further investigation by the Scottish Government into best practice on community engagement. The lead author of the report was invited by the Scottish Government to sit on the working group to produce a consultation document, which was used in a six-week public engagement exercise. In November 2014 the Scottish Government released a [Consultation Draft](#) document, identifying good practice methods for stakeholders to engage better with the public on wind turbine planning proposals. CXC's study was directly referenced in the Consultation Draft and the final [Public Engagement for Sub-20MW Wind Turbine Proposals Good Practice Guidance](#) document. Contact: Simon Coote, Michael Westwater.

## 5. Supporting Community Investment in Commercial Renewable Energy Schemes

CXC's [report Supporting community investment in commercial energy schemes](#), is informing the ongoing development of guidance and support materials for community groups and developers by Local Energy Scotland. Feedback from the onshore renewables team stated that a number of the report's findings will be taken forward by Local Energy Scotland. This includes developing further guidance and support materials aimed at both communities and developers, facilitating community investment, developing opportunities for sharing

experiences, and building contacts through networking events. Contact: Sue Kearns, Jennifer Ramsay.

6. [The economic scale of community and locally owned renewable energy in Scotland and projections to 2020](#)

CXC economists assisted the renewables policy team to understand the local economic impacts of community energy by reviewing the current and projected [economic benefits of the expansion of community and local owned renewables](#) in Scotland. CXC examined the current level of community and locally owned renewable energy development in Scotland to project the economic benefit of expanding these types of renewable energy projects. The report was cited in the Scottish Government's [Community Energy Policy Statement](#). Contact: Sue Kearns.

7. [Comparative costs of commercial and community energy](#)

This study compared the costs and cost factors faced throughout the lifecycle of projects under three different ownership categories: commercial, community and commercial-community partnerships. The findings of the study informed and were used by Local Energy Scotland in their [response to DECC's consultation on changes to Feed-In Tariff pre-accreditation](#). Contact: Sue Kearns, Jennifer Ramsay.

#### **4.1.4 Benefits to other stakeholders**

1. [Wind Farm Impacts Study \(2015\)](#)

[This study](#) looked at whether the visual, shadow flicker and noise impacts predicted by wind farm developers in documentation submitted with their planning applications are consistent with the impacts experienced once the wind farm is operational. A Project Steering Group (PSG) oversaw the project with representatives from various local and national interest groups representing both those living near wind farms and wind farm developers and operators- including Scotland Against Spin and Scottish Renewables - and representatives from local and national government planning interests. The PSG was chaired by CXC and continues to meet as a collaborative forum in which to begin to take forward the Study's recommendations.

2. [Local Energy Challenge Fund \(2015-2016\)](#)

Policy Director, Andy Kerr, is part of the selection panel for the Local Energy Challenge Fund, coordinated by Local Energy Scotland with Scottish Government funding. It dispersed nearly £20m in its first year and over £10m in its second year to innovative local energy system projects around Scotland following competitive tendering.

## Collaboration and Multidisciplinary Working

### 4.1.5 Collaborations

1. [Citizens' juries on onshore wind farms \(2015\)](#)

This [project](#), coordinated and part-funded by CXC, brought together non-CXC researchers from the University of Edinburgh, University of West of Scotland and Queen Margaret University in collaboration with CXC members. The research used a citizens' jury approach to assess how citizens can be involved in making decisions about complicated issues that may affect them. A report for policymakers was published and presented at a launch event attended by around 100 policymakers, researchers and community representatives. The event was opened by the Assistant Chief Planner (Scottish Govt) and closed by the Minister for Local Government & Community Empowerment, Marco Biagi MSP. The report was the key reference in the June 2015 Royal Society of Edinburgh advice paper in [Unconventional Gas in Scotland](#), which was presented at the Science & Tech Committee at the Scottish Parliament.

2. [Measuring the economic and social impacts of local and community energy projects \(2015/16\)](#)

A collaborative project between the Fraser of Allander and the James Hutton Institute is developing an approach to measure the economic impact of local energy initiatives, with a particular focus on projects funded through the Scottish Government's Local Energy Challenge Fund. The project is being delivered in collaboration with researchers assessing the social impacts of local and community energy at the University of Edinburgh, also under CXC.

## **4.2 Transport**

CXC established a PDRF post focused on transport in 2015 in response to the Scottish Government's identified need to better understand the constraints and opportunities around the adoption and delivery of low carbon transport technologies in Scotland. The post-holder is working closely with policymakers in Transport Scotland and OCEA to shape a work plan for delivery in the 2016/17 funding period.

### **Supporting Policy and Practice**

#### **4.2.1 Stakeholder engagement**

1. Stakeholder workshop: Developing car clubs in Scotland (2015)

In 2015 our Transport PDRF facilitated a strategy workshop coordinated by CarPlus on behalf of Transport Scotland. The workshop generated an overview of stakeholder opinion concerning the continued development of car clubs in Scotland between 2015-2020, considering market growth, availability of funding and support, integration of EVs into car club fleets and the integration of car clubs with the wider transport system.

#### **4.2.2 Policy relevant outputs**

1. Electric vehicle spatial adoption profile for Scotland (2015)

A policy note [Exploring the spatial demand for electric vehicles in Scotland](#) was delivered to Transport Scotland. This policy brief profiled electric vehicle (EV) adoption levels across Scotland's Local Authorities and highlighting areas of relatively high and low adoption. This output is assisting policymakers and researchers to evaluate the spatial variance in EV diffusion by identifying adoption front-runner areas. Contact: Zak Tuck.

