

# Adaptation decision making at the local level: a role for national level indicators?

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## Summary

Adaptation to climate change can be planned nationally but is in large part delivered locally, and is context-specific in nature. This means that actions have to be tailored to local situations. Indicators of climate change risks and opportunities, and impacts, at the local and regional level have been identified as a potentially useful resource for local adaptation decision making.

ClimateXChange (CXC) has produced a suite of over 100 national level indicators to monitor adaptation progress and identify trends in climate risks and impacts in Scotland. This project looks at the potential for CXC indicators, supplemented by other types of information, to contribute to the evidence needs of local authority decision making, while creating an effective link with national policy and how it is delivered.

The report presents findings from a case study based on Stirling Council and their City Region Deal (see Annex 1) and a Literature Review (see Annex 2).

## Key findings

The existing CXC Indicators can provide a valuable contribution to local decision making through:

- a national overview of climate adaptation and trend data; directly linked to national policy;
- high-level summaries in the indicator narratives; and

Developing the indicators further can potentially contribute by:

- articulating the local impacts of projected climate scenarios;
- strategically choosing case studies to raise awareness of future climate impacts; and
- including economic data to make the business case for adaptation

Considering the context in which local decision making operates – including the policy context and knowledge needs identified in this report – effective use of knowledge and evidence requires:

- an effective system of iterative knowledge exchange between national policy / knowledge provider level and local level; and
- knowledge that is interpreted and tailored to local user capacity

## Recommendations

### Utilising the current indicator resource:

- Run a pilot study with local authorities to test the usability of current CXC Narratives and identify any potentially beneficial changes to content or presentation, to create added-value to the national perspective.
- Investigate mechanisms to select subsets of indicators that are relevant to local authority users (e.g. combination of CXC Narratives and Local Climate Impact Profiles/Local authority adaptation strategies where these exist).

### Developing the indicators further:

- Investigate potential for CXC Indicators and/or narratives to help translate climate projections into knowledge about projected local impacts.
- Research ways to provide economic costs of (lack of) adaptation: e.g. new indicators that quantify costs and benefits, or using existing indicator data with other tools such as cost-benefit analysis to develop cost data. Business is currently a gap in national adaptation policy. CXC indicators for business could potentially provide economic information.
- Research the feasibility of producing an Index for Adaptation that can quantify multiple benefits in a single metric, potentially based on CXC Indicators.

### Developing supporting case studies:

- Provide illustrative case studies to accompany each CXC Narrative. Select these to showcase good practice.
- Consider providing case studies (i) to accompany CXC Narratives (ii) within Scottish Government policy documents, e.g. SCCAP; and including links to key knowledge sources (e.g. CXC Indicators and Narratives) in policy documents.
- Include awareness-raising examples that address future risks for Scotland, i.e. beyond the experienced impacts such as flooding. Consider use of international case studies to highlight future risks for Scotland.

### Building knowledge exchange capacity:

- Investigate possible delivery mechanisms for tailored knowledge products to local authorities (e.g. SEPA is their source of expertise on flooding issues). A 'trusted messenger' is required.
- Establish/maintain knowledge exchange links with local authorities to ensure knowledge provided is tailored to fit the local context/continues to fit user needs. There should be a strong link between national level policy and decision-makers at local authority level, with a two-way flow of information.

## Contents

Summary .....	2
Key findings.....	2
Recommendations.....	3
Introduction .....	5
Adaptation at the local authority scale.....	5
Decision-making processes in local authorities .....	5
Local authority adaptation knowledge requirements .....	5
Decision Making.....	5
Drivers and Barriers .....	6
Knowledge and Evidence Requirements .....	8
Other Observations.....	10
References .....	12
Annex 1. Case Study: Stirling City Region Deal .....	14
Background .....	14
Methodology.....	14
Findings .....	14
The Decision-Making Process .....	14
Knowledge and Evidence Requirements .....	18
Conclusion.....	22
Annex 1a. Case Study: Interview Questions .....	22
Annex 2. Literature Review.....	23
Introduction .....	23
The Decision-making Process.....	23
Knowledge and Evidence Requirements .....	25
Conclusion.....	27

## Introduction

### Adaptation at the local authority scale

Adaptation to climate change can be planned nationally but is in large part delivered locally and is context-specific in nature. This means that actions have to be tailored to local situations.

Local government, as the level of governance that is closest to individual community needs and geographic constraints, has a crucial role in delivering adaptation. It is therefore important to understand how effective national policy is in influencing action at local authority level. This should be seen in light of other drivers of and barriers to such action, including alternative or supplementary sources of knowledge.

### Decision-making processes in local authorities

The first step to understanding the knowledge and evidence needs of local authority decision-makers, is a clear appreciation of their decision-making processes. Mapping and analysing the decision-making process can help build this understanding and forms an important part of this report. This enables assessment of the degree to which adaptation knowledge or evidence developed in support of policy at the national level, is relevant at the local scale to inform decisions, such as in quantifying risks to prioritise certain issues.

### Local authority adaptation knowledge requirements

ClimateXChange (CXC) has produced a suite of over 100 national level indicators to monitor adaptation progress and identify trends in climate risks and impacts in Scotland. Their primary purpose is to inform the Scottish Government on progress against the objectives of the Scottish Climate Change Adaptation Programme (SCCAP). They have also been used by the Adaptation Sub-Committee of the UK Committee on Climate Change to inform its audit of Scotland's adaptation progress.

The CXC indicators are a significant knowledge and evidence resource that is potentially valuable for local authorities seeking to climate proof their development plans. In the course of previous engagement work, Adaptation Scotland have found there is a need for evidence among local authorities trying to implement adaptation, while in discussions with the CXC adaptation team, stakeholders have expressed an interest in 'making the CXC indicators local'. As the indicators are linked specifically to both the risks identified in the national Climate Change Risk Assessment and the aims of the SCCAP, finding a way to bring them into the evidence base for local authority decision making could help link local policy and practice more closely to national policy.

## Decision Making

### The process

Adaptation decision-making is inherently challenging. In addition to dealing with climate change impacts and uncertainty about future risks and impacts, local authorities have to manage competition and conflicts with other priorities in a crowded policy agenda. Barriers to action encompass economic, institutional, social and political spheres (Ranger et al. 2010).

The Stirling City Region Deal is an integrated development strategy, a novel approach for the Council with inherent complexity that has raised new challenges. However, this integration has demonstrably provided a suitable framework for including adaptation; given that adaptation by its nature is cross-sectoral and requires an inclusive approach. The City Region Deal offered the opportunity to deliver adaptation throughout a planned growth strategy. This approach also highlighted a particular challenge for adaptation monitoring and evaluation: quantifying the costs and benefits of adaptation options, including the co-benefits. Effective cost-benefit analysis can help make a business case for the positive inclusion of adaptation planning within a crowded policy environment.

## Strategic Environmental Assessment (SEA)

One obvious and important route for including adaptation in the planning process is through Strategic Environmental Assessment (SEA). However, the SEA process cannot always be implemented at a very early stage of planning, as was found to be the case in the Stirling City Region Deal. Nevertheless, factoring it into timelines at the beginning of the planning process (planning with the SEA process in mind) can help focus attention on adaptation, along with other environmental and sustainability issues (Runhaar 2016). This ultimately enables a synergistic, optimised plan that avoids unnecessary conflict between policy objectives. Early consideration facilitates using the SEA as a design tool, not just a process-driven exercise for compliance purposes. This unlocks its potential as a policy instrument.

## The need for flexibility, and evolution of responses over time

Climate risks will change over time; impacts will occur over different timescales. To manage this evolving challenge, flexibility should be integral to adaptive responses. The French Environment & Energy Management Agency (ADEME) note that this 'adaptive management' approach enabled the local authority response to climate change to evolve in line with increasing impact and a developing knowledge base (ADEME 2013).

