

Climate Ready Councils

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The business case for managing the impacts of severe weather and a changing climate

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Foreword

The nature, scale and frequency of severe weather events are hard to predict but when these events occur, councils are on the frontline in providing an immediate response. They are also responsible for dealing with many of the longer term consequences, such as damaged roads and infrastructure.

Climate resilience is not just about managing severe weather. Effective long-term planning for a changing climate is an integral part of ensuring business continuity, safeguarding people and places, protecting and enhancing the natural environment, and contributing to a resilient economy that can cope with volatile resource prices and supply chains.

Many councils are responding to the challenge of managing the impacts of severe weather and a changing climate. Drawing on their experience, this report demonstrates that doing so makes good business sense.

Many actions are low- or no-cost but even where costs are more significant, action to develop climate resilience can deliver direct financial benefits to councils and their partners, in the form of income and/or avoided costs, even in the short term. Such actions can also be pivotal in delivering wider objectives, such as protecting and promoting local economic growth and supporting vulnerable communities, which are often hardest hit by severe weather events.

We recognise that securing resources for developing climate resilience is a challenge in a period when council budgets are under strain. This report, therefore, not only makes a clear business case for action, but also highlights a range of opportunities for securing funding for action, including the use of innovative finance mechanisms.

Whilst this report will be invaluable to council officers and members seeking to develop specific climate- and weather-related actions, the report also has a bigger aim. It makes the case for mainstreaming climate resilience. The impacts of weather and climate are so wide-ranging that across government, both at national and local levels, developing climate resilience is becoming increasingly reflected in decision-making, policy development and service planning. This report is intended to speed progress in this direction across the local government sector.



Peter Box, Chair of the Local Government Association's Environment, Economy, Housing and Transport Board



Councillor Robert Light, Deputy Chairman Environment Agency

Executive Summary

This report sets out a council business case for managing the cross-cutting impacts of severe weather and a changing climate, including the impacts of:

- **flooding, storms and erosion**
- **heat waves and extreme cold**
- **water stress or drought**

It is intended to provide council officers and members with information to draw out the costs and benefits of taking action.

The report makes the case for **developing climate resilience to be seen as a core council responsibility**. The impacts of severe weather and a changing climate are so wide-ranging that developing climate resilience needs to be incorporated in all decision-making, policy development and service delivery. There are a range of statutory drivers which underpin this (as summarised in section 2). In addition, the report highlights the following key aspects of the business case for developing climate resilience:

1. Councils are directly affected by severe weather events and will be increasingly affected by changes in our climate.

The storms of recent years have led to significant direct costs for councils. The winter storms of 2013/14 cost Kent County Council an estimated £4.4m in direct costs. In the longer term this is expected to rise to £11.2m given the repairs and investment to infrastructure.

Looking ahead, the costs to councils of climate impacts are likely to grow. Heat-related mortality is projected to increase steeply in the UK – by around 70% in the 2020s¹. Heatwaves increase the number of visits to GPs and hospitals, calls to NHS and social care referrals. This leads to costs to health and social care providers, including councils, of £266 to £625 per patient per day².

2. Many councils are already responding to the challenges and opportunities of severe weather and a changing climate.

Eight case studies are included at the end of this report. These and a series of other examples of council action referenced within the report illustrate the range of activity which is ongoing and delivering real benefits for the councils involved, their partners and the communities and businesses they serve.

Resilience:
the capacity to
withstand shocks
while maintaining
function.

70%

heat related mortality
increase by 2020s

£5.8M

sustainable drainage
measures are projected
to avoid costs to council
services

¹ Health Protection Agency, 2012. Health effects of climate change in the UK 2012

² Public Health England, 2013, Heatwave Plan for England and DEFRA, 2013, The Economics of Climate Resilience

3. Action to develop climate resilience delivers multiple benefits across different council service areas.

The key benefits to councils include:

- a. **Avoiding costs and making savings.** Developing greater resilience to climate impacts can help to avoid costs to councils and lead to savings in the costs of service provision. At one development site in Cambridge, sustainable drainage measures are projected to avoid costs to council services, homeowners and industry of £5.8m through measures costing £2.1m.
- b. **Supporting economic growth.** Climate-related risks to sites and infrastructure can hinder economic growth but a focus on climate resilience can generate economic opportunities. Liverpool City Council and the Liverpool Local Enterprise Partnership (LEP) are seeking to create the world's first sustainable coastal city region cluster ('AquaFutures'), specialising in marine impacts, river clean-up and water smart infrastructure.
- c. **Safeguarding vulnerable residents.** It is often the most vulnerable in society who are most affected by climate impacts and who will, therefore, most benefit from council action to develop climate resilience. A scheme in Islington identifies households most vulnerable to heat and cold through a 'seasonal health referral network', whereby those providing services from the voluntary or community sector are able to refer service users' details to the Seasonal Health & Affordable Warmth team at the council.
- d. **Protecting and enhancing the natural environment.** The natural environment can play a key role in developing resilience, e.g. through improving air quality or providing flood or drought alleviation, and significant environmental benefits can be delivered by initiatives to develop climate resilience. Research involving Birmingham and Coventry City Councils illustrates a wide range of potential benefits of water sensitive urban design and integrated catchment management, including combating of extreme heat, improving air quality, increasing council tax income and creating jobs.