#### **4.2.3 Impact on policy**

1. Transport Scotland Road Asset Management Plan: perceptions of transport disruption surveys (2013)

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. Contact: Stephen Thompson.

## **Collaboration and Multidisciplinary Working**

### **4.2.4 Collaborations**

#### 1. Urban Foresight Collaboration (2016)

CXC's Transport PDRF post-holder is cultivating a strategic partnership with Urban Foresight who manage the electric vehicle strategy on behalf of Transport Scotland. This partnership involves providing Urban Foresight with assistance in preparing and analysing statistics on EV adoption in order to feed into their development of key performance indicators for Scotland's EV strategy.

#### 2. Scottish Transport Energy and Air Pollution Model (2016)

CXC's Transport PDRF post-holder and Principal Investigator are collaborating with the University of Oxford and the UK Energy Research Centre to develop a Scottish Transport Energy and Air Pollution Model (STEAM). The model will build on the UK Transport and Carbon Model developed by UKERC. Moving into the next programme, the research team have scheduled consultation with OCEA and Transport Scotland staff in 2016 to ensure that the model is complementary to existing models in Scotland, including TIMES, and to consider application of the model in the development of RPP3 scenarios.

### **4.3 Forestry**

CXC's woodlands expansion work aims to enable Forestry Commission Scotland (FCS) and other policymakers to make more informed decisions on where and how trees should be planted to help meet Scotland's emission reduction targets. This includes quantifying the carbon benefits of different planting scenarios, as well as identifying the types of incentives that may be required to ensure increased rates of appropriate tree planting by landowners. It is also assessing the impact of woodland expansion on agricultural production, rural livelihoods, and other ecosystem services, to identify the most beneficial planting scenarios for Scotland's environment and economy.

Our forest adaptation project is communicating key learning on adaptation to the sector, including forest managers and policy leads. The work is led by a PDRF based at Forest Research and aspects of the work have been delivered in collaboration with Heriot-Watt University. A key aim of the work has been to ground-truth research and policy in practice across Scotland through demonstration projects. Ongoing work in 2016/17 will examine the impacts of future climate scenarios and changes in forest management on the delivery of goods and services provided by Scotland's forests.

#### **Supporting policy and Practice**

##### **4.3.1 Stakeholder engagement**

1. Woodlands research: engagement series (2014-16)

A series of meetings was held between CXC research staff, Secretariat and staff from Forestry Commission Scotland (FCS) throughout 2014-16. These allowed CXC researchers to present the findings of work to date and to discuss priorities for future research. Policymakers from FCS gained a greater understanding of CXC's capacity to model carbon stock changes resulting from various land use scenarios. The ongoing work plan for this research stream has been revised in response to feedback received during these meetings.

2. Woodland biodiversity meeting (2013/14)

CXC researchers presented the CXC Woodlands project at the Biodiversity and Woodland Ecosystems meeting in March 2014. 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.

### 3. Climate Ready Forest Network

We have established a 'Climate Ready Forest network' of partners across the forest sector, including staff in FCS, the private sector and additional stakeholders and researchers. The Climate Ready Demonstration Forest at Queen Elizabeth Forest Park has been a focal point of this network. Working with the network has enabled CXC to identify key adaptation issues facing the forest sector, and to begin developing solutions across all levels. The network has been supported through demonstration projects, including web resources, videos and literature in addition to demonstration sites and workshops. These resources communicated key issues to the sector and policy leads, and allowed the research team to ground-truth research and policy with practitioners. Communication back to policy makers has been delivered through FCS policy advisors. Feedback suggested that the work was highly regarded and valued by both the sector and policy leads.

#### **4.3.2 Policy relevant outputs**

##### 1. Maps of above and below ground carbon stocks in Scotland (2015)

CXC researchers presented FCS with maps showing modelled above and below ground carbon stocks and total carbon stock changes out to 2050, under conversion of current land use to woodland. Maps were presented at a national and regional scale for 11 forestry management alternatives (FMAs) in 2015. The datasets were also presented in graphical forms to show the range of possible outcomes for FMAs and the most likely outcomes in the absence of positive targeting interventions. Discussions were held with FCS to interpret the outputs. The maps are currently assisting FCS to consider the most appropriate strategic balance of broadleaf to conifer planting and the desirability of seeing new woodlands on better quality land. A final report on this work package will be delivered in June 2016. Contact: Maida Ballarini.

##### 2. Report: Future options for forest carbon markets in Scotland and the UK (2013/14)

[This report](#), delivered to the Forestry Commission Scotland, 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. Contact: Pat Snowdon.

3. Briefing note: A simple guide to ecosystem services (2013/14)

[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. Contact: Maida Ballarini/Chris Nixon.

4. Ecosystem services delivery in Cowal and Trossachs Forest District under future climate scenarios and adaptation management options (2016)

This report discusses the impacts of both climate change scenarios and changes in forest management on the delivery of forest goods and services provided by the District, including carbon storage, timber outputs, and recreation and biodiversity. It takes into consideration the effects of increasing species diversity, increasing the area of forest managed as native, productive broadleaves, and under Continuous Cover Forestry. The report is currently under internal review and will be delivered to FCS in Spring 2016. Contact: Maida Ballarini.