Similarly, the Director leading the City Region Deal process in Stirling Council observed a fundamental shift occurring both within the Council and more broadly among local stakeholders. Leaders are recognising that, over the timeline of the City Region Deal, the environment in which it evolves will not be static but that social, political and environmental changes will occur. There has been a growing acceptance that plans cannot be 'set in stone' but will have to evolve in response to such changes. In developing the City Region Deal, the Council have adopted a flexible approach that can cope with managing multiple aims in a changing world. Maintaining this approach, and extending it beyond the City Region Deal to a broader planning landscape, is likely to increase the Council's ability to step up adaptation action in response to growing climate impacts, informed by ongoing monitoring.

Adaptive management thus emphasises the need for an ongoing monitoring of indicators that is sensitive to local decision making outcomes, as well as knowledge exchange between scientists, policymakers and decision-makers to ensure actions on the ground are responding to the latest knowledge generated as national capability and capacity. This exchange of knowledge should also occur in the reverse direction, to keep national policymakers abreast of implementation needs for adaptive actions and impacts.

## Engagement, inclusion and partners

The interviews with Stirling Council revealed that limited action on climate adaptation stemmed in part from negative connotations around adaptation on the part of decision-makers. There was a perception that adaptation would add to costs and reduce the ability to achieve core objectives. These perceptions are starting to change, and this can be attributed to a number of reasons:

- The integrated City Region Deal approach, encompassing multiple objectives, has encouraged recognition of co-benefits
- The City Commission that leads the City Region Deal bid includes a number of local stakeholders. Recent additions to the Commission are the Scottish Environmental Protection Agency (SEPA) and Scottish Natural Heritage (SNH) who bring a wealth of knowledge regarding current and future climate impacts in the local area, together with the adaptive actions they are taking to address them. This is a valuable knowledge resource that can be shared with stakeholders, raising awareness and ensuring alignment of plans.
- The City Region Deal aim of inclusive development, resulting from engagement with elected representatives (councillors), while not specifically an adaptation aim, nevertheless has the potential to improve adaptive capacity by addressing inequality and therefore reducing vulnerability and improving adaptive capacity.

## Drivers and Barriers

### Experience

Experience is an extremely important driver of adaptation. In Stirling, past impacts proved to be a powerful driver of action, such as climate-proofing buildings in light of flooded schools, overheating in workplaces and flooding more

generally. The literature also recognises this reactive mode but also the potential drawbacks of relying on experience. The strong emphasis on flooding in adaptation measures is largely due to experience of flood events. Other factors include the availability of flood risk data and guidance from SEPA together with relatively strong regulatory and legislative oversight. Taking immediate action to deal with climate impacts that are already happening makes sense (Ranger et al. 2010). However, such action needs to address long-term adaptation planning, or be supplemented by further measures that do (e.g. Kythreotis & Bristow 2016; UK Climate Impacts Programme 2015; Thompson et al. 2015). Reactive adaptation measures based on experience may not always be adequate or cost-effective in the longer term, if they are solely focussed on short-term resilience. For example, they may reduce flexibility to deal with longer-term climate impacts (Ranger et al. 2010).

To address future climate change risks and impacts, adaptation planning needs to take account of climate projections and associated future risks as well as experienced impacts. Decision-makers therefore need to have accessible climate information that directly highlights the consequences of projected climate change for their interests.

### Policy

The case study findings indicate that it may be helpful to integrate climate adaptation policy more widely across other policy areas, notably in the Scottish Planning Policy (SPP). This finding is widely recognised in the literature (e.g. Urwin & Jordan 2008; Town and Country Planning Association 2016). Planning powers in particular are considered 'crucial policy tools' (Measham et al. 2011).

Interviewees from Stirling pointed to a lack of detail in the SPP. In terms of outcome-driven governance, there are good reasons for that lack of detail (an overly prescriptive approach tending to provoke a compliance-driven response). However, the current approach leaves a gap for planners working with third parties. A policy mandate for adaptation would help provide traction with developers.

The scope of the case study did not include analysis of local authority level strategic plans, however, other studies have conducted such analysis. In their review of Local Development Plans in Scotland, Land Use Consultants (LUC 2016) found that these were largely effective in planning for flood risk (implementing national planning policy). They were less effective in promoting measures to deal with longer-term climate impacts, such as applying the precautionary approach and flood avoidance (as opposed to mitigation) measures. This reinforces wider findings in this paper about the need for more efficient targeting of long term measures.

### Policy recommendations

Awareness of the benefits and costs of adaptation, or lack thereof, is needed to drive action. In particular the Stirling interviewees noted that quantifying costs to business would have traction. Addressing the gap in the Society theme of SCCAP for business, and implementing monitoring and evaluation of this (for example, with CXC indicators for the Business sector) would help to draw attention to these risks and to identify the associated costs. Indicators should include quantifiable costs where possible. This would also potentially assist in justifying adaptation spending within City Region Deal funding appraisals.

### Barriers to Adaptation

Lack of public awareness regarding the need for adaptation, resulting in lack of public demand and therefore lack of political pressure from elected representatives, is a knowledge gap that constitutes a barrier to action (O'Donnell et al. 2017). In Stirling adaptation is happening to some extent 'by default', amalgamated with energy initiatives targeted at mitigation. Inclusion of energy projects, such as district heating schemes, earned recognition and 'plaudits' that contrasted sharply with limited recognition of the benefits of climate adaptation (Hopper 2017). The sustainability team acting as 'champions' have found ways to leverage adaptation action by combining it with high-profile mitigation efforts.

Resource constraints can constitute a barrier to effective adaptation decision making, however the provision of relevant, usable information and 'instructive examples' can help to offset this (Ranger et al. 2010). This is reflected in the knowledge requirements identified by interviewees at Stirling. Research to supplement existing knowledge resources with locally relevant information could help simplify the decision process for local authorities and thus mitigate the effect of the lack of resources.

## Knowledge and Evidence Requirements

Decision making at local authority level needs to take account of current and projected climate change impacts. Effective adaptation solutions are context-specific. The knowledge and evidence required is therefore a synthesis of national trends and policy priorities, together with local knowledge to find practical solutions. A number of knowledge resources can be combined to address this need. A summary of these is provided in Table 1.

Knowledge Requirement	Suggested Solution
National overview / trends	CXC Indicators & Narratives
High level summaries (national level)	CXC Narratives
Climate projection information – local impacts	e.g. CXC climate projection summaries: ‘Future changes in precipitation and temperature’ <sup>1</sup>
Selected indicators for area	Selected subset from CXC Indicators; may be supplemented by additional indicators suitable for use at a smaller spatial scale. Mechanisms to identify relevant subsets of indicators might involve, for example, analysis of a combination of CXC Narratives, Local Climate Impact Profiles and Local authority adaptation strategies.
Case studies / examples of good practice	1) Produce case studies to accompany CXC Narratives, and potentially include in policy documents. Consider including international case studies to illustrate future risks for Scotland. E.g. weADAPT <sup>2</sup> 2) Films of case studies; CXC demonstration projects <sup>3</sup> 3) Adaptation Scotland case studies <sup>4</sup>
Economic data; adaptation costs	1) Produce CXC indicators that provide economic data where possible. 2) Data from existing indicators may be of use in developing estimates of economic loss, etc. 3) Investigate potential economic impact assessment methods, e.g. cost-benefit analysis.

Table 1: Potential knowledge resources for local authority decision-makers

### CXC Indicators

The Stirling case study identified a user need for a national overview and trend information. National level indicators were identified in the literature as a useful source of this information (Kennedy et al. 2009, cited in Leiter 2015; ADEME 2013). Various drawbacks that have limited their use have been identified in the literature (Brown, 2003; Higginson et

<sup>1</sup> <http://www.climateexchange.org.uk/adapting-to-climate-change/future-changes-precipitation-and-temperature/>

<sup>2</sup> <https://www.weadapt.org/>

<sup>3</sup> <http://www.climateexchange.org.uk/adapting-to-climate-change/adaptation-practice/>

<sup>4</sup> <http://www.adaptationscotland.org.uk/how-adapt/case-studies>

al., 2003; Lehtonen, 2015; Graymore et al., 2008, cited in Runhaar 2016; Leiter 2015). Table 2 below shows these drawbacks and how it is proposed CXC indicators can overcome them.