4. Many actions which develop climate resilience are low-cost.

Hampshire County Council, in conjunction with partners, have invested officer time in developing community resilience in areas affected by flooding. This has significantly reduced the level of response needed from external agencies during floods, saving significant sums of money for the council.

5. Where the costs of action are significant, a range of funding opportunities can and are being accessed by councils.

Chapter 5 provides an overview of the range of funding options available to councils for climate resilience activity, from zero or low-cost policy interventions which incentivise and equip residents and businesses to develop their own resilience through to different forms of debt finance. Having built a business case, funding need not be a barrier to action.

Glasgow City Council has entered into a commercial partnership with a non-domestic water supplier which has funded investment in new water efficiency infrastructure through a Gainshare model, which will allow the Council to benefit from the associated financial savings without the need for up-front capital expenditure. This will result in operational savings of £1m in water and wastewater over 4 years.

The Portsea Island Coastal Strategy sets out the long term strategic approach to managing Portsmouth's coastline. It is expected to be part-funded by the council's Community Infrastructure Levy

20% of the EU budget for 2014-2020 should be spent on climate action, including developing resilience



Call to action

The actions your council should be considering will be dependent on your own situation and the specific climate-related risks and opportunities you face. However, there are some key steps which can support you in identifying your local priorities:

- 1. Build an understanding of key risks and opportunities**
- 2. Identify priority areas for action**
- 3. Secure senior-level buy-in**

The report is accompanied by a suite of tools to support officers and members in building their own business case locally, which are available on the Climate Local website (www.local.gov.uk/climate-local). These are:

- an annotated PowerPoint presentation, which provides a visual summary of the business case for developing climate resilience; and
- a series of briefing sheets which can be used in making the business case to busy colleagues. These cover the following key functions:
 - Growth, Regeneration, Housing and Planning
 - Finance / Corporate Resources
 - Transport
 - People, Places and Communities
 - Highways and Transport
 - Health and Wellbeing
 - Education and Skills
 - Environmental Services.

A learning resource developed by the Environment Agency's Climate Ready Support Service in association with the Local Government Association, Climate UK and the Core Cities Group

Service briefing: Growth, Regeneration, Housing & Planning

Why should your council take action?

Small firms directly affected by the 2013/14 winter storms suffered average damages of £1,531 per business¹.

In 2011 the global market for goods and services which help develop climate resilience, such as flood modelling and protection, was worth £2.1 billion and employed over 21,000 people in the UK. The sector has a forecasted UK growth rate of 7.1% by 2017-18².

Local planning for severe weather is a statutory requirement of government legislation including the Civil Contingencies Act 2004 and Flood and Water Management Act 2010.

The National Planning Policy Framework requires local planning authorities to adopt proactive strategies to adapt to changing weather, taking full account of flood risk, coastal change and water supply and demand considerations. Effective planning decisions now can result in significant avoided costs in future.

What interventions can your council make?

- Establish Local Plan policies supported by Supplementary Planning Documents to provide guidance to developers on measures to be incorporated into new developments (e.g. sustainable drainage, greywater recycling, passive cooling mechanisms).
- Join forces with the local chamber of commerce to offer business support and clustering opportunities through education and awareness raising (e.g. as part of Local Enterprise Partnership (LEP) competitiveness strategies or a City Deal).
- Partner with housing associations to explore the use of insurance, pension funds and municipal bonds to fund new affordable and sustainable housing.
- Consider and apply the Delivering Resilient Growth LEP information note to help inform local growth plans and projects. For example, understand and support strengths in adaptation goods and services.
- Encourage your LEP and their partners to run through the Local Environment & Economic Development toolkit so that they understand the relationship between economic plans and the environment.

1. PSM, 2014, Wave of Small Business Panels February 2014 Group Full Update Report
2. Kilmartin, 2012, Adaptation and resilience schemes through

A learning resource developed by the Environment Agency's Climate Ready Support Service in association with the Local Government Association, Climate UK and the Core Cities Group

Service briefing: Highways and Transport

Why should your council take action?

Recent plans for a new road network for work and play is set to increase highway and roads use by 10% with 100,000 more cars, vans and lorries on the roads.

Why councils are responsible for maintaining highways and other roads (e.g. street cleaning, gritting, and winter maintenance). Councils should be a major player in several key areas to ensure the safety of the road network and ongoing maintenance.

Investing in sustainable and business based energy from solar weather sites demonstrates the local authority's commitment. A survey by the Association of Local Business of 200 shows that the 2013/14 winter storms hit firms with an average cost of £1,531, amounting to a total of £322m as a result of lost business, supply disruption and staff absence.

What interventions can your council make?

- Monitor and record the impact of severe weather on public services to assist with future planning, budgeting and resilience fundraising. Consider local strategic partners (e.g. GEMRI). Consider using local authority or other funding sources to support the network in a changing climate, and provide a business case for infrastructure funding.
- Establish sustainable design guides in the Local Plan (e.g. drainage, resilience of surfaces to water and heat).
- Use Local Resilience Plans to help plan and coordinate your action during an emergency, including educating residents and businesses on alternative travel routes and consider local resilient travel routes.