### **4.3.3 Impact on policy**

1. Scottish Native Woodland Adaptation – the potential use of a Flexible Adaptation Pathways (FAP) Framework

This report explored how the principles of the [Flexible Adaptation Pathways](#) approach could be applied to native woodland adaptation in Scotland. It was the final output of a long-term project exploring what is known about the risks to native woodlands from climate change, their capacity to respond, and appropriate management responses. The report provided a comprehensive set of options for enhancing biodiversity and Scottish woodland adaptive capacity. It also considered the scope for providing greater support for woodland managers in relation to climate change. An [issues paper](#) was produced to further stimulate discussion on these issues, developing ideas that were first raised in a 2012 workshop. An earlier report on the FAP approach was used to inform drafting of the Scottish Adaptation Programme. The FAP approach was adopted by SNH as a trial approach for native woodlands adaptive management. Contact: Mary Christie (SNH) Gordon Patterson (FCS).

#### **4.3.4 Benefits to other stakeholders**

##### **1. Demonstrating adaptation - climate ready forestry workshop (2013)**

This 2013 [workshop](#) 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.

### **Collaboration and Multidisciplinary Working**

#### **4.3.5 Collaborations**

##### **1. Woodlands expansion project**

CXC's ongoing woodlands expansion project builds on existing work in the RESAS Strategic Research Programme. 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. The overall project is multidisciplinary, involving plant physiologists, economists, geographers, foresters, soil scientists, GHG specialists, hydrologists, and ecologists.

## **4.4 Natural Environment**

CXC's natural environment research assists policymakers to identify priority measures for protecting Scotland's natural environment from the impacts of climate change and for mitigating greenhouse gas emissions. Our biodiversity research team has developed an analytical procedure for prioritising climate change adaptation measures for Scotland's protected areas. This work is assisting SNH to achieve its priorities and has fulfilled a key measure set out in the Scottish Climate Change Adaptation Programme. Our peatlands research team is developing tools for targeted peatland restoration, which will support achieving Scotland's emissions reduction targets, and the aims of the National Peatland Plan and the 2020 Biodiversity Challenge. These include a decision support tool, calculations of the likely emissions abatement that can be achieved through peatland restoration, and assessment of the economic cost and benefits of restoration activities.

### **Supporting Policy and Practice**

#### **4.4.1 Stakeholder engagement**

1. Assessing climate risks to Notifiable Features - communication and training

The biodiversity work plan for 2015/16 was focused on communicating the results of this project with relevant SNH staff. A series of workshops was held with staff from the SNH Climate Change Adaptation team (freshwaters, earth sciences, woodlands and uplands) to discuss the results of the risk assessment process and to tailor the results and analytical process to the specific needs of their habitats. The research team also delivered training to SNH staff in the same period to ensure that they are skilled to employ the analytical processes developed by the project into the future.

2. Workshop on Bayesian approaches to risk assessment

This 2014 workshop allowed CXC members to introduce SNH staff to the concept of Bayesian modelling techniques and explored their potential use by SNH to identify and prioritise risks. The workshop informed the development of a new approach to assessing climate risk that has been well-received by policy colleagues in SNH (see 4.4.3 (1) below).

3. Scotland's National Peatland Plan

CXC brought together key stakeholders from policy, research and practice groups at a workshop in October 2014. The aim was to draw out key research priorities that will help to secure the long term future for Scotland's peatlands. Three strategic priorities were agreed which address core knowledge, long term monitoring and the interrelationship between social and scientific factors. The

results of this event are directly referenced in the [published plan](#) (p.33). Contact: Neil Ritchie

#### 4.4.2 Policy relevant outputs

1. [Assessing climate risks to Notifiable Features \(2013-16\)](#)

[This project](#) developed an assessment of the risk posed by climate change to notified features of protected areas (SSSI, Ramsar and Natura sites) in Scotland. The condition of notified features is used as the measure of success of conservation efforts. For example, site condition monitoring assesses features as being in 'favourable' or 'unfavourable' condition. This work informed understanding of the detected and possible future impacts of climate change and links directly to SNH's climate change action plan<sup>1</sup>, specifically to "Identify the consequences of climate change for protected [areas] and put in place adaptive measures." A full dataset and training in the analytical procedures was handed over to SNH in March 2016. Contact: Mary Christie.

2. [2013 Supplement to the 2006 IPCC Guidelines for National Greenhouse Gas Inventories: Wetlands \(2015\)](#)

[This report](#) examined the likely implications of changes in emissions calculations under UNFCCC reporting guidelines, following publication of the 2013 Supplement to the 2006 Guidelines: Wetlands (The 2013 Wetland Supplement). It also considered the steps likely to be required for future inclusion of Wetland Drainage and Rewetting (WDR) as a reporting category in national accounting, as per the 2013 Revised Supplementary Methods and Good Practice Guidance Arising from the Kyoto Protocol (the 2013 Kyoto Protocol Supplement). This followed the earlier publication in February 2014 of an initial CXC report considering the use of the guidelines, then in draft, in GHG accounting of peatland restoration. Contact: Liam Kelly.

