



Department
for Environment
Food & Rural Affairs

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Climate Change Evidence Plan

**Policy portfolio: Climate, Waste and Atmosphere
(CWA)**

Policy area within portfolio: Climate Change

Timeframe covered by Evidence Plan: 2013/14-2017/18

Date of Evidence Plan: March 2013

This evidence plan was correct at the time of publication (March 2013). However, Defra is currently undertaking a review of its policy priorities and in some areas the policy, and therefore evidence needs, will continue to develop and may change quite rapidly. If you have any queries about the evidence priorities covered in this plan, please contact StrategicEvidence@defra.gsi.gov.uk.

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1. Policy context

What are the key policy outcomes for the policy programme/area?

Climate models indicate that many parts of the UK¹ are likely to experience more heavy rainfall (leading to flooding), rising sea level and faster coastal erosion, more heat-waves, droughts and extreme weather events as this century progresses. Information on the science of climate change is available on the [Government Office for Science pages](#) on climate change. The Climate Change Risk Assessment (CCRA) set out the key risks to the UK from these impacts.

Climate Change can be divided in two policy areas: Climate Change Mitigation and Climate Change Adaptation.

Climate change mitigation deals with limiting the extent of future climate change by reducing greenhouse gas emissions and removing them from the atmosphere.

Climate Change adaptation deals with the effects of future climate change.

Projected climate change presents a set of opportunities and threats to every sector in the UK. Organisations will take advantage of opportunities that arise and mitigate against the risk of threats through traditional markets.

There are barriers to adaptation, however, that risk undermining the efficient functioning of a market. Market failure, distributional equity and behavioural barriers all provide a rationale for the government to intervene. The government also has responsibility to ensure public goods and services such as national infrastructure (eg the road network) as well as non-market goods and services (eg environmental amenities).

Defra's role in Climate Change policy

The Department of Energy and Climate Change (DECC) is the government lead department on climate change mitigation. DECC's website provides more detail on the government's overall work on reducing greenhouse gas emissions. Defra is the government lead department on Climate Change Adaptation. The Climate Change Act (2008) sets the overall legislative framework under which the government operates. Both climate change mitigation and adaptation are devolved issues but Defra collaborates with Devolved Administrations where relevant. The following table summarises Defra's policy outcomes and objectives from its business plan.

¹ Impacts vary geographically across the country

Policy Outcomes and Objectives

<p>Defra Climate Change Mitigation</p>	<p>Policy Outcome: Facilitate the achievement of Government Climate Change Mitigation objectives sustainably.</p> <p>Policy objectives: Only the evidence supporting policy objectives D and F are delivered through the Climate Change evidence plan; the rest have only occasional evidence needs and are delivered either on an <i>ad-hoc</i> basis through outputs of other evidence plans or using other sources (such as in-house economic analysis).</p> <ul style="list-style-type: none"> A. To reduce greenhouse gas (GHG), ozone-depleting and F-Gas emissions. (GHG emissions from resource and waste management also contributes towards this); B. To negotiate an EU Greenhouse Gas Monitoring Mechanism regulation, to make it fit for purpose, avoiding unnecessary reporting burdens and competency creep; C. To negotiate an EU Land Use, Land Use Change and Forestry (LULUCF) Regulation which is fit for purpose, avoiding unnecessary accounting burdens and competency creep; D. Removal of principal uncertainties over sustainability of low carbon power technologies to aid sustainable deployment; E. Defra meets its commitments to cut greenhouse gas emissions in its sectors in line with agreed carbon budgets; F. Enhance the environment and biodiversity to improve quality of life and ensure specific Government policies on low carbon energy are in tune with Defra objectives on the environment and rural economy.
<p>Defra Climate Change Adaptation (Climate Ready team)</p>	<p>Policy Outcome: Encourage society to plan ahead effectively to address the risks and opportunities of the impact of climate change</p> <p>Policy objectives:</p> <ul style="list-style-type: none"> A. National Adaptation Programme (NAP): Building on the results of the Climate Change Risk Assessment (2012), the NAP will enable society to make timely, far-sighted and well informed decisions to address the risks and opportunities posed by a changing climate; B. Adaptation Reporting Power: Increasing adaptive capacity in key sectors.

Climate change mitigation

Defra is responsible for a number of policy areas which are associated with greenhouse gas emissions. These include agriculture, forestry, land management, waste, fluorinated gases and non-CO₂ emissions from industrial processes, and treatment and use of water. In many of these areas Defra determines policy in England, whilst working closely with the Devolved Administrations, who determine policy in Wales, Scotland, and Northern Ireland. Defra also leads on many policies which encourage sustainable behaviours, and supports the transition to a green economy. For example, Defra's policies guide on corporate emissions reporting and energy performance standards for products.

In order to address the threat of climate change, the UK has a legally binding target to cut greenhouse gas emissions by 80% by 2050. Achieving that will require a massive change in how we use and generate energy, which poses substantial challenges such as affordability of new infrastructure, its impact on the environment and competing pressures on land and resources. Defra works with other departments to ensure the UK achieves reductions in greenhouse gas emissions in a sustainable way, by taking measures which bring wider benefits and which do not have unacceptable impacts.

Climate change adaptation

Building the UK's resilience to climate change is an economic, social and environmental challenge that cuts right across the work of Government and every sector of society. The Climate Change Act requires the Government to publish a report to Parliament on a National Adaptation Programme (NAP) following the publication of a Climate Change Risk Assessment in January 2012.

The Defra 'Climate Ready' service is leading the work on behalf of Government, working alongside other government departments, businesses, local authorities and civil society, to 'co-create' the National Adaptation Programme. We encourage innovative policymaking and empower a wide variety of organisations to take responsibility for finding the best solutions for their sector. We expect to publish the report on the Programme during 2013.