A learning resource developed by the Environment Agency's Climate Ready Support Service in association with the Local Government Association, Climate UK and the Core Cities Group

Service briefing: Education and Skills

Why should your council take action?

Extreme weather can hit schools hard, lead to staff absence, staff absence from school, disruption, or resource inefficient buildings which are either too cold or hot from one season to the next. Investment in building improvements can often be recycled through energy bills.

The global market for goods and services which help to develop climate resilience (e.g. flood modelling and flood protection) was worth £2.1 billion in 2011, with over 21,000 employees in the UK, and the sector has a forecasted UK growth rate of 7.1% by 2017-18¹. Promoting skills, development and apprenticeship opportunities in these fields can enhance local resilience.

What interventions can your council make?

- Work with schools through the Education & Sustainable School programme, to reduce the way schools incorporate sustainability principles in the management of premises and the teaching curriculum.
- Establish training funds for schools to fund a specialist training for training. Each of each individual school budget is ring-fenced for education, so savings from this investment would be returned to be shared with the council.
- Partner with the LEP and with higher education establishments to address the potential for learning young people in training into high skilled, job opportunities in the local and environmental goods and services market.

1. Kilmartin, 2012, Adaptation and resilience schemes through

A learning resource developed by the Environment Agency's Climate Ready Support Service in association with the Local Government Association, Climate UK and the Core Cities Group

Service briefing: Environmental Services

Why should your council take action?

There is an opportunity for councils to derive multiple benefits from investing in environmental services (green, open spaces, water and water). They can play a key role in managing the impacts of severe weather and a changing climate.

Thinking and acting in green (biodiversity) and blue (water) infrastructure is moving on from delivering ecological and social benefits in their own or also delivering economic and financial benefits.

According to Natural England, views of landscapes can increase in value by 30%, and landscapes can counter opening temperatures in densely populated areas and reduce energy costs for cooling and heating by 10%. There is an opportunity for Environmental Services to manage opportunities to deliver good customer with Regulation or Plans to be in their own right.

Planning grants can lead to significant value adds for councils in the face of weather changes for dealing with their damaged property.

What interventions can your council make?

- Consult with councils partners to establish sustainable design guides for developers in the Local Plan (e.g. tree planting, sustainable drainage) to help manage the impacts of severe weather and a changing climate.
- Work with local services to understand the financial, social and environmental benefits of the natural environment (investment of natural capital).
- Partner with the council's Planning team to encourage cultural and artistic projects (e.g. Flood Resilient Groups, or "Water Neighbour" schemes).

1. Natural England, 2014, Views of Landscapes can increase in value by 30%, and landscapes can counter opening temperatures in densely populated areas and reduce energy costs for cooling and heating by 10%. There is an opportunity for Environmental Services to manage opportunities to deliver good customer with Regulation or Plans to be in their own right.

A learning resource developed by the Environment Agency's Climate Ready Support Service in association with the Local Government Association, Climate UK and the Core Cities Group

Service briefing: People, Places and Communities

Why should your council take action?

The way that new developments are designed and built (e.g. in providing shade, being permeable or containing water) can help reduce the risk of flooding and other weather impacts and also a critical role in determining an area's long term resilience to severe weather and a changing climate.

Planning can result in major costs to councils. Low cost programmes to develop the capacity of residents to respond to floods and other emergency situations reduce pressure on council and partners budgets. Design costs and water costs are rising, addressing these costs can be a key element in anti-flooding interventions to councils.

What interventions can your council make?

- Ensure that design and refurbishment of buildings and open spaces takes account of future changes in the climate and severe weather events such as heatwaves and floods.
- Work with communities at risk from flooding to establish community emergency plans.
- Encourage collective action to waterwise (e.g. "Water Neighbour", water efficiency or "water saving" campaigns, which in turn can also help a sense of place).

A learning resource developed by the Environment Agency's Climate Ready Support Service in association with the Local Government Association, Climate UK and the Core Cities Group

Service briefing: Finance / Corporate Resources

Why should your council take action?

Investing finance is a way to address more for less and to becoming a more proactive for asset managers and buyers in local government.

Techniques to manage assets (e.g. inventory, condition, value and asset performance) can be enhanced and more robust programmes, ranging from asset management and asset performance indicators to regularly reporting to institutional investors.

Such interventions, as illustrated in the case studies, can help to address major cost burdens of housing, water and other services (e.g. water supply, flood protection, etc.) in the context of the 2013/14 cost (Down County Council) an estimated £20m in total over the next 10 years.

Councils' human resources business need to consider the implications of severe weather and a changing climate for the health and wellbeing of staff and their ability to carry out their work.

What interventions can your council make?

- Establish a working force efficiency in buildings to support from reductions in utility bills (e.g. water consumption) to address budget.
- Encourage offers to invest, such as crowdfunding for green infrastructure (e.g. water gardens, programmes, making use of open spaces like in business and school areas, water and drought resilient planting to institutional investors).
- Regularly report to institutional investors on your council's plans for managing the impacts of severe weather for its infrastructure (e.g. flood protection, etc.) in the context of the 2013/14 cost (Down County Council) an estimated £20m in total over the next 10 years.