Issue	Solution
Language differences between (i) planners and policy-makers, and (ii) developers of indicators	CXC indicators are written in plain language, to be accessible to non-specialists
Discrepancies in spatial scale	The indicators were designed for national level use. As such, not all are relevant or appropriate for local scale use; only selected indicators would be used. Some of the indicators do have local authority level data available. Local authority data (especially socio-economic data) may be available to populate local level indicators.
Do not account for the context-specific nature of adaptation	Supplement a suitable subset of the national level indicators with case studies (see below)
Loose linking between reporting schemes and policymaking	CXC indicators are linked directly to the SCCAP and the CCRA. Their use can strengthen the link between national policy and local decision-making.
Lack of resources within the administration	All decision support tools need to account for the gap between producers (experts) and users – the so-called ‘climate information usability gap’ - so that information supplied meets user-defined needs.

Table 2. Use of CXC Indicators – addressing the issues

### CXC Narratives

Stirling interviewees – operating at a local authority level - identified their need for high level summaries at national level. Existing CXC Indicator Narratives provide national level thematic summaries and can fulfil this role. Additionally, they provide a ‘way in’ to help identify relevant indicator subsets, and a summary of the national policy context.

*Recommendation: Run a pilot study with local authorities to test the usability of current CXC Narratives and identify any potentially beneficial changes to content or presentation, to create added-value to the national perspective.*

### Case studies

Indicators are limited with respect to dealing with the context-specific nature of adaptation (Leiter 2015). The need to account for local context is widely recognised (e.g. Measham et al. 2011). Case studies were identified both in Stirling and in the literature as a suitable means of providing examples of practical adaptation solutions that can showcase potential local strategies and be tailored to local conditions (Ranger et al. 2010). Examples should include strategically chosen issues to raise awareness of future risks that require action with longer lead-in times. Such examples could use locations other than Scotland to demonstrate impacts we may see in future. CXC Indicators could include links to illustrative case studies, e.g. indicator NB11 ‘Extent of key habitats: deep peat’<sup>5</sup> includes a link to a peatland restoration case study: Lowland raised bog at Blawhorn Moss National Nature Reserve<sup>6</sup>. It may be more appropriate to link case studies to the overarching narratives, which are more accessible for local authority users. Further examples that

<sup>5</sup> <http://www.climatechange.org.uk/adapting-to-climate-change/indicators-and-trends/resilience-natural-environment-terrestrial/nb11-extent-key-habitats-deep-peat/>

<sup>6</sup> <https://www.weadapt.org/placemarks/maps/view/920>

illustrate their relevance to local authorities could be developed for key adaptation issues; e.g. a case study on overheating buildings in the health care sector could potentially be developed.

*Recommendation: Consider providing case studies (i) to accompany CXC Narratives (ii) within Scottish Government policy documents, e.g. SCCAP.*

### **Economic Data**

There is a need for economic data for decision-makers to justify spending on adaptation both internally and with third parties. Further investigation is needed to identify tools to help leverage funding and justify project implementation, e.g. with regard to City Region Deal funding criteria. A particular issue with the Stirling City Region Deal was their inability to include Sustainable Development as a primary project goal, because there was no simple, single measure available to quantify an impact which cut across sectors and included co-benefits. One potential solution would be a sustainable development index, which could be an aggregate of several indicators. A similar Index could potentially be developed for adaptation, which is capable of accounting for co-benefits. The Natural Capital Asset Index produced by SNH (Scottish Natural Heritage 2017) is one potential model.

*Recommendation: Research the feasibility of producing an Index for Adaptation, potentially utilising CXC Indicators.*

### **Contextual Factors**

So far, adaptation in Stirling has been largely driven by previous climate impacts. Personal experience of the costs and disruption of not adapting is an effective catalyst of action.

Experience-driven, reactive solutions that provide short term robustness may be entirely appropriate in some cases. However, they may lead to maladaptation, reduce flexibility, or be insufficient to deal with future climate impacts (Ranger et al. 2010). Having access to relevant knowledge and evidence is crucial to inform adaptive actions, ensuring they are sufficient to deal with future climate impacts.

Decision-makers require knowledge of both current and future climate risks and impacts, and the options for tackling them. While a large amount of information is available, such as UKCP09 climate projections, the CCRA2 and CXC indicators for Scotland, there is a lack of capacity required to sift through and interpret all of this information.

To increase its impact with decision-makers, information needs to be:

- Clearly signposted in policy and guidance documents
- In plain language accessible to non-experts and non-scientists
- Simple, concise and relevant

*Recommendation: Provide local authorities with easily assimilated information that is more informative about local impacts and vulnerability, together with practical guidance on implementation.*

### **Other Observations**

#### **Local Authority Employee Training**

The value of inspirational examples and practical knowledge are apparent in the Stirling case study, e.g. an EU Mayors Adapt twinning trip to France to see adaptation measures was described as having led to an increase in the willingness to innovate. Interviewees identified the need to raise staff awareness of adaptation issues, e.g. staff having to replace storm-damaged gutters with a more robust/higher capacity design. There is confidence in the ability of staff to devise their own solutions to fit local needs, provided they are given the necessary knowledge about climate impacts and adaptation. Context-specific adaptation and flexibility require knowledge on the part of the implementers.

Local Authorities may wish to provide Continuing Professional Development training on adaptation knowledge.

#### **City Region Deals and Adaptation**

The Stirling Case Study demonstrates the opportunity presented by City Region Deals to integrate adaptation into development plans. Including adaptation at an early stage increases the potential for cost-effective options that can

achieve co-benefits. Conversely, City Region Deal developments that are not adequately adapted to future climate impacts are at risk, including the risk of failing to deliver their economic potential.

Stirling's experiences in early development of their City Region Deal may also be of interest to other councils who are embarking on a similar process.



*Vision for Stirling City Park (Stirling Council/Stallan-Brand/Turner & Townsend)*

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## Annex 1. Case Study: Stirling City Region Deal

### Background

The City Region Deal for Stirling formed the main focus for examining adaptation decision making. This is a major development proposal incorporating a number of different projects over multiple locations. As such it involves a range of development and planning decisions that will shape the city in the coming decades. Data and evidence about the likely impacts of climate change is therefore needed to support decision making. City Region Deals are a partnered UK-Scottish Government initiative focussed on achieving economic growth<sup>7 8</sup>, and the proposed City Region Deal for Stirling and Clackmannanshire is scheduled to run from 2016-2026.

### Methodology

Focussing on the City Region Deal, the research methods were designed to answer the following over-arching questions:

1. Where is adaptation considered in local authority decision making or planning processes?
2. What are the barriers and drivers for meeting adaptation policy objectives?
3. What information or evidence (such as indicator type data) is needed to inform decision making?

Evidence was gathered through six semi-structured interviews with members of Stirling Council, each involved in the process of developing the City Region Deal. Five of the interviews were conducted at Stirling Council offices during January 2017. Interviews were recorded; each interview lasted a minimum of 45 minutes. A sixth phone interview was conducted in March 2017, with notes made during the call; this lasted one hour. The interviews were supplemented by informal meetings, phone calls and emails with members of the Council's Sustainability team. Relevant local documents such as the Climate Change Adaptation Strategy for Stirling (Stirling Council 2016b) and documents related to the City Region Deal process were also analysed.

The interviewees had the following roles in the council structure:

- Director Children, Communities & Enterprise (and Chair of the City Region Deal Steering Group)
- Senior Manager Infrastructure
- Service Manager Infrastructure Delivery
- Service Manager Sustainability
- Planning Policy Team Leader
- Senior Sustainable Development Officer

The interview questions focussed on the City Region Deal specifically, relevant climate risks and adaptation, the priorities and drivers that had an influence in adaptation decision making, and knowledge needs. The questions are included in Annex 1a.