The objectives of the NAP could be further subdivided in the following way: improving the climate evidence base; developing adaptive capacity in key sectors; providing the conditions to adaptation by removing barriers and supporting others; and taking action to adapt.

2. Current and near-term evidence objectives

What are the current and near-term objectives for evidence and how do they align to policy outcomes?

Climate Change Mitigation team – evidence objectives

The Defra Climate Change Evidence plan team currently addresses two of the policy objectives of Climate Change Mitigation (D & F). Other policy objectives have more occasional evidence demands that are addressed on an *ad-hoc* basis either through outputs of other evidence plans (eg Waste, Air and Local Environment) or via other activities (such as in-house economic analysis).

The 2011 Natural Environment White Paper (NEWP) highlighted significant gaps in evidence about the impact of low carbon energy on the natural environment. NEWP commits the Government to work with others to establish a research programme to fill

evidence gaps on the natural environment impacts from the energy infrastructure needed to meet 2050 objectives. In particular, research will cover the cumulative and indirect effects. The research will be used in a strategic way to inform pathways to 2050 and inform judgements on best ways to achieve greenhouse gas benefits, energy security, affordability and protection of the natural environment.

The Sustainable Pathways to Low Carbon Energy (SPLiCE) programme, delivered through the overarching CCM evidence programme, will deliver this commitment. The research outputs will be useful for a range of stakeholders, including policymakers, industry, investors, planners, regulators and the wider public.

For example, the research outputs will or should contribute significantly to the following outcomes:

- identify how energy production and demand reduction options can be balanced to achieve optimum economic, social and environmental outcomes. This could inform the structure of the various incentives and regulations in order to steer decarbonisation along a sustainable pathway;
- improve investment certainty and stability by increasing confidence in the likely technology mix and reducing the risk of unintended consequences that lead to sudden changes in policy or incentives;
- avoid being locked into reliance on certain technology mixes which turn out to be unsustainable in the long term;
- improve public acceptability to the low carbon agenda by increasing confidence that the transition will be made in an acceptable way;
- speed up the planning and consenting process by filling evidence gaps about impacts, which currently slow down or lead to inconsistent decisions.

This is very ambitious and as such it may not be possible to deliver the full scope of this programme in the initial phase of work. It is planned that SPLiCE will deliver its objectives via a staged work programme starting with a review of existing research and identification of significant knowledge gaps.

This research programme aims to be funded by a partnership of Government Departments, Research Councils, industry and other organisations with an interest in its objectives. So whilst the Defra contribution to this programme is £200-250 thousand pounds a year the ambition is to achieve a total budget equivalent to at least £1 million per year. The programme is run by one full-time R&D Programme Manager. The programme will take a holistic, whole systems approach and as such requires a wide range and depth of expertise. It will need to draw on a range of experts, bringing together and engaging energy research and ecosystem research. SPLiCE will need to address in its analysis subjects such as biodiversity, habitats, land use, climate change impacts, energy systems design, social research, psychology, economics, health, agriculture, transport systems and

marine management.

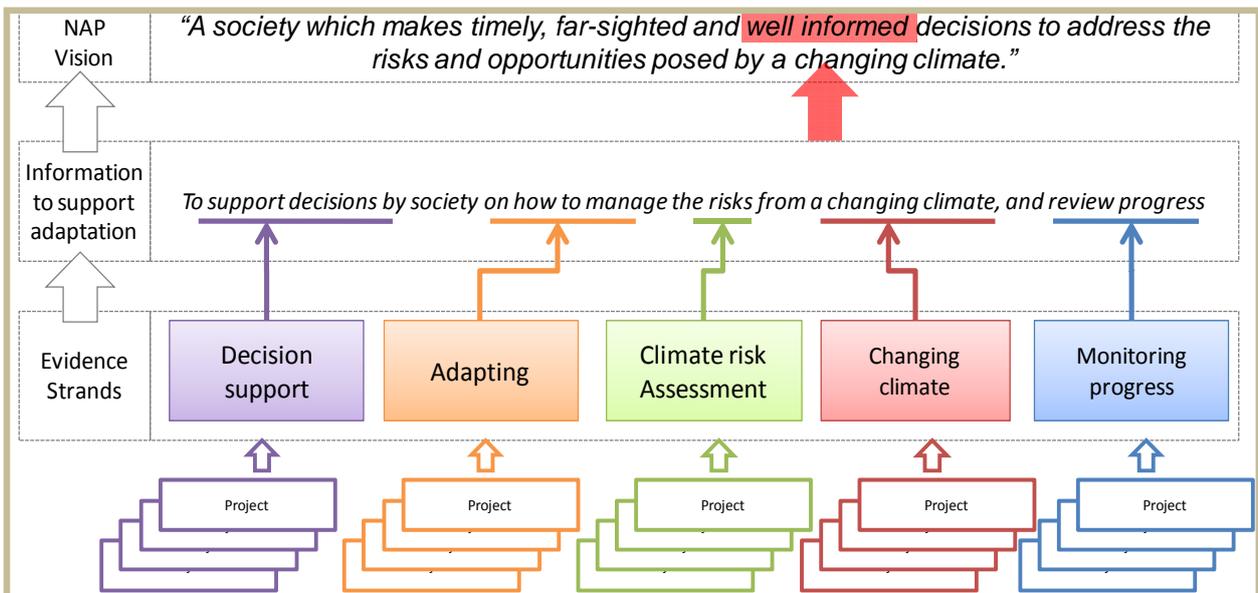
Policy Outcomes – Climate Change Mitigation	Policy Objective	Evidence Objectives
Facilitate the achievement of Government Climate Change Mitigation objectives sustainably.	<p>Removal of principal uncertainties over sustainability of low carbon power technologies to aid sustainable deployment;</p> <p>Enhance the environment and biodiversity to improve quality of life and ensure specific Government policies on low carbon energy are in tune with Defra objectives on the environment and rural economy</p>	<p>The overarching Evidence Objective of the Climate Change Mitigation Evidence programme is to support <i>informed decision making</i> by society on how best to <i>mitigate against the effects of climate change in a sustainable manner</i>.</p> <p>We aim to provide information and tools for organisations (public and private) to assist them in taking decisions. This is done by Defra but also in cooperation with other organisations such as DECC, Research Councils and the Environment Agency. This is supported by analysing the costs, benefits and wider impacts of mitigation policy options to identify the effects on the environment, society and/or the economy (the three tiers of sustainability). This is delivered through a mix of internal analysis and commissioning research.</p> <p>Current projects include supporting integration of environmental metrics into the DECC 2050 calculator and SPLiCE delivering information gateways and tools to support sustainable decision making on deployment of low carbon energy.</p> <p>Among the evidence gaps that have been identified in this area and that Defra is looking to fill in the next years are:</p> <ul style="list-style-type: none"> • Sustainability of certain low carbon energy systems (individually and in combination). • The inclusion of sustainability information in decision making tools used by Government on the environment. • A comprehensive ‘one-stop shop’ source of information for public and private organisations on the impacts of low carbon energy system. • The costs and benefits of low carbon energy deployment on the environment, society and rural communities.