1. Risk Register, 2014, Risk Register update report

1. Aim and target audience for this report

This report responds to a government requirement³ for the development of a council business case for managing the cross-cutting impacts of severe weather and a changing climate, including the impacts of:

- **flooding, storms and erosion**
- **heatwaves and extreme cold**
- **water stress or drought**

It is intended to provide council officers and members involved in delivering the range of council services with information to draw out the costs and benefits of taking action.

This report comprises one part of a suite of information resources on the business case for action. **The report is complemented by:**

- **a set of short service briefings** - these can be used to help make the business case to colleagues, council members and partner agencies; and
- **an annotated PowerPoint presentation** which sets out the business case, for use as a resource in meetings and workshops.

These are available under 'Climate Local Resources' on the Local Government Association's Climate Local web pages (<http://www.local.gov.uk/climate-local>)

Development of this report was supervised by a 'Task and Finish' group acting on behalf of Climate Ready and the Local Adaptation Advisory Panel. To build a robust evidence base, the methodology involved: a review of the key practitioner and academic literature; interviews with opinion leaders across the public, private and civil society sectors (e.g. Federation of Small Businesses, Association of British Insurers, CDP, Future Cities Catapult, Public Health England, Joseph Rowntree Foundation); and development of council case studies to understand what is being, and can be done.

This report is intended to complement and amplify a range of other initiatives which are working to support and inform the work of councils in this field. Some of these are summarised in section 7.

3 Objective 29 of the National Adaptation Programme



2. Policy context: Key drivers for action

The Climate Change Act (2008) introduced legislation around developing resilience to our changing climate. The Act required the production of a Climate Change Risk Assessment (CCRA), published in January 2012, which analysed over 700 climate risks to the UK. As a follow up to the CCRA, the National Adaptation Programme (NAP) was launched in July 2013. This outlines the key risks and sets out a range of actions that will help the country improve its resilience to climate change.

The NAP contains a local government chapter, which sets out a range of objectives to be delivered at a strategic level through the work of the Local Adaptation Advisory Panel, the Environment Agency’s Climate Ready Support Service, Climate-UK and the Local Government Association’s (LGA) Climate Local initiative.

There are 3 key legislative instruments which underpin council action in this area:

<p>The 2008 Planning Act and 2011 Localism Act, supported by the National Planning Policy Framework (NPPF)</p>	<p>Requires local planning authorities to develop policies and adopt proactive strategies to mitigate and adapt to a changing climate, taking full account of flood risk, coastal change and water supply and demand considerations.</p>
<p>The 2004 Civil Contingencies Act</p>	<p>Places a legal obligation on emergency services and councils to assess the risk of, plan, and exercise for emergencies. Councils are also responsible for warning and informing the public in relation to emergencies.</p>
<p>The 2010 Flood and Water Management Act</p>	<p>All unitary councils and county councils are designated as Lead Local Flood Authorities (LLFAs), with a responsibility for managing flood risk from local sources, e.g. smaller rivers and streams, surface water and groundwater.</p>

Local Authorities also have an opportunity to improve public health by tackling the causes of illness and improving well being. This includes working with partners in social care, housing, planning and the health system to reduce the health impacts of climate change.

Responsibilities also extend beyond these statutory drivers and the NAP highlights the range of existing roles councils have relating to developing resilience to severe weather and a changing climate. These cut across council roles and responsibilities relating to the provision of essential services such as public health, social care, repairing roads, attracting inward investment and jobs. This is alongside their wider role as community leaders, supporting local communities and businesses to help themselves.



Green infrastructure in a residential area

© Environment Agency



Flooded street in Hampshire in the winter floods 2013/14

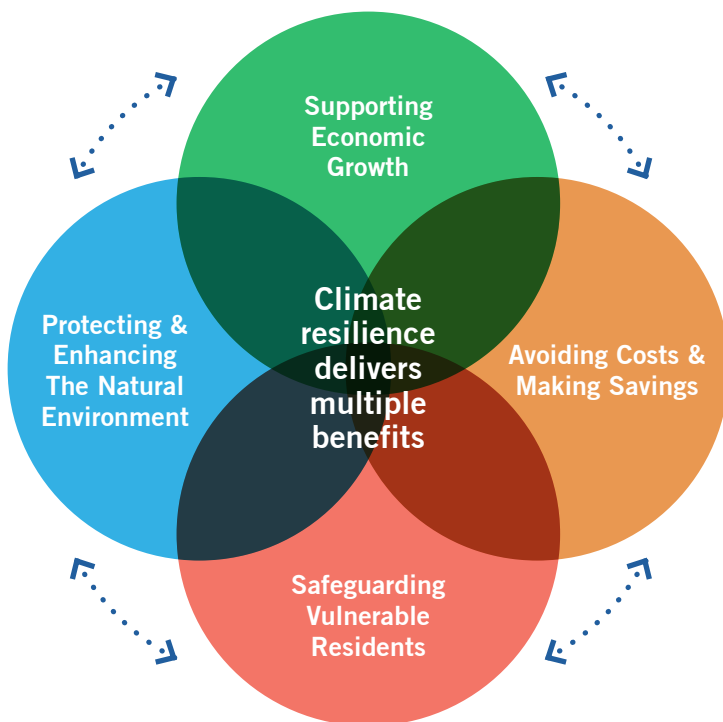
© Hampshire County Council

3. Developing climate resilience: The value for councils

Local councils have a pivotal role to play in managing the opportunities and challenges arising from the impacts of severe weather and a changing climate. In doing so, **developing climate resilience delivers multiple benefits across a range of council service areas.**