### Findings

#### The Decision-Making Process

Development of the City Region Deal began early in 2015 with the initial aim of developing an economic strategy for the Stirling area and to leverage Growth Accelerator<sup>9</sup> funding. Initial discussions with the Scottish Government gradually led to the programme becoming a City Region Deal bid. City Region Deals were introduced by the UK Government in 2011 as a mechanism to enable the decentralisation of major economic development and infrastructure projects to local

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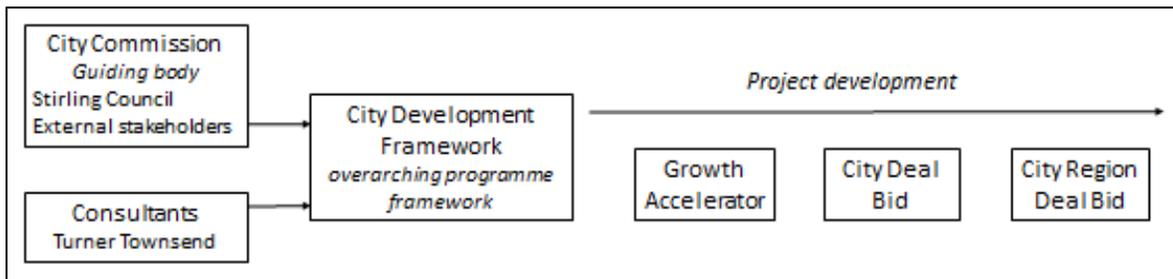
<sup>7</sup> <https://www.gov.uk/government/policies/city-deals-and-growth-deals>

<sup>8</sup> <http://www.gov.scot/Topics/Built-Environment/Cities>

<sup>9</sup> <http://www.scottishfuturetrust.org.uk/our-work/funding-and-finance/economic-investment/growth-accelerator/>

authorities (Roelich 2015). A City Commission was set up to lead the City Development Framework; the official name for Stirling's City Region Deal bid<sup>10</sup>.

The City Commission is headed by the Council leader with representatives from organisations providing a range of influence, knowledge and expertise across sectors. Within the council, the project is led by a City Region Deal Board, headed by the Director of Children, Communities and Enterprise. Since its inception, there has been gradual linking of separate strategies to achieve an integrated City Region Deal programme, including a broadening range of stakeholders.



**Figure 1. Development of the City Region Deal Programme**

There is no standard City Region Deal, each one is unique, and with only minimal guidance available to local authorities there is a lot of scope for diverse approaches. The Director explained that, as a relatively small local authority, Stirling Council did not have 'project-ready' development plans, but instead had to find a way through the process which constituted a steep learning curve.

The Stirling City Region Deal currently includes the following projects<sup>11</sup>:

The Harbour; Digital District; Grow-on Space; City Park; River Project; Mercat Cross; Rural Stirling; Skills and Employment.

The unique challenges the City Region Deal posed for Stirling Council led to a departure from their usual procedures. Some key attributes of the process that emerged, identified by interviewees, had an impact in the way climate change adaptation fitted in:

- **Time:** Interviewees involved early in the process agreed that time constraints had an effect on decision making, including through the implementation of the Strategic Environmental Assessment (SEA, see below for details).
- **Integration:** Early conceptual work aimed to bring together all of the Council's key strategies, such as the Local Development Programme, Local Transport Strategy and Economic Strategy. Multiple objectives merged towards a single vision that was more holistic and cross-sectoral than a typical growth agenda. The City Region Deal therefore has a broad development focus encompassing tourism, leisure, health and wellbeing and communities.
- **Partnership and Inclusion:** It was felt that partnership working (especially with the Scottish Futures Trust and external consultants) accelerated progress. City Region Deal planning occurred both within the Council as an internal process, and together with key stakeholders connected with the Stirling area, including businesses and the third sector. Engagement with cross-party elected representatives was a key factor in the City Region Deal becoming focussed on inclusive growth; the ambition was to create a growth strategy that will benefit all, and address long standing issues and inequalities in Stirling and the surrounding rural areas.
- **Place:** The City Region Deal team examined 'people and place', what Stirling needs and what its strengths are. One resoundingly clear piece of common feedback emerged across stakeholder groups - 'involve the river' -

<sup>10</sup> Note: the term 'City Region Deal' is used throughout this paper to refer to the City Development Framework/City Region Deal bid, although it is not technically a City Region Deal until approved. This reflects the terminology used within Stirling Council.

<sup>11</sup> <http://my.stirling.gov.uk/services/business-and-trade/citydeal>

highlighting a desire to re-integrate the river in daily life. This was driven by a variety of stakeholder priorities. Senior managers in the Council supported this feedback and a 'River Project' was adopted as a key element of the City Region Deal.

- **Influence:** Interviewees identified the requirement to influence, persuade and achieve cross-party elected member buy-in at all levels – within Stirling Council, Members of the Scottish Parliament (MSPs) and Westminster Members of Parliament (MPs).

The complexity of the City Region Deal process stemmed from its integrated approach, bringing together different existing strategies and targeting multiple objectives. This presented a new way of working for the Council. Although challenging to implement, this integration provided an excellent opportunity for achieving climate change adaptation which is often multi-sectoral. Flooding provides a particularly resonant multi-sectoral issue; and a focus on alleviation of flood risk was driven by the previous experience of flooding in Stirling.

### Achieving Integration and Adaptation

The key factors in successfully achieving integration, including adaptation, were encapsulated in the River Project, as follows:

- Inclusivity: stakeholders with a shared sense of place
- A cross-sectoral issue: flooding
- A well-placed champion

The River Project was inspired by engagement with stakeholders around a shared place, the river. The Sustainable Development Manager, brought into the process to lead the River Project, was thus able to influence the wider programme, including a brief to consider the Council's duties under the Climate Change (Scotland) Act.

#### Stakeholder aims for the River

##### Communities:

'Bring the river into Stirling' -

History, Culture, Place-making, Recreation, Wildlife, Beauty, Social

##### Stirling Council:

Economic drivers – higher riverside property values



Image: John McPake

Bringing elements of flood management, greening and sustainability into the proposal enabled the incorporation of the Council's existing £60 million Flood Management Plan into the City Region Deal.

As the project took shape a broader range of objectives started to be addressed across the City Region Deal. These objectives included adaptation initiatives to address pluvial flooding (rainwater runoff), by replacing existing or planned hard surfaces with soft, porous alternatives to slow runoff.

### The Process: Strategic Environmental Assessment (SEA)

A Strategic Environmental Assessment (SEA) applied to the City Region Deal master plan was published in July 2016 (Stirling Council 2016a; Stirling Council; Turner & Townsend: Stellan-Brand 2016). Stirling is the only one of seven City Region Deals to date for which an SEA has been published. The SEA is considered here as a means by which to embed

climate change adaptation into the planning process. Among its findings, the SEA identified a number of climate change adaptation issues.

One of the interviewees (the Senior Sustainable Development Officer) was lead author on the SEA and all the interviewees were aware of the process. There were mixed opinions as to whether the SEA should have been completed earlier in the process, with one interviewee commenting: 'that's what you're meant to do – use as a tool for drawing up strategy... it maybe came a bit later in the process than it should have'. The stated rationale for completing the SEA at the start of a project is to ensure that it fully influences project objectives. In contrast, those individuals closely involved in the early stages of the planning process identified practical difficulties in producing an SEA because the early stage planning was so fluid, and it took longer than expected to define project objectives.

Overall, there was a somewhat negative perception of the SEA. The process tended to be viewed as an additional hassle that might throw up barriers to a project, rather than facilitating the achievement of goals. It is an onerous process, which is an issue in itself when resource is constrained.

There also appeared to be some lack of understanding about the SEA process. There are several possible reasons for this:

- It was the first some interviewees had direct involvement with the SEA process so it was unfamiliar.
- Confusion over the process, with some assuming that like the Environmental Impact Assessment the process is applied after decisions are taken, not as a tool to improve decision making.
- Lack of time, and the perceived urgency of putting together the City Region Deal to secure funding
- The complex nature of the programme to which it was applied; multiple projects and multiple objectives

Despite the drawbacks listed above, the SEA successfully highlighted the need to incorporate adaptation into elements of the programme, and suggested mechanisms for achieving this, so it has made a useful contribution. As a result of broad engagement, the City Region Deal has evolved to include a wider set of goals. This has brought recognition of synergies and co-benefits that can be achieved. The primary aim of economic growth can be achieved without damaging other aspirations and while achieving other policy aims at the same time. In this light the SEA can be seen as a valuable tool to help identify both potential co-benefits and potential conflicts between objectives.