	<ul style="list-style-type: none"> • Identification of 'no-regret' policy options • Benefits of Green Infrastructures • Scenario analysis
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Climate Ready – Evidence and Analysis objective

The objective of the Climate Ready Evidence and Analysis team is to support decisions by society on how to manage the risks and opportunities associated with a changing climate, and to review progress.

The chart and the table below summarise the main evidence strands of activities and how they link with policy outcome and objectives.



Policy Outcome - Climate Change Adaptation	Policy Objectives	Evidence strand
Encourage society to plan ahead effectively to address the risks and opportunities of the impact of climate change	<p>National Adaptation Programme vision: A society which makes timely, far-sighted and well informed decisions to address the risks and opportunities posed by a changing climate.</p> <p>Adaptation Reporting</p>	<p>Decision Support. This strand aims at providing guidance and tools for organisations and private individuals to assist them in taking decisions. These activities are led by the Environment Agency’s Climate Ready service.</p>
		<p>Adapting. This evidence strand aims to analyse the costs, benefits and wider</p>

	Power: Increased adaptive capacity in key sectors	impacts of adaptation policy options. This objective is delivered through a mix of internal analysis and commissioning research.
		Climate Risk Assessment. This strand's aim is to improve our understanding of the threats and opportunities implied by a changing climate. This objective is mostly delivered by commissioning research.
		Changing Climate. This strand's objective is to improve our understanding of how the present day climate and future climate might look. This evidence strand covers climate information as a whole (climate observations, variability and change). The largest contribution to this objective is met through co-funding of the Met Office Hadley Centre Climate Programme. Outputs will benefit users beyond Defra as we work with other users to understand the information that they need on future climate.
		Monitoring Progress. This strand objective is to monitor and evaluate progresses on the policy objectives.

Evidence Strand	Objectives and Priorities
Decision Support	<p>The Environment Agency works closely with the Defra Climate Ready team and is responsible for this strand of evidence and analysis. Their Climate Ready services provide:</p> <ul style="list-style-type: none"> ▪ Information to stakeholders about how the climate of the UK may change ▪ Guidance and advice on carrying out climate change impacts and risk assessments ▪ Guidance and advice on identifying and evaluating climate change adaptation strategies and decisions ▪ A helpdesk to answer queries on climate change planning as well as providing technical support on the UK Climate Projections ▪ Their tailored support service focuses on a number of sectors, based on those used in the National Climate Change Risk Assessment: <p>For more information visit the Environment Agency Climate Ready website:</p>

	<p>http://www.environment-agency.gov.uk/research/137557.aspx</p>
<p>Adapting</p>	<p>This Evidence strand focuses on assessing the costs, benefits and wider impacts of adaptation policy options. This strands' priority is to provide analysis underpinning the 2013 National Adaptation Programme and Adaptation Reporting Power strategy and support cost effective targeting of action.</p> <p>Current projects are analysing the rationale for adaptation action for government alongside other organisations and private individuals in a number of sectors identified as priority by the Climate Change Risk Assessment. This includes looking at climate change adaptation in Agriculture, Forestry, Power, Transport, Business, Health, Fisheries and the Natural Environment.</p> <p>Among the evidence gaps that have been identified in this area and that Defra is looking to fill in the next years are:</p> <ul style="list-style-type: none"> ▪ Costs and benefits of specific climate change adaptation policy options ▪ Improving methodologies to consider climate change in government policy options appraisal ▪ Identification of 'no-regret' policy options ▪ Benefits of Green Infrastructure ▪ Scenario analysis ▪ Assessing the potential contribution of local and household level action to contribute to overall UK preparedness
<p>Climate Risk Assessment</p>	<p>There is a statutory requirement for the SoS to lay reports before parliament every 5 years containing an assessment of the risks for the UK of the current and predicted impact of climate change. The next assessment is required for January 2017.</p> <p>Related to the above statutory requirement is a need to improve our level of understanding of key areas which were not covered in depth by the UK's 2012 Climate Change Risk Assessment. This evidence will help to gain understanding of the threats and opportunities of climate change to the UK and inform on the options to approach climate change risks effectively in the future.</p> <p>High priority evidence gaps are:</p> <ul style="list-style-type: none"> • Improved projections of potential changes in extremes such as heat waves and intense rainfall; • Development of socioeconomic scenarios to consider how changing conditions in the UK's social and economic context might affect adaptation responses; <ul style="list-style-type: none"> ▪ Threats and Opportunities of climate change driven by the international context; ▪ Estimation of the relative scale of costs of international impacts ▪ Better understanding of the interdependencies and risks of cascading impacts between sectors;