Councils are uniquely placed to work with partners to deliver the public services necessary to support growth, safeguard the vulnerable and contribute to improving the health and wellbeing of the local population. Through policy and investment decisions, they can help to safeguard their own finances and contribute to wider savings for partners and the communities and businesses they serve. Action to develop climate resilience can also deliver environmental benefits, including protecting and enhancing landscapes and biodiversity and providing open space, which can support the delivery of health and wellbeing objectives.

Key benefits for councils of developing climate resilience



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In designing our flood community resilience pathfinder project we were very keen to ensure it took a holistic approach and delivered cross-cutting outcomes. The flood doors not only provide a defence against surface water flooding, they also offer greater thermal efficiency, reduce external noise and improve the building appearance, raising property values and helping to reduce empty homes and social blight. Importantly, the work has acted as a platform to deliver key messages on climate change and community resilience.”

Dr Juliet Staples and Paul Byrne
Environmental and Emergency Resilience Unit, Liverpool City Council

The need for action is clear and present. **Councils are directly affected by severe weather events and will be increasingly affected by changes in our climate.**

For instance:

- Flooding and storms place a direct cost burden on councils. The winter storms of 2013/14 cost Devon County Council an estimated £3m in initial clear-up costs alone⁴. An economic impact assessment of the costs of the flooding of the Somerset Levels estimates the direct emergency costs to the County and District Councils alone were over £2.5 million⁵. Longer term costs will be far higher.
- Climate has direct impacts on local economic growth. Small firms directly affected by the 2013/14 winter storms suffered average damages of £1,531 per business⁶. Subsequent Federation of Small Businesses (FSB) research has shown that the financial consequences of indirect damages – the cumulative impact of customer, staff and infrastructure problems – are potentially far higher and more widespread.
- As a result of climate change we are increasingly likely to experience summer temperatures that can be harmful to health. In August 2003, there were over 2000 excess deaths recorded over a 10-day heatwave period⁷. The temperatures reached in 2003 are likely to be typical summer temperatures by 2040. Such events increase the pressure on the NHS and social care system, leading to additional burden of demand on the system and financial costs. Some of these costs will fall on council budgets due to the new roles and responsibilities for local authorities under the Health and Social Care Act. Taking precautionary action across the NHS and councils will be necessary to ensure that health and wellbeing is not compromised during hot weather.

£1500

Small businesses suffered average damages of £1,531 in the 2013/14 winter storms

7.1%

growth rate in flood modelling and flood protection by 2017-2018

“

Two thirds of small businesses have been negatively affected by some sort of severe weather in the last 3 years. However, two thirds still do not have an adequate resilience plan in place to help them cope with these events. Good information and engagement with these businesses is vital.”

Allen Creedy, Energy and Environment Chair, Federation of Small Business

Dealing with severe weather and a changing climate also generates economic opportunities.

- It is estimated that the global market for goods and services which help to develop climate resilience (e.g. flood modelling and flood protection) was worth £2.1 billion in 2011, with over 21,000 employees in the UK, and a forecasted UK growth rate of 7.1% by 2017-18⁸.

As this report demonstrates, many councils are already responding to the challenges and opportunities of severe weather and a changing climate. A summary of the main case studies included at the end of the report is provided below. On the basis of their experience, and in the context of the challenges and opportunities faced, this report makes the case for **developing climate resilience to be seen as a core council responsibility.**

4 Devon County Council, 2014. Extreme weather resilience report
 5 Somerset Economic Impact Assessment of the Winter 2013/14 Flooding, Somerset County Council/Environment Agency December 2014.
 6 FSB, 2014, Voice of Small Business Panel: February 2014 Snap Poll Topline Results
 7 Public Health England, 2013, Heatwave Plan for England
 8 K-Matrix, 2012, Adaptation and resilience (climate change)

Overview of case studies

Case study	Adaptation issue			Business case for action				Investment model	
	Flooding, storms and erosion	Over heating and severe cold	Water stress and drought	Growth	Efficiencies	Safeguarding	Rule of law	Facilitate/ regulate	Public funds
Cambridge sustainable drainage	x				x	x	x	x	
Kent Severe Weather Impacts Monitoring System (SWIMS)	x	x	x		x	x			x
Leeds vulnerability mapping tool	x					x			x
Liverpool community resilience	x					x			x
Suffolk & Waveney coastal fund	x			x			x	x	
Bristol smart flood management	x					x	x		x
Hampshire resilient communities and roads	x				x	x		x	x
Hull upstream collaboration	x					x			x