3. [Estimation of carbon abatement potential from peatland restoration to 2050 \(2016\)](#)

In response to a request from OCEA, we provided updated data to inform the estimation of carbon abatement potential from peatland restoration to 2050 by the Scottish TIMES model. This data, provided as an Excel model, included the addition of emissions estimates for methane, nitrous oxide and dissolved organic carbon, as well as carbon dioxide. Contact: Andrew Mortimer

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<sup>1</sup> Climate change and nature in Scotland, <http://www.snh.org.uk/pdfs/publications/corporate/ClimateChangeNatureScotland.pdf>

4. Report on peatland restoration activities under the Scottish Rural Development Programme's (SRDP) Land Managers Options (2007-2014) payments

This project is examining resources spent under the Scottish Rural Development Programme (SRDP) Local Priorities (2007-14) on measures relevant to peatland restoration. It will help to identify the degree of peatland restoration undertaken since 1990, informing the implementation of the elective Wetting Drainage and Rewetting category in SRDP 2014-2021, as well reporting required under the second commitment period of the Kyoto protocol. Contact: Chris Dodds.

#### **4.4.3 Impact on policy**

1. Assessing climate risks to Notifiable Features - analysis handover and training

The analytical process developed by this project was handed over to SNH staff in 2016. A series of workshops was held with SNH staff from the Uplands and Woodlands team, iteratively handing over the project data analysis and providing training in the analytical process to SNH staff. This is enabling SNH staff to gain a more effective insight into the climate based risks over the longer term. Contact: Mary Christie.

2. Evidence to Rural Affairs, Climate Change and Environment Committee (RACCE) (2013/14)

This project 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. Contact: RACCE Committee Clerk

3. Report: Potential abatement from peatland restoration (2013/14)

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. Contact: Neil Ritchie, Des Thompson.

## **Collaboration and Multidisciplinary Working**

### **4.4.4 Collaborations**

#### 1. Biodiversity research

This was a collaborative project involving input from researchers in BioSS, the Hutton, the Universities of Aberdeen, Edinburgh and Glasgow, British Trust for Ornithology and from SNH staff.

#### 2. Peatland condition mapping (2015/16)

The peatland research team are working with Scottish Natural Heritage partners to enable the production of more accurate maps of current peatland condition, baseline (1990) drainage extent, and drainage and rewetting since 1990. The team are collaborating with the CEH team responsible for the compilation of the Land Use, land-use change and forestry (LULUCF) sector emissions in the UK GHG Inventory.

## 4.5 Agriculture

CXC's agriculture work aims to increase knowledge of the mitigation potential in Scotland's agricultural sector, and to improve understanding of the potential impacts of climate change on agricultural production and food security. CXC research has been focused on assessing the potential to reduce emissions from cropping practices, as well as the impact of climate change on where particular cropping practices may be feasible into the future. Discrete projects have been commissioned to provide policymakers with accessible insights into current knowledge on the potential to reduce emissions through changes in technology, land use and livestock health.

### Supporting Policy and Practice

#### 4.5.1 Stakeholder engagement

1. Land use workshop (2015)

In January 2015, CXC hosted a workshop session focusing on land use; bringing researchers together with the policy leads from across the CAMERAS network. The event informed ClimateXChange priorities for 2015/16 and generated constructive discussion on the draft CAMERAS evidence plan for integrated land use management and planning. It also identified emerging synergies and the potential for cross-cutting projects that address multiple land use policy objectives.

2. Food security and GHG mitigation seminar (2013)

[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.

3. International Conference on Sustainable Intensification in Agriculture (2013)

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.

## 4.5.2 Policy relevant outputs

### 1. Crop Modelling (2014-2016)

CXC researchers have developed a model to assess the geographical spread of greenhouse gas emissions from cropping activities. The model has been used to assess the impact of changes in cropping practices on emissions from the agricultural sector. Initial analysis has been focussed on the intensive, high-value cereal crops, including barley and wheat, as well as potatoes. Modelling has also been undertaken to assess the potential for climate change to alter where particular cropping activities will be feasible into the future. The modelling capability developed will be applied in 2016/17 to address key policy questions, including the consideration the trade-offs between emissions reduction and maintenance of agricultural production. Contact: Keith McWhinnie.

### 2. Workshop summary: carbon sequestration in grassland (2013)

CXC jointly hosted this stakeholder workshop with the Scottish Government's Agriculture and Climate Change Team, bringing together a range of CXC researchers, 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. It also identified research areas that should be considered for the next Strategic Research Programme funding period. These were presented to policymakers in a workshop summary paper. The key Scottish Government customer identified this paper as an excellent example of knowledge exchange. It was subsequently presented to the Agriculture & Climate Change Stakeholder Group and used as an example of best practice presenting research to policymakers. Contact : Antje Branding

### 3. Benchmarking the emissions intensity of Scottish Livestock (2016)

[This project](#) explored potential approaches to benchmarking Scotland's agricultural emissions to those of other countries. It examined various approaches for quantifying emissions and recommended priority agricultural products to be benchmarked. Approaches identified by the study may be used by Scottish Government to better understand the potential to reduce greenhouse gas emissions from the agricultural sector. Contact: Neil Swanson.