Furthermore, the City Region Deal projects are still being developed and the programme is flexible, with time and potential to further embed the SEA findings within the planning process.

### **The Role of National Policy**

The City Region Deal proposal was 'alignment-tested' for compatibility with national policy by outside consultants. This approach appears to suggest that decision-makers worked to achieve compliance with national policy, rather than policy being a primary driver in shaping the programme. The policies mentioned by interviewees in relation to climate change adaptation were the Scottish Climate Change Adaptation Programme (SCCAP), Scottish Planning Policy (SPP) and the Land Use Strategy (LUS).

At a decision-making level, senior managers did not refer to policy detail. As plans evolved in discussion with multiple stakeholders, the balance of different interests and agendas made it challenging for the interviewer to clarify how outcomes are driven by policy alignment.

The senior Sustainable Development Officer was named by interviewees as the 'go to' person for knowledge on climate change adaptation policy, among the planning and infrastructure team members, who did not individually have detailed knowledge of this policy area.

### *Public Sector Climate Change Duties*

None of the interviewees considered Public Sector Climate Change Duties to be a strong driver of adaptation action, noting the emphasis was on mitigation of climate change.

### *Across Policy Areas*

Interviewees suggested that stronger policy directives are needed to help planners in negotiating with developers:

- If it's not mandated, it's not going to happen'
- 'It would be helpful to have policy to cite as justification' (Planning Policy Team Leader).

General observations from the interviewees who use policy documents in their everyday work were identified as follows:

- Communication is stymied by some of the language and terms used. For example, the Scottish Government's draft 'Climate Change Plan' only covers mitigation, not adaptation, although the title suggests it should do both. This sends an unclear message and has the unintended effect of marginalising adaptation – at least one interviewee thought mitigation and adaptation had been combined into a single plan.
- It would be helpful if policy set out more clearly the relevance of adaptation for local authorities.
- There is a lack of targets in adaptation policy. It was acknowledged that setting these may be difficult, however suggestions included targeting to carry out certain pieces of analysis such as producing an Adaptation Strategy.
- Climate change policy contains obligations but not enforcement.

### **Knowledge and Evidence Requirements**

#### *Consideration of climate risks within the decision-making process*

The climate change actions being incorporated into the City Region Deal plan all respond to impacts that have been experienced in the Stirling area. Experience was clearly a strong driver of action; however climate change was not always recognised as an explicit part of an issue. This has a number of ramifications:

- Responses may not be future climate proof; they may not account for increased levels of vulnerability in future
- It reinforces the suggestion that there is a lack of knowledge, or confidence, in acting on the basis of climate projections
- Future climate risks that have not yet manifested in the area may not be taken into account
- It can lead to complacency – there has not been significant disruption in the area related to extreme weather events during the last 3 years

#### *Projections*

Some interviewees had experience in using forecasts and projected data and had developed strategies to manage uncertainty. However interviewees indicated there was less confidence in the use of climate projections in decision making.

It was clear that planners are experienced in using projected data, such as population projections to understand future needs for housing. In light of this experience, they are fairly comfortable in working with projections and managing uncertainty, as evidenced by the interviewee comments on projections:

- 'You have to use them and go for it'
- 'Everything is a bit of an estimate'
- 'Monitor as you go and use monitoring in future plans to improve – what worked, what went wrong?'

Planners have to justify how they arrived at a figure used for decision-making, and are comfortable with this uncertainty. For example, the accuracy of previous forecasts is tracked through comparison with actual trend data, helping to build confidence in levels of forecasting accuracy.

Similarly, projections of flood risk provided by SEPA are being used to inform planned actions within the City Region Deal including measures to reduce rainwater runoff (pluvial flooding), such as a change from hard to soft (permeable) surfaces and provision of blue and green infrastructure.

Climate projections are available to the Council; these are included in Stirling's Adaptation Strategy (Stirling Council 2016b) and in the Jacobs report for the Cities Alliance (Gorman 2015), both based on UK Climate Projections (UKCP09). However, none of the interviewees described using these projections to inform actions, and the Sustainable Development Manager commented that uncertainty was an issue in persuading others to take action.

More people in the Stirling area will become vulnerable to climate impacts in future conditions, and this needs to be accounted for in plans. There is a lack of public pressure to help drive such inclusion, and consequently a lack of political pressure. There needs to be wider communication of the impacts of changes such as higher temperatures

'People in Stirling tend to think warmer weather will be a good thing; so it is difficult to convey the consequences of heatwaves and high temperatures that we are not used to dealing with'.

More needs to be done to:

- Improve confidence in use of climate projections
- Improve understanding of the impacts that will result from future climate change
- Promote utilisation of climate projections to inform and future-proof decisions

The interviewees were asked which climate risks they thought were applicable to the City Region Deal. The risks were selected from the Climate Change Risk Assessment for Scotland (CCRA2) to cover a range of issues.

Some clear patterns emerged:

- Knowledge of risks reflected interviewees' experience working on adaptation issues; those who had most involvement in adaptation identified a higher number of risks.
- Specific risks identified reflected individuals' areas of expertise, e.g. planning, built environment.
- Risks identified by most (or all) of the interviewees were those that had already impacted in the Stirling area.

#### *Risks to infrastructure services from river, surface water and groundwater flooding.*

This was the only risk identified by all those interviewed. Interviewees agreed flooding was the most obvious risk and awareness was high due to past experience of flooding events in Stirling.

Experience of the impacts of extreme weather is demonstrably a powerful driver of adaptation action, with flooding the prime example. In the early City Region Deal plans, just one example of adaptation was evident: the flood attenuation scheme in the City Park. The need for adaptive action was recognised because the site was already a well-known problem area for water management. This represents a reactive planning mode that was typical throughout areas of concern (below).

#### *Risks to building fabric from moisture, wind and driving rain*

Over the last few years heavy downpours have caused severe disruption in the Stirling area, including the flooding of schools when guttering – which was not designed to cope with such extreme conditions – was overwhelmed. The resulting school closures caused widespread disruption, clear up costs and citizen pressure, all effective drivers for action to ensure such problems are avoided in future. These school closures were cited by interviewees as a 'wake-up call'. The high profile of such incidents means that funding is likely to be provided for adaptive measures to prevent repeat incidents.

*Risks to business from reduced employee productivity, due to infrastructure disruption and higher temperatures in working environments*

Interviewees considered that during two consecutive snowy winters, including a spell of several weeks duration with no train service between Stirling and Dunblane, productivity of council staff was significantly impacted due to the length and scale of the disruption. Various workarounds included bussing staff to work; flexible working hours allowing travel in daylight; home working. Where work needed to be posted or emailed out, there were issues with lack of access to files. The Council's Adaptation Strategy highlighted this as an issue, and a number of actions have been taken or are planned, to reduce the future impact of such conditions. For example, the Council's IT system has been upgraded to improve remote working access and consideration is being given to creating rural hubs with 'touchdown' work space, which provide the co-benefits of improving flexibility for staff and an expected increase in productivity.

Experience of carbon dioxide build-up and overheating in the Council's current premises at Teith House, leading to staff reporting sleepiness in afternoons has prompted the inclusion of adaptive measures within plans for the new Council premises within the Civic Hub project. Buildings will be adapted to weather conditions, providing sufficient ventilation and cooling.

Cost constraints and lack of regulation were not perceived to be a major barrier to ensuring the Civic Hub infrastructure is suitably adapted, because experience and knowledge gained personally by council staff in Teith House have raised the profile of these issues. There is a clear distinction in this respect between the Council, who have to deal with the consequences of their own decisions, and a developer who works to the regulations and sells the development without being directly impacted by any failure to adapt.

*Knowledge and data to inform decision-making*

One of the key aims of this study was to investigate what contribution the CXC indicators might make to local authority knowledge needs. They are a source of national level data and trends, providing information on data availability and sources.