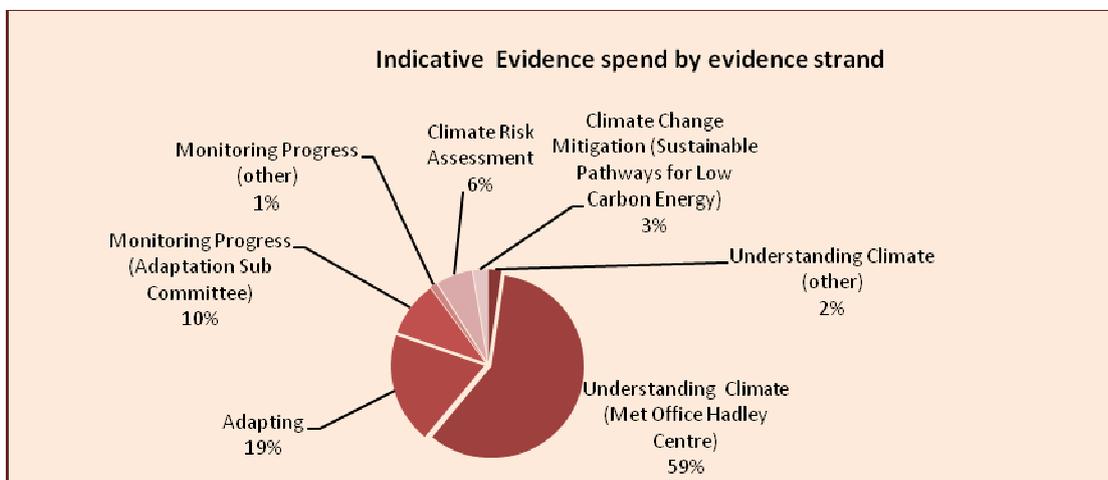
	<ul style="list-style-type: none"> ▪ Cumulative or co-incident economic costs of multiple “low” impact risks occurring; ▪ Macroeconomic impacts <p>Medium priority evidence needs include:</p> <ul style="list-style-type: none"> • Updated climate models and projections based on the best available science; • Development of mechanistic, multivariate models of climate impacts, for example forestry and agricultural growth models that consider temperature, soil moisture and carbon dioxide levels under different land-use and socioeconomic scenarios; ▪ Identification of key thresholds & feedbacks and consideration of the rate of change of climate elements that might affect the UK’s climate; ▪ Improved understanding of vulnerability to climate change – taking account of exposure and sensitivity to risk as well as adaptive capacity; ▪ Evidence on how adaptation policy objectives affect the impact of current and future climate risks;
Changing Climate	<p>Both now and for the future, our climate science evidence needs consist largely of understanding how climate, climate variability and extreme events (eg future precipitation) are changing, at a scale that decision-makers can use. This includes both examining the optimal use of existing science for informing adaptation decisions now; as well as undertaking underpinning science to deliver ahead of the next risk assessment and beyond. This evidence strand also includes a small number of projects and collaborations on dangerous climate change, on knowledge exchange, and on climate tools for adaptation.</p> <p>The Met Office Hadley Centre (MOHC) leads the UK’s national climate capability and provides essential and world-leading climate modelling services to Government, with a central role of meeting the Government’s requirements for climate evidence and advice. The MOHC Climate Programme is funded by both Defra and DECC on behalf of Her Majesty’s Government as a whole. The 2012-2015 Programme has more emphasis, than in the past, on (i) monitoring of climate for local and regional patterns of change and (ii) regional projections of the biophysical impacts of climate variability and change from near term out to a few decades. Adaptation-relevant outputs for the 2012-15 programme include <u>information on the regional consequences of climate variability and change</u>, which will be needed to inform future climate risk assessments and for national adaptation planning.</p>
Monitoring and Evaluating Progress	<p>This monitoring priority is to assess progress towards the objectives set in the National Adaptation Programme in 2013, working closely with the Adaptation Sub Committee of the Committee on Climate Change and agencies that hold useful data to inform this such as the Environment Agency. A survey will also assess how the public view adaptation and changing climate risks.</p> <p>Evaluation is critical to ensuring effective outcomes and well directed policy.</p>

Within Climate Change, this includes assessing the cost-effectiveness of approaches to reporting under the Adaptation Reporting Power strategy and working with the Environment Agency and others to understand the impact of policies (including the Climate Ready support service) so these can be refined to provide the best value for money. In addition to carrying out in-house evaluation of the effectiveness of policies and measures, we will engage with others, enabling organisations to carry out their own evaluation of their actions against identified risks and opportunities.

Climate Change Adaptation and Mitigation resources and budget

The team is currently composed of 7 people who oversee a budget of around £7.6 million a year over the period 2012-2015 subject to ongoing scrutiny, review and prioritisation. Of this amount, around £1.7 million represents contracted research projects, while the remaining forms contributions to other programmes: namely, the Met Office Hadley Centre Climate Programme (MOHC CP) and the Adaptation Sub-Committee (ASC). The team is a mixed group of specialists spread across these strands who also produce a limited amount of its own secondary analysis.