### 4. Livestock health (2016)

A rapid assessment of the available evidence on the potential contribution that can be made to reducing the intensity of greenhouse gas emission by eradicating or controlling the livestock diseases in Scotland. This project was very well received by the policy lead, and described as giving "... a clear steer on which diseases to prioritise, the evidence for them and the evidence gaps". It will inform policy

development and discussions with stakeholders on what to do next, Contact: Gordon Struth.

5. Review of Potential Measures for RPP2 – Agriculture (2012/13)

This report gave advice on mitigation measures beyond those included in the first Report on Proposals and Policies (RPP1) that can provide GHG mitigation at a low (or negative) cost in the agriculture sector. It fed into policy thinking for RPP2 Contact: Antje Branding.

6. Agricultural emissions inventory – policy briefing (2014)

CXC researchers met with Scottish Government staff in August 2014 to provide a policy briefing on agricultural emissions. This included an update on the development of the agricultural emissions inventory, recent relevant research findings and a compilation of emissions projections. The audience included representatives from policy, statistics, economics and research staff covering the agriculture, climate change and environment topic areas. Contact: John Landrock.

7. Implications of proposed CAP reforms for climate change action in Scotland (2012/13)

The policy briefing analysed the opportunities and possible impacts of CAP reform on climate change adaptation and mitigation effort in agriculture. Contact: Carole Stewart.

8. Advice on the inclusion of precision farming in RPP2 (2012/13)

The report summarises the current scientific knowledge about the GHG mitigation effectiveness and financial costs of precision farming techniques. It also gave an estimate of the possible GHG savings in Scotland. Contact: Emma Close.

9. SRDP impacts on carbon mitigation in Scotland (2013/14)

CXC reviewed the impact of the agri-environment options of the Scotland Rural Development Programme in relation to greenhouse gas emissions. [This report](#) presented 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. Contact: Jonathan MacLure/Susan Turpie.

10. Implications of climate change on animal health (2013/14)

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 was

prepared for the Agriculture & Climate Change Policy Team of Scottish Government, on subject of 'Liver fluke - environmental and animal health issues' (May 2013). Contact: Antje Branding.

### 4.5.3 Impact on policy

1. Scotland Rural Development Programme (SRDP) Targeting Project (2013-14)

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. In 2014, we provided Scottish Government with [a report](#) assessing the climate impact of existing SRDP options and potential additional benefits that may be targeted in the 2014-2020 programme. The Scottish Government subsequently asked CXC to form a climate change sub-group, and to produce spatial targeting maps and criteria for SRDP options with a potential climate impact. These outputs fed directly into the development of options for the 2014-2020 SRDP. CXC researchers and the Secretariat also sat on the project Steering Group, which provided final recommendations to the Implementation Group. Contact: Susan Turpie.

2. Scottish Rural Development Programme 2014–2020 – Beef Efficiency Scheme

The Scottish Government is developing a [Beef Efficiency Scheme](#) as part of the SRDP 2014-2020. This five-year scheme will provide support to beef breeders to improve efficiency, through genetic, economic and environmental improvements in the breeding and finishing sector. CXC researchers informed this scheme by providing evidence in response to direct requests from the Scottish Government's Livestock Policy Team. Contact: Frank Strang, Heather Curran, Martin Morgan.

3. Evidence to the Committee on Climate Change (2014)

On 23 January 2014 CXC academics presented evidence to the Committee on Climate Change's [review of the Scottish Government's progress](#) towards meeting its climate change targets in the agriculture and land use sector. The Committee's report was published in March 2015. Contact: Ute Collier, UK Committee on Climate Change.

4. Policy briefing on the abatement and cost-effectiveness of selected greenhouse gas mitigation actions (2015)

This study reviewed the available evidence on the potential greenhouse gas abatement cost-effectiveness of a number of specified policy instruments and mitigation measures. The measures, identified during a stakeholder meeting hosted

by CXC in 2015, included compulsory soil testing, nutrient management plans for the above land, Interest-free loans widely available for efficient farming technology and cost-effective measures on livestock health. The study informed [Scottish Government policies](#) to introduce compulsory soil testing on all improved agricultural land and new action to reduce wastage by improving livestock health in 2015. Contact: Gordon Struth.

#### **4.5.4 Benefits to other stakeholders**

##### 1. Guiding the Agricultural Industries Action Plan

CXC researchers from SRUC advised 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 was to identify routines to “tackle climate change by reducing... greenhouse gas emissions by three million tonnes of CO<sub>2</sub> equivalent per year from 2018-2022 from English agriculture.” The Action Plan group informed initiatives in the devolved administrations, including “Farming for a Better Climate” in Scotland. Contact: Antje Branding, Jane Salter (Agricultural Industries Confederation)

#### **Collaboration and Multidisciplinary Working**

#### **4.5.5 Collaborations**

##### 1. Mainstreaming climate change into rural development policy post 2013

This CXC report informed the European Commissions' Directorates General for Climate Action and Agriculture about the Rural Development Programme (RDP) policy implementation potential mitigation and adaptation options. The project was designed to inform ongoing mainstreaming of climate change in the RDP as it evolves over the 2014-2020 budget period (e.g. through health checks). The authors of the report also co-organised a workshop for national RDP programming officers and other RDP stakeholders in Brussels in June 2014. The aims of the workshop were to enable attendees to provide feedback on the RDP guidance developed during the project, and to raise their awareness about the scope for integrating climate change measures in their RDPs.