Interviewees considered that a combination of the following would be useful:

- A national perspective and overview of trends / a few high level summaries of national level data
- Selected indicators relevant to the area
- Case studies / examples of good practice

Decision makers favoured selected indicators relevant to the Stirling area plus a few high level summaries of national level data, while those involved in delivery thought case studies and a national perspective and overview of trends would be most helpful.

As expected, interviewees found that the indicators in their current form were too numerous to get to grips with, although some of them would be useful to inform development issues (see box below). However, interviewees suggested that within the Council there isn't the resource or expertise to take all of the current indicators on board. Nevertheless, the indicators were felt useful in providing an example of the sort of information that is available and a starting point for discussion.

**An example of indicator use**

Planners will be providing supplementary guidance on spatial planning in a future part of the City Deal process. CXC indicators such as BB13 'Extent of impermeable surfaces in Local Authority areas' could be used to justify the inclusion of more permeable surfaces. 'This is key information for planning – if this was in guidance to use in justification for actions, it would be useful'.

### *Knowledge needs in Local Authority Planning*

Planners require a wide knowledge base to cover a broad remit, and adaptation is a relatively new area to them. As an interviewee observed 'There is not a huge amount of guidance or information for planners'. A visit to an EU Mayors Adapt twinning project in France provided a learning opportunity including practical examples of adaptation, which has raised awareness of the impact planners can have in implementation. Providing case studies and exemplars of good practice embedded in planning policy documents could improve this awareness, such as through the CXC Adaptation Demonstration Projects.

### *Communication*

From their experience in communicating climate change issues within the council, one interviewee observed a general need to simplify the language used in both verbal and written communications, particularly to engage with colleagues who do not have a scientific or technical background. 'Insider' short-hand language can present a problem.

In making knowledge available to help local authorities, a further consideration is where that knowledge is disseminated from. For example, SEPA are the recognised 'go to' organisation for expertise on flooding. If further sources of guidance are made available for adaptation, it's important to make sure people know where to find it, and develop a trusted source.

### *Project Monitoring and Evaluation needs*

The data requirements for the City Region Deal are driven by the funders, and these require measurement of only a few key performance indicators to demonstrate the project's additionality. The Stirling City Region Deal has nine 'top line' objectives. The Steering Group wanted to include sustainability as a top line objective, but were unable to do this as they could not identify a suitable indicator. As the Director leading the Group noted 'it's difficult to encapsulate progress against multiple objectives in a one-liner'. Similarly, measurement of progress in climate change adaptation is difficult; there is no single metric (as there is for mitigation).

### *Staff training and Continuing Professional Development needs*

At operational level, it was felt by interviewees that staff need to be provided with knowledge and understanding in order to build an awareness of adaptation that can be related to their specific role. The Service Manager - Infrastructure Delivery explained the value of giving staff background information:

#### **Continuing Professional Development**

Experience (e.g. training on asbestos awareness; working at height) has shown that Continuing Professional Development is an effective way of communicating issues, through an interactive training session lasting an hour and a half. For climate change adaptation, this should include a national perspective, overview of trends and case studies, and involving staff in debates around the examples shown and initiating debate around delivery. Given suitable knowledge, staff would then be able to work out their own local solutions. This has been demonstrated within the Council: for example nurseries that previously accommodated children aged 3-5 now house 0-2 year olds and require a different setup. No design guidance is available for this, but staff are working out solutions for themselves. Similarly training for working at height provoked constructive debate. There is also a need to maintain awareness through annual updates covering topics including climate change awareness, policy, developments over the past year and example projects, e.g. a novel drainage system, the benefits and specific design elements. The key learning points should be presented in a way that is relevant to the role; think 'why are they doing it; why should they listen?'

Giving staff the tools to apply knowledge about national level climate risks and impacts and find solutions appropriate to their local context is an important element in addressing the place-specific nature of adaptation.

### *Skills for Adaptation*

It was observed that mitigation and adaptation require very different skill sets and that adaptation in particular is not well served by 'silo' working. It needs to be mainstreamed across Council departments and with other strategic objectives. This reflects a key finding across this study; there is a need to mainstream adaptation.

### **Conclusion**

The decision process in the Stirling City Region Deal has been a novel approach for the council, involving wide consultation with stakeholders and local people. The goal has broadened from economic growth to inclusive economic growth. This encompasses sustainability, adaptation and a sense of place. While there are a number of challenges to adequately addressing adaptation needs in decisions, this broad and inclusive approach appears to be an enabling factor.

Data about the costs of (lack of) adaptation is an important knowledge requirement to enable a business case to be made. The emphasis on experience-driven adaptation points to a need for more knowledge and evidence about future climate risks, for example public health impacts and increases in the number of people who are vulnerable to climate impacts. Interviewees recognised the need for both national level overview and more specific information about climate impacts, together with case studies as exemplars of practical solutions. The CXC indicators can potentially contribute to a number of these knowledge needs. This is discussed in more detail in the main body of this report.

### **Annex 1a. Case Study: Interview Questions**

1. Can you briefly outline the key elements of the decision making process in shaping the City Region Deal?
2. What do you consider the main priorities in these decisions?
3. The City Region Deal project timeline is 2016-2026, however the lifespan of the developments will be much longer. Are projections of changing conditions over that time span, such as population change, socio-economic factors (and climate change), taken into account?
4. These are some of the climate risks that have been identified for Scotland:
  - a. Risks to landscapes from pests, pathogens, invasive species
  - b. Risks to infrastructure services from river, surface water and groundwater flooding
  - c. Risks to transport networks from slope and embankment failure
  - d. Risks to health and wellbeing from high temperatures, e.g. in hospitals, care homes, schools, offices
  - e. Risks to building fabric from moisture, wind and driving rain
  - f. Risks to health and social care delivery from extreme weather
  - g. Risks to business from reduced employee productivity, due to infrastructure disruption and higher temperatures in working environments
  - h. Risks to energy, transport and ICT infrastructure from high winds and lightning Which of these do you consider relevant to/priorities for the Stirling City Region Deal?
5. Have these been considered in the process? At what point?
6. Are you aware of the Strategic Environmental Assessment for the City Region Deal?
7. Going back to the priorities in decision making, how would these climate adaptation considerations fare when weighing priorities?
8. What are you aware of in terms of SG policy drivers influencing the process?
9. Would more knowledge help in raising the profile of climate resilience in decision making?

## Annex 2. Literature Review

### Introduction

This review provides an overview of the available literature covering where climate change adaptation fits into regional decision-making and planning processes, and the associated knowledge and evidence requirements. It includes studies undertaken at city, local authority and regional level, and identifies lessons and best practice from elsewhere, providing context for the Stirling case study.

The following questions are considered:

1. Where is adaptation considered in decision making or planning processes?
2. What are the drivers and barriers for meeting adaptation policy objectives?
3. What information or evidence (e.g. indicator type data) is needed to inform decision making?

There is a large body of literature available on adaptation decision-making, but a limited resource related to how adaptation is considered within broader decision-making processes at local or regional level; such as for specific projects like the City Region Deal or within development planning. For example, the Town and Country Planning Association (Town and Country Planning Association 2016) note that the spatial planning system (in England) can potentially play a key role in 'preparing for the growing impacts of climate change', however there is limited literature related to spatial planning for adaptation in the UK (Town and Country Planning Association 2016). In order to identify useful and relevant adaptation knowledge and evidence for decision-makers, it is important to understand the challenges they face (LUC 2016).

There are also a large number of studies on the monitoring and evaluation (M&E) of climate change adaptation. This paper is concerned with M&E for the specific purpose of contributing to the knowledge needs of local authorities in their adaptation decision making, and identifying the potential role for CXC national indicators. Therefore only the findings from the literature that are relevant to this purpose are reviewed in detail. The CXC paper 'Developing adaptation monitoring and evaluation in Scotland' (Moss 2017) provides a detailed analysis of this topic.