The chart below shows the indicative allocation of the evidence budget spent by the Climate Ready Evidence & Analysis team to commission analysis, aggregated by different evidence streams. Note that while these charts give a sense of implicit prioritisation, they are for indicative purpose only; a number of other activities across Defra, across Government and potentially outside government indirectly contribute to the same objectives. Moreover, not all evidence projects can be attributed strictly to one evidence strand. A significant fraction of the largest component, the spend on the Met Office Hadley Centre, is needed to provide the underpinning science and development of the tools applied to produce projections of the future, and understanding of the past, present and future.



3. Future evidence needs

What are the longer-term evidence needs for the policy area/ programme?

Policy outcome – Climate Change Mitigation	Future Evidence needs
<ul style="list-style-type: none"> Facilitate the achievement of Government Climate Change Mitigation objectives sustainably. 	<p>For SPLiCE itself we anticipate that there is a good chance that the current projected period of 3-5 years may only be sufficient time and resource to deliver some of the main evidence gaps on the sustainability of low carbon energy, and further phases to address remaining gaps may be needed. The initial phase will be to review existing research and establish evidence priorities for research in the subsequent stages of SPLiCE.</p>

Policy outcome – Climate Change Adaptation	Future Evidence needs
<p>Encourage society to plan ahead effectively to address the risks and opportunities of the impact of climate change</p>	<p>Short term evidence priorities focus not only on producing the evidence for the next statutory requirement, but also in filling evidence gaps for future ones.</p> <p>The Climate Change Act (2008) introduces a 5-year cycle of Climate Change Risk Assessments (CCRAs) and National Adaptation Programmes (NAPs). When the first NAP report is laid before Parliament, delivery of the plan will largely fall to the Environment Agency.</p> <p>Whilst departmental priorities may shift immediately after delivery of the first NAP report, it is recognised that a re-prioritisation in central government would be needed as we move towards delivery of the second CCRA and NAP reports.</p> <p>In addition, we need to monitor the effectiveness of the actions</p>

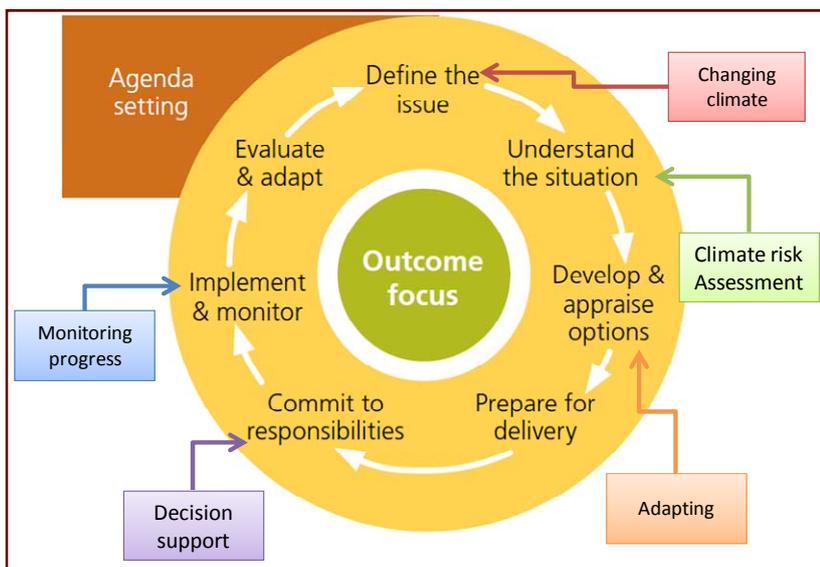
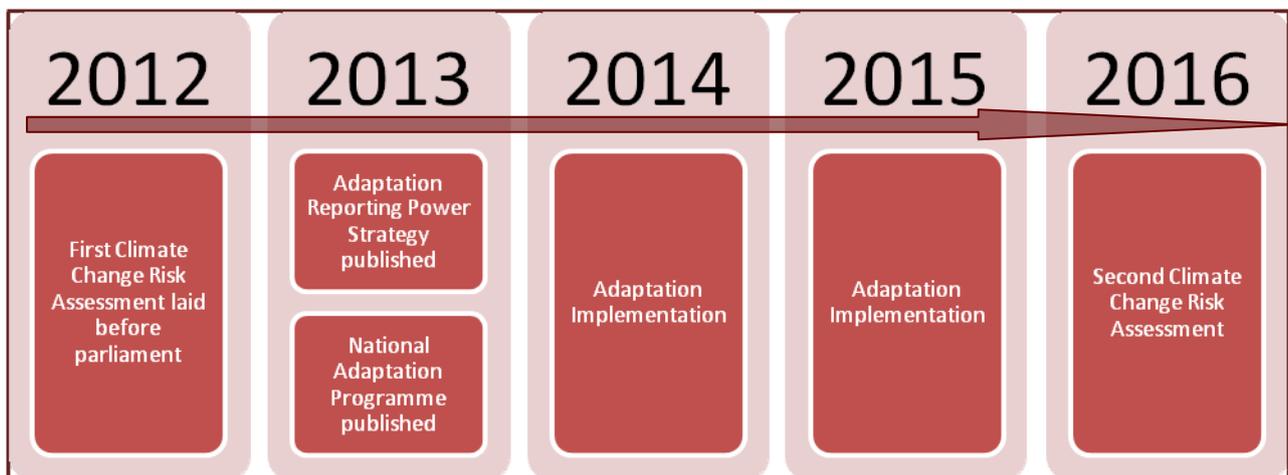
highlighted in the first NAP report, and to transparently present relevant data already gathered by the Environment Agency and others. The Evidence Team can support this process in several ways, for example helping to identify potential new adaptation-relevant data sets or improving the presentation of climate projections data for climate impacts modellers.