Council function							Stakeholders involved			Costs and benefits
Regeneration, housing, planning	Corporate resources	Transport	People, place and communities	Health and social care	Schools and education	Environmental services	Business	Emergency services	Community groups	
x							x			Net value of £3.7m by avoiding damages worth £5.8m via engineering fix costing £2.1m
x	x	x	x	x		x		x		Through improved understanding of impacts and costs of flooding events over winter 2013/14, secured £7.6m external funds (e.g. for roads and rights of way repairs, other flood defence)
	x		x	x		x		x	x	Defra £50,000 grant used to help map vulnerability and help to save on health & social care costs which can amount to £625 per patient per day
x			x		x	x			x	EA/ Defra pathfinder £0.5m grants to retrofit uninsurable homes and raise value 5-10%
x	x					x				Member fee of £1 per day for LGA coastal group to lever private funds. Business contributions to Flood and Coastal Erosion Risk Management (FCERM) projects deductible expenditure for Corporation Tax and Income Tax
x	x	x	x			x			x	Retrofitting of SuDS and installation of sensors to address cost flooding - 13/14 floods cost Council £500,000+
		x	x					x	x	Low cost community resilience work significantly reduces costs of floods to Council and other agencies. Long term highways savings from whole-life approach
x			x	x						£14.4m scheme funded by flood grant and ERDF to address economic, social and environmental costs of flooding. 2007 floods cost £110m+. Health costs £2.5m+

4. How councils are developing climate resilience

Flooding, storms and erosion

Why is it important?

Flooding can cause devastation to residential property and businesses and disrupt infrastructure and services such as transport, education and health and social care.

- There are 2.4 million properties at risk from flooding from rivers and the sea. A further 3 million properties are at some risk from surface water flooding in England. About 600,000 properties are at risk from both sources of flooding⁹.
- The average annual economic consequence of flooding is estimated to be about £960m from river and coastal flooding and coastal erosion, and £290m from surface water flooding¹⁰.
- Important national infrastructure is also at risk. 55% of water pumping stations/treatment works are at risk, as are about 14% of electricity infrastructure sites, 10% of main roads and 21% of railways¹¹.
- Around 700 properties could be lost to coastal erosion over the next 20 years, and about 2,000 could be lost in the next 50 years¹².
- 40% of UK manufacturing is situated on or near the coast, 31% of all tourism expenditure is at the seaside and 50% of prime agricultural land is within the coastal plain. Yet, coastal erosion occurs on 30% of England’s coastline and 44% of the coast is defended¹³.

40%

of UK manufacturing is situated on or near the coast

2.4M

properties are at risk from flooding from rivers or the sea.

£960M

The estimated average annual economic consequence of flooding from river and coastal flooding and coastal erosion

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As the trade body for insurance providers, a key area of our guidance to local councils is to avoid exposure to the risk of severe weather through their local planning system. One big challenge is minor developments, as there tends to be less scrutiny at the local and national level, yet taken together the collective risk of these smaller developments could be very significant. ”

Matt Cullen, Head of Strategy, Association of British Insurers, November 2014

Key interventions

Councils across England are already showing why and how taking action now can avoid costs in the short and longer term and help to ensure that their communities and economies continue to thrive. **Many of these interventions are low-cost, and all make good financial sense in the right context.**

Key interventions to deal with flooding, which are illustrated in the case studies and examples in this report, include:

- Informed by advice provided by the Environment Agency, local councils can manage flood risk for new development. The Environment Agency provides bespoke advice for higher risk development, and standing advice for lower risk development.
- Developing community resilience to flood events in flood-prone settlements
- Establishing Local Plan policies, supported by Supplementary Planning Documents, to provide guidance to developers on measures to be incorporated into new developments (e.g. sustainable drainage, greywater recycling, passive cooling mechanisms).
- Adopting a whole-life approach to highways maintenance.
- Ensuring that council service strategies and action plans accurately capture the costs of severe weather for the purpose of recharging, full cost recovery or external fundraising.
- Piloting innovative financial instruments for investment in risk management measures.



The value of investment

Hampshire County Council's Emergency Planning team and Hampshire Fire and Rescue, in conjunction with the Local Resilience Forum (LRF), has invested officer time in developing community resilience in areas affected by flooding. In previous flooding events, approximately 100 properties in the village of Hambledon flooded and the response was costly to councils and emergency services, as well as the homeowners and businesses affected. The early part of 2014 saw the highest volume of rainfall in 250 years but just 10 properties in Hambledon experienced flooding in domestic areas¹⁴. This reduction was likely due to better preparedness and the use of privately-owned pumps, meaning that the level of response needed during the event itself from external agencies was substantially reduced.

The promotion of Sustainable Drainage Systems (SuDS) in Cambridge is projected to result in significant savings for Council services, homeowners and industry (e.g. evacuation, infrastructure measures, and disposal of materials to landfill). At one specific site, based on average annual damages, a net value of £3.7m could be achieved by avoiding damages worth £5.8m through measures costing £2.1m.

The overall objective of Suffolk Coastal and Waveney District Councils' joint Coastal Management Team (CoMT) is to manage the risk to life, property and the environment from coastal erosion and related flooding in the community. However, economic benefits can also be gained.

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By ensuring the 2 councils have sustainable communities ready to serve the offshore wind energy supply chain, key sites including Lowestoft have the potential to benefit from the creation of 13500 jobs and attraction of 200 businesses during the lifetime of the enterprise zone.”