## **4.6 Adaptation**

Our work on climate change adaptation is assisting policymakers to monitor the effect of adaptive actions, understand how climate risks are changing and adjust adaptation measures in response to changes. We were asked by the Scottish Government's Directorate for Energy and Climate Change to develop indicators to build understanding about how Scotland is adapting to our changing climate. The indicators are informing the independent assessment of the Scottish Climate Change Adaptation Programme (SCCAP) and support decision making by Scottish Government policy and agency teams. A significant proportion of CXC's in house resources have been focussed on delivering the indicators including natural environment, built environment and social researchers from multiple institutions. The commissioning budget has also been used to fill discrete knowledge gaps identified throughout the project.

### **Supporting Policy and Practice**

#### **4.6.1 Stakeholder engagement**

##### 1. Secondment – Scottish Government Adaptation team

The ClimateXChange Knowledge Manager spent 3 months on secondment in 2012/13 to the Scottish Government Climate Change Legislation Team working on the draft Scottish Climate Change Adaptation Programme. Contact: Alistair Montgomery.

##### 2. Adaptation indicators: series of engagement activities

The Adaptation Indicators research team has undertaken extensive and ongoing engagement with policy teams, agencies, and other key stakeholders to ensure the indicators capture the best and most useful data available and are aligned with current and planned policy and practice. A key engagement event was held in August 2014 at Victoria Quay and involved a policy leads from a wide range of sectors including Agriculture, Biodiversity, Water and Flooding, Planning and Building Standards. Researchers also attended meetings of the Critical Infrastructure Resilience Unit, the Scottish Utilities Contingency Planning Group, and the Natural Environment Statistics Advisory Committee to present their work and solicit input to the further development of the indicators. Wider engagement has included staff from: SEPA, Forestry Commission Scotland, Scottish Natural Heritage, the Scottish Government, Scottish Water, Ofgem, the energy utilities, National Grid, the Energy Networks Association, Transport Scotland, rail companies, NHS Scotland, the Regional Resilience Partnerships and several local authorities.

##### 3. Scottish Wildfire Forum

The Scottish Wildfire Forum was re-launched in October 2013. CXC researchers 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.

#### **4.6.2 Policy relevant outputs**

1. Adaptation Indicators (2014-2016)

Over one hundred Adaptation Indicators have been developed across the SCCAP themes of Natural Environment, Buildings and Infrastructure Networks, and Society. Fifteen narratives have been developed to provide a 'route in' to the indicators; each narrative presents a group of indicators within their adaptation and policy context. Indicator documents have been presented and communicated to the Adaptation Sub Committee of the UK Committee on Climate Change and are currently feeding into their independent assessment of the SCCAP. The Indicators are also being actively used by Scottish Government agencies, most notably SNH, in developing their adaptation response and in monitoring risks to their assets. Contact: Susan Wallace.

2. Assessment of the consideration of flood risk by Scottish local planning authorities (2016)

[This report](#) provided an assessment of how current and future flood risk is being accounted for in land-use planning decisions in Scotland. The project focused on the two stages of land-use policy: development planning and development management. This study dovetails with other research on the rate of development in flood risk areas in Scotland and will report in the next programme. Contact: Michael Westwater.

3. Mapping Change in Impermeable Surfaces in Scotland

This study used digital mapping to examine the change in area of impermeable surfaces in Scotland, between c. 2008 and 2014. The project assessed the extent of urban green and open space as a proportion of the urban area, by local authority, and change in this proportion. It will support work by CREW and will feed directly into SEPA's ongoing work on flood hazard mapping. Contact: Mark McLaughlin/Katherine Lakeman.

#### **4.6.3 Impact on policy**

1. Scottish Climate Change Adaptation Programme development (2012-13)

CXC members took part in a series of Scottish Government-led workshops in 2012/13, contributing ideas for Policies and Proposals for inclusion in the Scottish Climate Change Adaptation Programme (SCCAP) and concrete proposals for how the SCCAP should be monitored. In 2013 we provided the Scottish Government with a policy note on [Principles and Features of a Good Adaptation](#)

[Strategy](#). This note summarised best practice for developing national adaptation strategies. It was used by the team drafting the SCCAP as a checklist against which to assess the draft SCCAP as it evolved. We also provided Scottish Government with a policy brief on [Examples of 'no-regret', 'low-regret' and 'win-win' adaptation actions](#). This paper set out how adaptation actions can create greater benefit. This was also used by Scottish Government staff in drafting the SCCAP.

In October 2013 Directorate member, Professor John Rowan presented evidence to the Rural Affairs, Climate Change and Environment Committee to inform its consideration of the Scottish Government's draft Climate Change Adaptation Programme. Contact: Jody Fleck.

## 2. Monitoring, evaluating and reporting adaptation progress (2014-16)

The CXC Adaptation Indicators team provided advice to the Scottish Government Climate Change Legislation team (as was) on monitoring and evaluation of the Scottish Climate Change Adaptation Programme for the annual reporting to Parliament. CXC produced a prototype template for recording progress against the SCCAP, which was directly used by the Scottish Government for collecting information to populate the SCCAP annual report. In addition, CXC provided case studies that were used in the annual report. CXC researchers and Secretariat also supported developing the template for mandatory reporting under the Climate Change (Scotland) Act 2009 Public Bodies Duties, with CXC providing the wording for several questions as well as a support function to the public bodies completing the template, through our Indicators project. Our Adaptation Indicators are currently assisting the ASC's assessment of the SCCAP. Contact: Jo-Anne Lawson, Paul Fagan.