In terms of evidence providing a better understanding of future climate, the Met Office Hadley Centre (MOHC) Climate Programme is continually improving weather and climate forecasting, through development of an Earth Systems Model and improvements in underpinning science. The MOHC have previously produced several sets of long-term climate change projections for the UK. It is unlikely that the Earth Systems Model will be able to produce the next generation of UK climate projections until 2016, but there are ways in which the data gathered in the 2009 modelling exercise can be statistically handled in order to provide further information of use to decision-makers, for example by making available any improved near-term forecasting data of relevance to planners.

Whilst the most effective framework for delivery of the next CCRA is being discussed, the assessment should be based on the latest climate and weather projections. Improved data will be made available by MOHC to the climate impacts modelling community, with a view to research based on this data informing the next CCRA.

The second chart below shows how the evidence strands of Climate Ready Evidence and Analysis team fit with Defra's policy cycle.

Although a priority could be identified in the Climate Risk Assessment (to produce CCRAs) and Adapting (to produce NAPs) strands, all of the evidence strands are considered important to meet our longer term future evidence needs. For example, 'Changing Climate' is essential to improve Risk Assessment analysis, 'Monitoring Progress' is essential to developing analysis on 'Adapting' and to monitoring and improving policies. Decision support is important to implementing adaptation policies. A cyclicity could be identified in terms of the effort focusing on the nearest statutory requirement and improving the evidence for the requirements further away.



4. Meeting evidence needs

What approach(es) will be taken to meeting evidence needs?

Climate Change Mitigation

The initial stage of the SPLiCE programme will be a gap analysis that will review existing research and identify evidence needs which will be delivered in subsequent stages.

The process of developing project specification, initiating calls for proposals, reviewing proposals and selecting a contractor to deliver the project will be done in accordance with the Defra Evidence handbook to ensure the process is robust, fair and defensible. Where an evidence proposal has UK wide implications we will always try to involve relevant parties in the Devolved Administrations. For the SPLiCE programme it is hoped that there will be significant partner investment from Research Councils so procurement and review will need to accommodate as much as possible the policies and systems they use for

procurement.

SPLiCE

The Natural Environment White Paper (NEWP) raised concerns over the apparent lack of evidence on the effect on the natural environment of new energy infrastructure (including low and zero-carbon types) of the scale needed to meet 2050 emission targets. The government therefore made the commitment in the NEWP to work with others to establish a research programme to fill evidence gaps about impacts on the natural environment of the level of infrastructure needed to meet 2050 objectives, in particular with respect to the cumulative and indirect effects. Defra is therefore scoping this research programme in cooperation with DECC, OGDs and Research Councils.

The SPLiCE programme is a large, ambitious piece of work that requires a wide range of disciplines and a high level of expertise and staff hours which cannot be realistically delivered internally by Defra staff. Such a large endeavour requires careful scoping to ensure clear and realistic goals are set and clear path to reach them is laid out. Defra and the Research Councils recently ran a workshop for a range of experts from academia, industry and government to establish priorities for the SPLiCE research programme. The holistic approach taken with SPLiCE will place significant demands on any contractors to have access to, internally and/or externally, expertise on a wide range of disciplines.

It is essential that the work is respected and has broad buy-in from government departments, industry, NGOs and the public. It is important, therefore, to ensure research is objective, of high-quality, peer-reviewed and transparent. We envisage establishing a steering committee comprising the funders of the research, which is likely to consist of government departments and agencies, Research Councils, industry and NGOs, assisted by a Secretariat which provides the day to day link between the research team and the steering committee. An advisory group comprising a wider range of experts and interested parties could also be established.

The programme will be part funded by Defra with the intention to obtain co-funding from other Government departments, Research Councils, NGOs and industry.

SPLiCE will review existing research and commission new primary research that will be relevant to the whole of the UK. This involves linking up with other teams in Defra (biodiversity, air quality, habitats, etc) to draw on work they are in the process of delivering. The use of specific spatial data and techniques will depend on what comes out of the scoping workshop and what proposals are made by bidders for the contract.

For SPLiCE there is significant dependency on producing a research specification which attracts external funding, as the Defra contribution in isolation is not sufficient to sustain this scale of work. The wide range of low carbon energy technologies and impacts (direct and indirect) that are to be covered by this research (biodiversity, habitat, land use change, visual impact, etc) also means from scoping to delivery a wide range of disciplines and access to suitable experts both inside and outside Government is needed. Much of this expertise will be accessed via:

External partners

Climate change mitigation requires the integration of an increasingly diverse range of disciplines. Assessing the multifaceted impact of mitigation measures means that we draw on expertise in a range of areas such as biodiversity, habitats, visual impacts and societal issues (effects on rural communities, the economy and health). We must therefore engage with a wide range of expertise that can address these diverse areas.

As such our external partners cover a broad range of sectors and types of organisation in a variety of contexts; it is therefore not practical to list all partners. We aim to use research and analysis both from universities/institutions and companies. Key relationships include:

Defra – The Climate Change Mitigation team is a small one which has strong and productive relationships with other teams in Defra who address specific policy and science requirements for our Department (eg biodiversity, economics). They provide valuable intelligence on important issues and developments that we can follow up or work in partnership on within areas of common interest.

OGDs - Who undertake their own research on subjects which touch on sustainability and mitigation, for example DECC on deployment of renewable energy.

Living with Environmental Change (LWEC) - A partnership of research funders who can achieve more together than the sum of their parts in the field of environmental research.