Bill Parker, Coastal Management, Suffolk Coastal and Waveney District Councils, January 2015

9 Environment Agency, 2014, Flood and coastal erosion risk management Long-term investment scenarios (LTIS) 2014

10 *ibid.*

11 Environment Agency, 2009, Flooding in England: A national assessment of flood risk.

12 Environment Agency, 2014, Flood and coastal erosion risk management Long-term investment scenarios (LTIS) 2014

13 LGA Coastal Special Interest Group, 2013, On the Edge 2014: A Coastal Strategy

14 Figures supplied by Hampshire and IoW LRF compiled from info taken from Hambledon Flood Action Group and the content of multi agency meetings held during the flooding incidents.

Overheating and severe cold

Why is it important?

Severe bouts of heat or cold are a danger to public health. Older residents, very young children, and people with serious medical conditions are particularly vulnerable to the effects of heatwaves and cold weather snaps.

- There were over 2,000 excess deaths in England in the 2003 heatwave, 680 excess deaths in the 2006 event and 300 in the 2009 event¹⁵.
- On average, there are around 25,000 excess winter deaths each year in England¹⁶.
- Rising temperatures do not signal an imminent end to cold weather snaps but to an increase in extremes. December 2010 was the coldest winter on record for 100 years. Travel disruption was estimated to have cost the UK economy £280m per day and overall the severe winter weather was reported to have reduced the UK's GDP by 0.5%¹⁷.
- Higher summer temperatures are projected to result in rising energy demand for cooling, which will lead to increased costs for building owners, including councils and tenants.

2000

excess deaths in England
in the 2003 heatwave

“

We work with 767 institutional investors holding US\$92 trillion in assets to help reveal the risk in their portfolios. To understand the return associated with putting their capital into an area's infrastructure, investors want to know about how that council is managing the impacts of severe weather. For instance, heat island effects, and cooling in major buildings. Councils know there is major competition to be an attractive place for investment, that's why 207 cities in England and around the world, including Manchester and London, voluntarily disclose their plans to the market.”

Conor Riffle, Cities Director, CDP, November 2014

£280M

daily cost of travel
disruption in December
2010, the coldest winter
on record for 100 years

Key interventions

Councils across the country are taking action to safeguard vulnerable communities against heatwaves and cold snaps and to ensure that local infrastructure is protected against the impacts of temperature extremes. Actions to address hot and cold weather are also being taken to ensure long-term attractiveness to institutional investment. **Many of these interventions are low-cost, and all make good financial sense in the right context.**

Key interventions to deal with hot and cold weather, which are illustrated in the case studies and examples in this report, include:

- Manage climate risks such as overheating through suitable adaptation measures in local plans and developments, including green infrastructure and the design and orientation of new buildings to maximise summer cooling.
- Making use of open source data to assist Health and Wellbeing Boards in reinvigorating their Joint Strategic Needs Assessment (JSNA)¹⁸.
- Preparing local heat wave and cold weather plans.
- Working in partnership on affordable warmth interventions and wider self-help such as 'collective switching'.
- Voluntary reporting to institutional investors about a council's plans and performance on managing the impacts of weather on its building stock and other infrastructure.

¹⁵ Public Health England & NHS England, 2014, Heatwave Plan for England 2014.

¹⁶ Public Health England, 2014, Cold Weather Plan for England 2014.

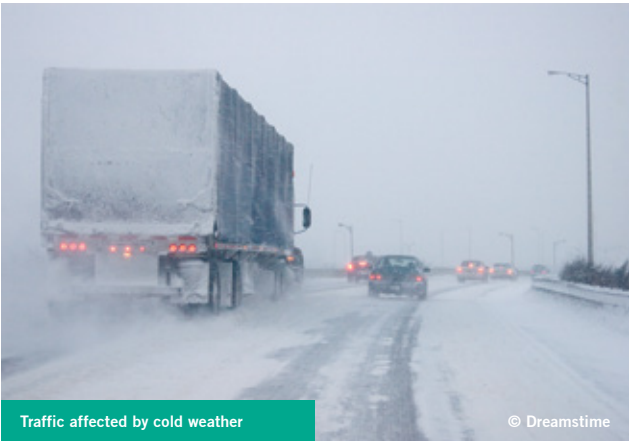
¹⁷ Reported in Met Office, 2014, Too Hot, Too Cold, Too Wet, Too Dry: Drivers and Impacts of Seasonal Weather in the UK

¹⁸ A Joint Strategic Needs Assessment (JSNA) is an on-going process by which a range of data, information and analysis about the health and wellbeing of an area is undertaken to develop an understanding of the issues impacting on the population. This evidence is used to underpin Health and Wellbeing Strategies.



London Underground 'Stay Cool' campaign

© Environment Agency



Traffic affected by cold weather

© Dreamstime

The value of investment

Leeds City Council has developed a Vulnerability Mapping Tool to identify those residents most susceptible to the adverse impacts of severe weather, including extreme temperatures. One powerful output is a map of elderly peoples' access to GPs in heatwaves. Heat increases the number of visits to GPs and hospitals, calls to NHS Choices, and social care referrals. This increases the burden of demand on the health and social care system.