### **4.6.4 Benefits to other stakeholders**

#### 1. The UK Climate Change Risk Assessment

CXC members were involved in supporting the 2<sup>nd</sup> UK Climate Change Risk Assessment. Working with the ASC Secretariat, sector representatives in Scotland, Adaptation Scotland, UKCIP, LWEC partners and the wider UK research community, CXC was part of the planning process for the CCRA and played a pivotal role in framing the CCRA summary for Scotland that will be published in 2016. CXC continues to be influential in the CCRA process, providing a voice for, and representing the interests of, the wider Scottish stakeholder community in the CCRA development process.

#### 2. National Centre for Resilience

CXC has been a key partner in the design and development of Scotland's [National Centre for Resilience](#) (NCR) since it was announced in 2014. Our Policy Director was nominated to the Programme Board and is currently Chair of the

Research and Training Working Group. Our Project and Information Manager was seconded to the NCR Project Team within the Scottish Government's Resilience Division throughout 2015/16. This post supported the establishment of the Centre in Dumfries, including staffing and accommodation. CXC continues to work with the Scottish Government is designing the Centre's governance and delivery models and this important collaboration will continue into the next programme.

## **Collaboration and Multidisciplinary Working**

### **4.6.5 Collaborations**

#### 1. Adaptation Indicators

The Adaptation Indicators core team is comprised of academics from the Royal Botanic Garden Edinburgh, Forest Research, the University of Dundee, Heriot-Watt, the Crichton Carbon Centre and the James Hutton Institute. 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, MRPs and consultants as part of the wider project team. We have also worked with the Marine Alliance for Science and Technology for Scotland (MASTS), as well as with UKCIP and ARCC at UK level.

#### 2. Cost-Benefit Analysis of a local authority climate change risk register (Aberdeenshire)

CXC has been working closely with Aberdeenshire Council and Scottish Water to develop a pilot project that will examine the costs and benefits of managing the risks arising from climate change. Time was invested in securing a detailed specification, involving colleagues from Aberdeenshire Council, SEPA and Scottish Water. This was an exceptionally valuable process, with participants gaining insight into adaptation principles and increasing their understanding of their complementary perspectives. Project leads have also worked closely with Adaptation Scotland, who recognise the value of such a case study to other local authorities and have provided input into the project.

## **4.7 Capacity Building and Societal Change**

As Scotland's Centre of Expertise on Climate Change, we support policy makers in accessing the most up to date research on issues relating to climate change mitigation and adaptation. An important part of this function is to influence the way that policymakers receive and understand research outputs. Over our first five years we have established trusted relationships with key policy bodies including the UK Committee on Climate Change and the Scottish Parliament. Our Policy Director has been a member of the Scottish Government's Climate Change Delivery Board since 2013. Through these relationships we have improved policymakers' capacity to access and understand research, and to ensure that issues relevant to Scotland are present on the UK-wide policy agenda.

Through stakeholder engagement and collaborations we have also proactively demonstrated the benefits of the Centre of Expertise models established in Scotland.

In addition to sector-specific research, we have provided evidence to support Scotland's cross-sector transition to a low carbon society, including behaviour change and taxation.

### **Supporting Policy and Practice**

#### **4.7.1 Stakeholder Engagement**

##### 1. RACCE members' introduction to CXC

In January 2014 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.

##### 2. Committee on Climate Change meeting, Edinburgh

In January 2015 CXC, along with the Edinburgh Centre for Carbon Innovation, hosted the first meeting of the UK Committee on Climate Change (CCC) ever to be held outside of London. The CCC'S aim for this meeting was to gather evidence for the Committee's '[Reducing emissions in Scotland – 2015 progress report](#)', which was published in March 2015. It provided the opportunity for the Committee to hear about the progress that Scotland is making in transitioning to a low carbon economy directly from a full range of Scottish stakeholders including Government, NGOs, business organisations, environmental groups and academics. Drawing on our extensive network of stakeholders, we recommended to CCC experts across Scotland to provide further evidence for the progress report. CXC researchers presented evidence to the Committee regarding the potential to reduce emissions from the agricultural sector. Organising and hosting this meeting allowed CXC to further strengthen the close working relationship we

have established with the CCC through our ongoing Adaptation Indicators project.

### 3. Presentations of the IPCC Fifth Assessment Report

The UN's Intergovernmental Panel on Climate Change released its *Fifth Assessment Report* in 2014. The report provides a detailed update on the state of scientific, technical and socio-economic knowledge on climate change, its causes, potential impacts and response strategies. The Scottish Government's Directorate for Energy and Climate Change approached CXC to present the key findings of the report and their relevance to Scotland. Our Policy Director presented the report to senior officials represented on the Climate Change Delivery Board in June 2014. In August 2014, CXC Science Director, who was a lead author of the report, presented the findings to Scottish Government staff and stakeholders from SEPA, SNH, Sustainable Scotland Network, Adaptation Scotland and various environmental charities.