The Committee on Climate Change (CCC) - The CCC is an independent body established under the Climate Change Act (2008) that advises the UK Government on setting and meeting carbon budgets and on preparing for the impacts of climate change.

Business - For example, using the LWEC Business Advisory Board to help shape priorities in understanding adaptation in the business context.

Research organisations - Provide valuable intelligence and are important delivery partners – co-funding and undertaking research.

Climate Change Adaptation

We utilise the following criteria in order to identify evidence needs and determine priorities for evidence projects:

- There is a clear policy need and policy customer.
- The analysis focuses on those risks which have the largest potential consequences and have a reasonable likelihood of occurrence, so maximising value for money of the investment.
- The analysis is of a cross-cutting nature or a strategic priority for the Climate Ready Team; hence the analysis would not be better directed by another organisation.
- Strategic evidence needs are planned and agreed through the relevant governance frameworks and stakeholders. For example, for the Met Office Hadley Centre this

includes the Met Office Science Review Group and users of the climate data. For preparing risk assessments, this would include the advice of the Adaptation Sub Committee of the Committee on Climate Change.

- Academics are consulted through a mix of ongoing engagement and specific events such as the Living With Environmental Change (LWEC) assembly in November 2012.
- In order to determine the method for producing analysis we take into account:
 - o The specific skills, capabilities and availability of our own staff in order to undertake in-house analysis
 - o Interdisciplinary input to the research questions
 - o The possibility of establishing collaboration with universities, research institutes, the private sector (eg power supply companies) and Other Government Departments
 - o The possibility of collaborating with other analytical teams in government
 - o The timing available and the priority associated to it

External partners

Our external partners cover a broad range of sectors and types of organisation in a variety of contexts; it is therefore not practical to list all partners. They fall within two broad categories: 1. those with whom we have a contractor-client relationship; and 2. those delivering adaptation at their own scale and developing an evidence base to underpin this.

Within the first group key relationships include:

1. The Adaptation Sub Committee - provides statutory advice under the Climate Change Act on preparing risk assessments and progress on implementing adaptation objectives. The work of the Committee is agreed in line with the Climate Change Act Concordat 2008, available on the DECC website
2. Environment Agency - lead on providing the Climate Ready service to stakeholders and therefore commission evidence to ensure that this service is properly targeted and is meeting consumer needs. This evidence programme is complementary to Defra's Climate Change evidence programme and plans and delivery are governed through the Climate Ready Project Board.
3. The Met Office Hadley Centre (MOHC) exists to provide up-to-date, robust and traceable scientific advice to HM Government on climate variability and climate change based on world-leading science. The scientific aim of the MOHC is to improve understanding of the climate system using observational data sets and climate models, and then to use this to provide projections of climate variability, future climate change and its impacts.

Climate science requires synthesis of an increasingly diverse range of disciplines. The Met Office Hadley Centre will maintain focus on the physical and biogeochemical aspects of climate where it has world-class expertise. Many important new components of the modelling system will be developed with the UK University and Research Council funded community. These collaborations bring very substantial added value to the MOHC Climate Programme funding.

The MOHC Climate Programme, jointly-funded with DECC, has in place a governance structure and programme management system to monitor performance against Departmental priorities for climate evidence. The programme also undergoes periodic review: the quality of the science is peer-reviewed annually; and a mid-programme review aims to assess the value the programme delivers. Both reviews make recommendations for future science to meet funders' evidence requirements.

Within the second group, key relationships include:

1. Other Government Departments undertake their own specific climate risk and impacts research (for example DoH on risks to Health) within the context of consistent climate projections and advice (provided by the MOHC).
2. Local authorities – such as Local Government Association and Core cities. Given that much of climate change adaptation naturally takes place at the local level.
3. Research Councils, for example through the Living With Environmental Change partnership and research fellowships in Defra
4. International engagement (eg European Commission, OECD) – Influencing external research and evidence budgets is vital to acquiring the climate evidence the nation needs.
5. External specialist advice is obtained through the Met Office Hadley Centre Climate Programme and the CCRA contracts, the Cranfield Risk Centre, through consultations with EU policy and research groups and through participation in IPCC processes.

We monitor the development of the evidence base across a number of partners through various knowledge exchange groups such as the EU 'CIRCLE2' group and by organising expert talks, for example from major new academic projects.

Multi-disciplinary approaches

Our Evidence team includes staff from different professions including Climate Science, natural sciences, economics and social research. In addition, we can draw on multi-disciplinary expertise from other areas of Defra, for example statisticians and operational research.

The multi-disciplinary nature of Climate Change Adaptation is highlighted by our evidence structure.

Quality Control and Evidence for Policy Development

We operate a light touch consultation process before evidence is either commissioned or published. The aim of this is to ensure: good line of sight to both Policy and Evidence Deputy Directors; strong links to policy objectives; a flow of information on the key emerging messages; quality control; and robustness. Maintaining a good line of sight also allows innovative or interesting work to be highlighted and cross-checked against Departmental priorities.

5. Evaluating value for money and impact

What approach(es) will be taken to maximise and evaluate value for money and impact from evidence?

Climate Change Mitigation

All the procurement processes are carried out following the Evidence Handbook guidelines to ensure fairness and transparency in our research competitions. Planning, tendering and evaluation of results from our research projects are, as a rule, overseen by a panel of relevant experts from Defra and its partners. Wherever possible we seek to ensure tenders and results are externally peer reviewed to provide confidence in the outputs of our evidence programme. For the SPLiCE programme it is hoped that there will be significant partner investment from Research Councils so procurement and review will need to accommodate as much as possible the policies and systems they use for procurement.