### The Decision-making Process

The decision-making processes being analysed are not adaptation planning per se; they are addressing other aims – single or multiple – such as economic growth, development, or provision of infrastructure, at regional level. Scottish Government policy aims to 'increase the resilience of Scotland's people, environment and economy to the impacts of a changing climate' (The Scottish Government 2014). In order to achieve this, decision-makers need to consider and address the growing impacts from a changing climate and integrate the necessary adaptation measures into their plans.

As adaptation is a relatively new policy area the evidence base on the efficacy of its implementation in regional decision-making is limited. It is therefore useful to review learning from efforts to integrate other aims, such as environmental or sustainability objectives, into planning. Runhaar investigated the application of a number of strategies or 'tools' to integrate environmental objectives (Runhaar 2016). Two types of tools are of relevance to this study; voluntary 'informational' tools such as indicators, which will be discussed later, and mandatory (regulatory) tools.

### Strategic Environmental Assessment (SEA)

One regulatory tool is the Strategic Environmental Assessment (SEA), designed to integrate environmental objectives into plans or policies by requiring that the environmental impacts of the plan are assessed. The Scottish Government publishes guidelines on the consideration of climatic factors within SEAs that include information about Scotland's changing climate and climate projections (The Scottish Government 2010). Runhaar found that the SEA influenced plans at two points in the decision process: (i) before the actual SEA is started, as decision-makers anticipate the SEA and so consider the potential impacts, and (ii) during the SEA process (Runhaar 2016). However, various studies have found that the SEA does not usually significantly impact decisions (Arts et al 2012; Lyhne et al 2016, cited in Runhaar 2016). It has been suggested that the impact that is achieved is due to the mandatory nature of the SEA; however this very factor also tends to limit its 'creative use' to optimise plans (Arts et al 2012, cited in Runhaar, 2012). Voluntarily conducted SEAs have achieved more success in addressing environmental and sustainability concerns, such use often being

undertaken by those more 'open to environmental values' and who use the SEA not solely for assessment but as a 'design tool' for plans (ibid).

### Scottish Planning Policy (SPP)

In assessing Scotland's local planning authorities' implementation of national planning policy in planning for flood risk, Land Use Consultants (LUC 2016) noted that the Scottish Planning Policy (SPP) provides high level principles but not detailed guidance on practical delivery, thereby leaving scope for interpretation by planning authorities and others. They observed that in general the SPP did not deal in absolutes and was not binding. LUC also found that the Strategic Flood Risk Assessment (SFRA), although required by the SPP, was not always used by planning authorities. It was seen as 'being a process-driven exercise – rather than a tool that can add value to plan-making' which appeared to reduce its potential to improve outcomes.

The observation that the SPP was seen as a process-driven exercise mirrors the findings about the SEA (above), suggesting that regulatory tools achieve a certain impact by virtue of their mandatory nature. However for both the SEA and the SPP, their potential to 'add value' and be utilised as a design tool, as opposed to a compliance-driven process is often overlooked.

### The local context

Adaptability requires 'a focus on outcomes rather than compliance with policy programmes' (Termeer et al. 2016). Because of the inherent uncertainties in adaptation, the ability to react flexibly to changing and sometimes unpredictable conditions is crucial. To achieve this at the local level, scientific knowledge needs to be complemented by knowledge of the local context and the ability to continually reassess the situation on the ground (Termeer & van den Brink 2013). The need for adaptation decisions to encompass consideration of local impacts and context is widely recognised in the literature (e.g. Urwin & Jordan 2008, Measham et al. 2011). This has ramifications for the provision of knowledge and evidence to decision-makers, which is discussed later. Termeer & van den Brink (ibid) used Rijkswaterstaat, the Dutch national agency responsible for infrastructure, as a case study in which they identified the importance of employees having flexibility to make their own choices rather than imposed solutions, and the need for continual adjustments to the measures taken, in order to effectively deal with 'the unknown unknown' qualities of adaptation.

### The policy dilemma

Adaptation presents many challenges to national policymakers; the importance of local context being one of those. The SEA and SFRA illustrate the tendency for mandatory tools to drive a compliance-driven response which is not optimal and may not even be adequate. A 'design tool' that can add value to decision-making and enable the simultaneous consideration of multiple aims enables a more flexible approach that can tailor solutions to local needs and conditions. The SPP, with its high level principles, enables that approach, but as Land Use Consultants found, it lacks the detailed guidance to help local authorities with practical delivery (LUC 2016). The Stirling Case Study supported this finding.

Adaptation is a cross-cutting issue across multiple policy areas including spatial planning, infrastructure, agriculture, energy and water management (Termeer et al. 2016). Local spatial planning has the potential to play a crucial role in adaptation, and achieving this requires a strong policy signal that climate change is a primary priority for local planning (Town and Country Planning Association 2016). The findings above demonstrate the complexities around how that is delivered, but two points made by TCPA are relevant here:

1. Policy-making, evidence gathering and methodologies used in addressing flood risk are 'far more sophisticated than the equivalent for ... any other aspect of adaptation' (Town and Country Planning Association 2016).
2. The scope of climate evidence in local plans should include 'issues beyond flood risk, including temperature and a wider range of public health risks' (ibid).

Flooding is by far the highest profile adaptation imperative in the UK; this is the case in Stirling and is seen throughout the literature. In their case study of the Rijkswaterstaat, Termeer and van der Brink found that the dominant focus on

flooding meant other climate change risks were neglected (Termeer & van den Brink 2013). This raises two key questions that influence this report:

- Can learning from flooding be used in developing knowledge and evidence to help address other climate risks?
- Can knowledge and evidence help prioritise the other impacts that have not yet manifested?

For adaptation policy, there is a balance to be struck between allowing scope for interpretation and a tailored response to fit the local context, versus a strong and clear message that can drive action, for example to provide local authorities with leverage when engaging with third parties such as developers. This dilemma is highlighted by Urwin and Jordan, who acknowledge that local actors are well placed to interpret and apply policy in the local context; however an over-reliance on those 'closer to (the) ground' is unlikely to be effective in practice, without a clear national policy level message prioritising adaptation (Urwin & Jordan 2008).

## Knowledge and Evidence Requirements

### What kind of knowledge and evidence is needed?

The principal source of climate information in the UK, including probabilistic projections of future climate and past climate data, is the UK Climate Projections (UKCP09 2014). A comprehensive national climate change risk assessment (CCRA) is conducted every 5 years (Lorenz et al. 2016). The 2017 assessment was carried out by the Adaptation Subcommittee of the Committee on Climate Change (ASC) utilising the UKCP09 projections (ClimateXChange 2016). For Scotland, the CXC Indicators, together with the ASC's own research, provided a key source of information on climate risks, impacts and adaptation actions to inform the ASC's assessment (ClimateXChange 2016). The UK is an acknowledged leader in adaptation (Lorenz et al. 2016) and the sources listed above constitute a good quality information base.

The value of knowledge and information as a means to influence behaviour and drive action has been demonstrated, for example in the implementation of low-carbon policies (Auld et al. 2014, cited in Runhaar 2016). Information provided by adaptation monitoring and evaluation (M&E) has the potential to enhance the planning and implementation of adaptation (Leiter 2015). However, the literature suggests that information sources such as those above may currently be of limited practical use to local authorities (e.g. LUC 2016; Lorenz 2016). This is an important consideration, because of the critical role played by local government in implementing adaptation (Massey et al. 2015, cited in Lorenz et al. 2016; Porter et al. 2015). For example, LUC found a high general awareness of climate change among planning authorities in Scotland, but this did not translate into an adequate appreciation of the likely impact on flood risk (LUC 2016). One way in which this was manifested was the weakness with which the Scottish Planning Policy (SPP) avoidance principle was applied. LUC concluded there was a 'need for guidance for local authorities to assist in understanding climate risks (and) interpreting available data' (ibid).

### The importance of context

To make well-informed decisions, local authorities need to know what conditions they have to adapt to and how:

- What does projected climate change mean for their area?
- What impacts should they expect?
- What are the options for adapting?
- What are the costs of adapting, or not adapting?

Lemos et al. identified the 'climate information usability gap' that needs to be bridged in order to address the knowledge requirements at local level. This gap marks the distinction between 'useful' information (climate information) and 'usable' information, that is of practical benefit to end users (Lemos et al. 2012; cited in Lorenz et al. 2016). Bridging this gap requires consideration of the context in which the information is to be used.