## 4.7.2 Policy relevant outputs

### 1. Climate Change Delivery Board membership (ongoing)

CXC's Policy Director continues to sit as a Non-Executive Member of the Scottish Government's Climate Change Delivery Board. This has allowed him to inform the Board's understanding of the latest climate science, providing expert advice on the key findings of the IPCC 5th Assessment Report. He provided critical analysis and advice on key issues facing Scotland, including recovery from recently missed emissions targets. He also contributed to planning changes to the Board's operating model to enable it to become more effective in overseeing cross-cutting policy development. These changes have since come into effect during summer 2015. He has also attended and advised the Rural Affairs, Food and Environment (RAFE) Climate Change Board on salient issues associated with developing emissions reduction targets for RRP3 in the RAFE portfolio.

### 2. A 'green and fair' tax system in Scotland: Distributional impacts and impacts on rural poverty of a carbon tax in Scotland (2014)

This [report](#) explores options for introducing a carbon tax on household energy use and private transport in Scotland, whilst protecting low income households from increased costs. The study illustrates how a green tax needs to interact with the wider benefit and tax system – particularly Universal and Pension Credit – to ensure that low-income households are protected and thereby balance environmental and social concerns. It was considered how carbon pricing might be applied beyond the domestic electricity market in the context of the challenging climate change targets set by the Scottish Parliament in 2009. Contact: Daniel Hinze.

1. Narratives of a low carbon life in Scotland in 2030 (2014)

In 2014 the CXC Behaviours research team produced a set of [narratives of a low carbon life in Scotland in 2030](#), which were used by the Scottish Government's Scotland 2030 project. The project provides a view of what Scottish life may look and feel like in a low carbon future. Contact: Helen Mansbridge.

2. Climate Change Public Conversations Series (2015)

The Secretariat worked with the Scottish Government's Low Carbon Behaviours Team to jointly specify and commission a project to develop and pilot a framework for a [Climate Change Public Conversations Series](#). The framework provides materials and a guide holding conversations about climate change with the public. This includes a separate guide aimed at community groups who wish to hold their own conversation about climate change, and a methodology for collecting and analysing data from these conversations to inform policymaking. The framework and research report will inform the Scottish Government's approach to engaging the public and community groups in conversations on climate change. The outcomes from these conversations will feed into the development of RPP3. Contact: Helen Mansbridge.

#### **4.7.3 Impact on policy**

1. ISM Behaviours Tool

The CXC Secretariat and researchers contributed to the final stages of development of the Scottish Government's [ISM Influencing Behaviours toolkit](#) by facilitating both training workshops and policy change processes. This work was undertaken in collaboration with Scottish Government and Transport Scotland officials, Health Scotland, Paths for All, Living Streets Scotland and Sustrans. CXC's contribution to the development of the tool was referenced in the [ISM Tool Progress Report 2013](#). Contact: Jackie Horne

#### **4.7.4 Benefits to other stakeholders**

1. Communicating best practice

The CXC Secretariat worked throughout its first five years to share best practice on how science can inform policy making. In 2014 the Secretariat contributed staff time to the Scottish Crucible Leadership and Development Programme, providing early career researchers a greater understanding of how science can benefit society. Members of the Secretariat also presented lectures on knowledge exchange to MSc students studying science, environment and society. In 2014 the Secretariat hosted Policy Officer from the Scottish Government Renewable Policy team on short secondment to gain insight into the work of CXC as a centre of

expertise. CXC's approach to knowledge exchange was also presented during a workshop at the 2014 [Adaptation Futures Conference](#) in Fortaleza Ceará, Brazil.

#### **4.7.5 Collaborations**

##### **1. Behaviours Research**

CXC's Behaviours research team is studying behavioural changes required across all sectors of Scottish society for the transition to a low carbon economy. The research covers transport and energy behaviour, energy extraction practices, land management and climate change adaptation. A multidisciplinary team has been established at the Hutton to undertake this work, including multiple social science (i.e. psychology, planning, and sociology) and biophysical disciplines (i.e. ecology and natural resource management). The team is also collaborating with a CXC PDRF based at the University of Aberdeen to research transport behaviour change.

## **5 List of acronyms**

ASC – Committee on Climate Change Adaptation Sub Committee

CCC – Committee on Climate Change

CoE – Centre of Expertise

CXC – ClimateXChange

DECC – Department of Energy and Climate Change

DEFRA – Department for Environment, Food and Rural Affairs

ESRC – Economic and Social Research Council

EV – Electric vehicle

FCS – Forestry Commission Scotland

IPCC – Intergovernmental Panel on Climate Change

KE – Knowledge Exchange

NCR – National Centre for Resilience

NGO – Non-governmental Organisation

NERC – Natural Environment Research Council

OCEA – the Office of the Chief Economic Advisor

QEFPP – Queen Elizabeth Forest Park

RAFE - Rural Affairs, Food and the Environment Delivery Board

RESAS – The Scottish Government's Rural and Environment Sciences Analytical Services

SCCAP – Scottish Climate Change Adaptation Programme

SEPA – Scottish Environment Protection Agency

SNH – Scottish Natural Heritage

SRDP – Scottish Rural Development Programme

SRUC – Scotland's Rural College

The Hutton – James Hutton Institute

UKERC – UK Energy Research Centre

UNFCCC – United Nations Framework Convention on Climate Change

WDR – Wetland Drainage and Rewetting