Success Measures

- Embedding sustainability in decision making across Government
This programme will help develop the knowledge and evidence tools to support routine integration of sustainability into decision making across national and local government.
- Fully integrated multidisciplinary evidence
Alongside the environmental science evidence base, an understanding of social and economic drivers/barriers to change to bring society with us on a journey towards a more sustainable future.
- That benefits are truly realised
Develop smart, clear proposals to focus on what benefits will be delivered and help to prioritise our evidence work. This will make the process clearer and make it more likely we will deliver the benefits we anticipated at the beginning of the process.
- Working in partnership with others and developing new ways of working
Building on existing evidence networks (for example LWEC and CCC) to help coordinate work, encourage collaboration and maximise knowledge exchange between evidence programmes. This allows greater benefit to be achieved from joint investment in research and gaining new insights from existing evidence.
- Knowledge Exchange (conversation rather than monologue)
Talk to audiences about our evidence so we can tailor it to their needs, making it more accessible and increasing its impact.

SPLiCE

We will review SPLiCE throughout its lifetime (considering interim and final outputs) to

ensure that it stays on track to fulfil the objectives of the programme. We will engage with the target audiences for this work (eg policy officials, academics, planning officers) to review how reliable and useful the outputs are and what extra value they generate.

We will publicise the results of the programme through specialist media, organise presentations and offer to speak at seminars on related topics to publicise the research. The contractor will be encouraged to prepare scientific research papers for publication in peer reviewed journals on the various outputs from the project (published on an ongoing basis during the lifetime of the work). We will be developing a communication strategy for this research programme. These actions will serve to promote the results and maximise their take-up and utilisation.

The two principal programme outputs are expected to be (along with reports, peer reviewed journal articles and seminars) a knowledge gateway that brings together and synthesises the full range of knowledge on sustainability impacts of low carbon power as well as a tool to aid decision making which uses a common currency to allow users to play with different parameters and make tradeoffs when looking at the sustainability of particular strategic infrastructure planning.

The intention is that these two outputs are accessible and provide a comprehensive and authoritative source of information that is used by policy officials, planning officials, industry, NGOs and the public. Once the project has delivered these outputs we will need to evaluate whether these tools are respected and are being used for making decisions on strategy and planning for deployment of low carbon infrastructure. Ultimately the value of these outputs can be judged by whether the wider user and academic community consider them important enough to take ownership of them and continue to update and develop them after the SPLiCE programme finishes.

Climate Change Adaptation

We aim to maximise and evaluate value for money and impact at both the individual project and the evidence programme level.

Evidence proposals

As part of the annual project commissioning cycle, evidence proposals are prioritised and budget allocations made taking account of (1) whether other sources of funding (eg from agencies, other government departments or Research Councils) have been or could be secured; (2) fit to Defra's Climate Change Evidence priorities as outlined in this Evidence Plan; (3) extent of project collaboration and multi-disciplinary working - wherever possible projects and evidence needs are developed in a cross-cutting collaborative way, drawing on a range of disciplines, linking with other projects and programmes within the Department, and considering each project in the context of the wider issues that Defra is addressing.

Evidence Procurement

Defra evidence procurement procedures are followed during tendering, management and evaluation of evidence projects to ensure quality of evidence, value for money and to minimise contractual and delivery risks. This includes independent peer review of project specifications and tenders for high value or sensitive projects; using the Adaptation Analyst Group (which includes analysts from cross-government) to peer review economic analyses; following appropriate codes of practice for commissioning external evidence projects and ensuring that contactors sign up to the Joint Code of Practice for Research; ensuring clear deliverables and milestones are agreed with contractors; encouraging publication of evidence outputs in the peer-reviewed literature and post-project evaluation of outputs.

Evidence Programme Reviews

Following best practice guidance in the Evidence Handbook, the Climate Change Evidence Programme is subject to external expert review periodically (typically every 5 years). This is to provide assurance that the projects commissioned over that period have cumulatively delivered value for money and provided high quality outputs that contributed to meeting policy needs. This provides external expert challenge to the long-term output and direction of the evidence programme, and helps to determine future priorities and opportunities. We also work with the Adaptation Sub-Committee of the Climate Change Committee who provide independent advice and scrutiny of our climate risk assessment and adaptation programme work.

The Met Office Hadley Centre Climate Programme (jointly-funded with DECC), undergoes periodic review. The quality of the science is peer-reviewed annually by a panel of independent experts (Hadley Centre Science Review Group). Not to mention the peer review of each of the programmes outputs through scientific journals. A new mid-programme review has been established at the midpoint of each programme cycle (currently 3 years long), to assess the value the programme delivers for Government. Both reviews make recommendations for future science to meet funders' evidence requirements.

Maximising and Evaluating Impact of Climate Evidence

We aim to maximise impact of the evidence by organising in-depth face to face briefing on specific timely topics with the policy customers so evidence is discussed and transferred; setting contracted research to deadlines that are timely to the policy needs, drawing on the 5-year cycle of the Climate Change Act and monitoring the efficacy of adaptation objectives eg through a targeted business survey

We will evaluate the impact of our commissioned evidence through post-project review of the outputs. Following the framework that the UK Higher Education Funding Bodies are developing for assessing the impact of their funded research on society and the economy, impact can be measured in terms of **Reach** - the extent and breadth of the beneficiaries of the impact and **Significance** - the degree to which the impact has enabled, enriched, influenced, informed or changed the products, services, performance, practices, policies or

understanding of governments, communities or individuals, commerce, industry or other organisations.

Contractors will be asked, as one of the project deliverables, to provide evidence of the impact/s of their project and the Climate Change Evidence team will evaluate the reach and significance of the identified impacts. Impact will also be one of the criteria used to assess the Climate Evidence Programme during the periodic programme reviews.