The climate information usability gap has been identified at local authority level in Scotland, where there is a need for detailed guidance on how to deliver principles in practice. For example, LUC found that planning authorities need

guidance in understanding climate risks and interpreting the available data, in order to incorporate knowledge into spatial strategies. To achieve this, in addition to climate data, there's a need to understand what information is useful for planners (LUC 2016). Another example is Stirling Council's Adaptation Strategy which provides climate projections and predicted impacts, however much of this information is at national level and therefore of limited value in informing local needs (Stirling Council 2016b).

The usability of information for local authorities is dependent upon contextual factors such as resource constraints, the small number of people with the expertise to use and interpret climate projections, and the need for simple, non-technical briefs for colleagues (Lorenz et al. 2016). There are also political factors such as the need to address multiple interests in a crowded agenda (Runhaar et al. 2009, cited in Runhaar 2016).

The role of institutional factors should therefore be recognised and taken into account (Lorenz et al. 2016; Runhaar 2016). In his investigation of 'tools' to help integrate environmental objectives into areas such as development planning, Runhaar found the usefulness of tools tended to be limited by a mismatch with the needs of planners. Because the tools failed to account for political and institutional conditions, they did not work so well in that context (Runhaar et al. 2009, cited in Runhaar 2016). Comparing various types of tools, Runhaar found a particular strength of informational tools, as opposed to, for example, regulatory instruments, was the flexibility they offered practitioners to shape their response to the information, enabling creative solutions adapted to the local context (Runhaar 2016). This suggests that providing knowledge and evidence tailored to the needs of local authorities is likely to be an effective mechanism to enable adaptation.

### **Bridging the climate information usability gap**

In translating climate science and policy into usable climate information, an iterative approach has been shown to be effective (Lemos & Morehouse 2005, cited in Lorenz et al. 2016). Lemos et al. (2012, cited in Lorenz et al. 2016) describe a 'transition space' through which information needs to flow between producer and user. With insufficient interaction between these parties the resulting information will not be a good fit with user needs and local context, and is less likely to be used. However, by creating opportunities for producers and users of information to interact, more usable information can be provided to users. Usable information will have value added through the conversion of climate-related data to relevant information, provided at a suitable spatial scale.

### **Evidence to leverage funding**

One important way in which local authorities can use evidence is to leverage funding for adaptation. Roelich, in her investigation of the challenges to funding of public sector adaptation projects, provided a particularly relevant example for the Stirling case study (Roelich 2015). She found that City Deals in the UK had the potential to fund adaptation in infrastructure and the built environment. However, in practice such investment was rarely included in proposals. Roelich attributed this to the overriding focus on economic development in City Region Deals, and the associated requirement to quantify economic outcomes; bids that include adaptation are therefore required to demonstrate the benefits in economic terms for funding appraisal purposes. Evidence that can help quantify the economic benefits of adaptation – or avoided economic losses – could therefore be one way to leverage funding.

### **Usable information – what do local authorities need?**

The Stirling case study found that the following types of climate information would be useful:

- High level summaries providing a national level overview of trends
- Selected indicators relevant to the area
- Case studies / examples of good practice

### **Indicators**

Evidence from the literature on the use of adaptation indicators to inform adaptation at the local level was relatively limited. Studies on the use of broader environmental indicators, for example to inform SEAs and Environmental Impact Assessments (EIAs), were also reviewed.

Indicators are a useful source of knowledge to provide an overview and trend information (Kennedy et al. 2009, cited in Leiter 2015) and they enable the tracking of trends over time (ADEME 2013). Moreover, they can help to raise awareness among stakeholders. However, they do not always work at multiple scales (Leiter 2015). Donnelly et al. concluded that while national level indicators were not suitable for a local scale SEA, because it required specific local data, they were useful to identify the types of indicators and data sources that were available (Donnelly et al. 2007). Runhaar posited a number of reasons why environmental indicators are not widely used in planning (Brown, 2003; Higginson et al., 2003; Lehtonen, 2015: cited in Runhaar 2016), including:

- Language differences between (i) planners and policy-makers, and (ii) developers of indicators.
- Discrepancies between the spatial scale of the indicator, and that relevant to the user (Graymore et al. 2008; cited in Runhaar 2016).
- Lehtonen (2015, cited in Runhaar 2016) identified a number of factors, including ‘excessively loose linking between reporting schemes and policymaking’; ‘lack of resources within the administration’; ‘neglect of user concerns in the design of indicator systems’ and a lack of trust on the indicators on the part of potential users.

One potential solution to the language barrier is to involve potential users of the indicators in their development (Brown, 2003; cited in Runhaar 2016). Some indicators can be applied at multiple scales, however this is not always the case (Leiter 2015). Often, such multi-scale indicators are not capable of accounting for the specific local context. Leiter (ibid) also highlighted the need for caution in aggregating or interpreting indicators across different scales, beyond using them to provide an overview.

In conclusion, the literature demonstrated that indicators are useful tools, but have limitations. Where necessary they should be supplemented with other forms of information to account for:

- The context-specific nature of adaptation
- The relevant spatial scale (Leiter 2015).

Selecting a suitable subset of relevant indicators from a larger set of national level indicators is one approach that can offset some of the drawbacks (Leiter 2015). In discussing the setting up of M&E systems for local authorities in France, ADEME suggest that indicators used will be a mix of those proposed at EU, national and regional level, and those specific to that local authority (ADEME 2013).

### Case Studies

Within the literature, there is wide recognition of the need to account for the local context in adaptation (e.g. Adger et al. 2005; Laukkonen et al. 2009; Measham et al. 2011). Ranger et al. make the point that adaptation cannot be addressed with a ‘one-size-fits-all’ approach. Providing information and practical ‘instructive examples’ to decision-makers enables them to use these tools flexibly to fit local conditions (Ranger et al. 2010).

Case studies are a means of providing examples of practical adaptation solutions that can be tailored to other locations, and of sharing good practice (e.g. Adaptation Scotland 2016). The French Environment Agency, ADEME, recommend the use of case studies to supplement indicator data in order ‘to develop, qualify and define context’ for that data (ADEME 2013).

### Ongoing monitoring and dialogue

It is important to consider the need for flexibility in adaptation, and for the evolution of adaptive responses over time. ADEME note that ‘adaptive management’ requires adaptation actions to be stepped up gradually as the impacts of climate change escalate, and also in light of the efficacy of previous action (ADEME 2013). Ongoing knowledge exchange and consultation will be a critical element of this process (ibid). Indicators that can provide trend information over time are especially useful as a monitoring tool.

### Conclusion

This literature review has found that local authorities and planning authorities play a key role in implementing adaptation. However, fitting adaptation into regional decision-making and planning, with multiple competing objectives,

can be challenging. Tools available to help decision-makers include mandatory tools (e.g. policy instruments), and informational tools (e.g. indicators and climate projections).

Policy can send a strong signal regarding the priority given to adaptation by government. However a balance needs to be found between sending a strong message and being too prescriptive. Adaptation is place-specific so there needs to be room for flexible interpretation of policy to account for the local context.

Informational tools allow users flexibility in how they implement knowledge. This allows tailoring of the response to the local situation. Evidence shows that knowledge can be a useful driver of adaptation, however gaps tend to appear in (i) the translation of climate information into an understanding of likely future impacts at the local level, and (ii) knowledge of the practical solutions available. Knowledge that bridges these gaps can enable a shift from experience-driven, reactive adaptation to a more forward-looking, avoidance driven approach.

- National level indicators can provide (i) an overview of trends at national level, and (ii) a set of indicators from which a subset relevant to the area can be selected
- Supplementary information, e.g. the CXC indicator narratives, can provide high-level summaries of key adaptation issues at national level.
- Case studies can provide examples of good practice and practical solutions that can be tailored to the local situation.

The usefulness of these sources of knowledge depends on the ability of users to interpret the findings for the local context. This requires ongoing interaction and knowledge exchange between the information producers and users.