.....
£1.5bn

the benefits of retrofitting green sustainable drainage systems at a city-wide scale are valued at over £1.5 billion over 40 years for Coventry

.....

“ Factors contributing to vulnerability are exposure, sensitivity and adaptive capacity. Representing these graphically via GIS is a simple way to communicate complex issues and inform decisions between us and our NHS and voluntary sector partners. **”**

Rob Curtis, Fuel Poverty Officer, Leeds City Council, January 2014

Research involving Birmingham and Coventry City Councils illustrates a wide range of potential benefits of water sensitive urban design and integrated catchment management, including combating of extreme heat, improving air quality, increasing council tax income and creating jobs. In total, **the benefits of retrofitting green sustainable drainage systems at a city-wide scale are valued at over £1.5 billion over 40 years for Coventry.** If water reuse infrastructure is included to store and recycle runoff, benefits increase dramatically to nearly £8.3 billion across the city¹⁹.

Plymouth Energy Community works closely with Plymouth City Council to provide energy and fuel poverty services to local residents, and is currently developing a bespoke energy tariff with Ovo Energy. In addition to reducing energy costs for residents, including those on pre-payment meters, this scheme will also provide free smart meters and create funds for the co-operative, which can be used to further reduce fuel poverty²⁰.

19 AECOM & Severn Trent Water, 2012, The Ripple Effect: Building Resilience of Urban Water Systems to Climate Change
 20 Couper, G & Shadrake, A, July 2014, A community-based approach to securing cheaper energy for low income households

Water stress and drought

Why is it important?

Whilst requiring the use of standpipes is rare, restrictions such as hose-pipe bans and constraining the level of abstraction are more common. Too little water could become a significant public health issue and threaten the attractiveness and viability of some local areas as locations of choice for families and inward investors alike.

- Without action to prepare, nearly half of key water sources could be at risk or deficit during a drought by the 2020s due to the combined effect of severe weather and population growth²¹.
- As a result the supply-demand deficit in the 2020s could be up to 1.2 billion litres per day, equivalent to 7% of existing supply²².

Key interventions

Many councils are becoming increasingly aware of the importance of water supply issues, both in terms of addressing the costs of their own water supplies, securing long term provision of adequate water supplies for homes and industry in their area and capitalising on the economic opportunities of innovation in the water sector.

Many of these interventions are low-cost, and all make good financial sense in the right context.

50%

of key water sources could be at risk or deficit during a drought by the 2020s due to the combined effect of severe weather and population growth

“

The historical reason why scarcity problems such as water stress are not dealt with is a lack of value capture - resources are under-priced, or one person invests but another benefits. Better modelling, use of big data and innovative finance can help bridge this gap. Already 32,000 enterprises and 400,000 professionals are working in the UK on tackling the challenges posed by the huge scale of urbanisation worldwide: architects, civil engineers and urban designers, data analysts, software developers, academics and financial and business service consultants. Altogether, this activity is already worth over £16 billion to the UK and we're predicting it will grow. ”

Peter Madden, CEO, Future Cities Catapult, November 2014

1.2bn

litres per day, possible supply-demand deficit in the 2020s

Key interventions to deal with water stress and drought, which are illustrated in the case studies and examples in this report, include:

- Using the planning practice guidance and information in the supporting ministerial statement for optional housing standards; establish if the higher standard of water efficiency in building regulations for housing can be applied in your local council area using a local plan policy (if you do not have this already).
- The production of a Water Cycle Strategy to inform the Local Plan and raise the bar for all new construction.
- Using revolving funds to make savings from the recovery of grey water in council premises and street cleaning or parks.
- Neighbourhood campaigns to educate the public about the value of saving water in the office or home.

²¹ DEFRA, 2012, Summary of the Key Findings from the UK Climate Change Risk Assessment 2012

²² Committee on Climate Change, 2012, Climate Change – Is the UK preparing for flooding and water scarcity?



The value of investment

Kent County Council has developed a monitoring system and evidence tool (Severe Weather Impacts Monitoring System - SWIMS) to inform decisions by the Council and its 150 public service partners on the management of local severe weather impacts. The logging of responses to incidents of drought, heat waves, flooding, or storms in Kent has enabled estimates of total costs to public service providers to be developed. These total £4.4m per year for responding to the impacts of severe weather events. This in turn guides future investments to meet long term resourcing requirements. For example, £7.6m of the additional £11.2m required to respond to the winter flooding of 2013-14 has been secured through external fundraising from Defra and the Environment Agency.

“

Senior management and elected members support the investment of officer time in SWIMS because it provides the evidence base for needed resources, some of which can be, and has been, levered through external funds for a number of functions - ranging from highways and regulatory services to families and social care.”

Dr Sarah Anderson, Flood Risk and Natural Environment Manager,
Kent County Council, January 2015

Glasgow City Council has entered into a commercial partnership with a non-domestic water supplier which has funded investment in new water efficiency infrastructure through a Gainshare model. This will allow the Council to benefit from the associated financial savings without the need for up-front capital expenditure, resulting in operational savings of £1m in water and wastewater over 4 years.

Liverpool City Council and Liverpool LEP are seeking to capitalise on the area's water innovation capacity. There are over 55 local companies working in the water sector, responsible for £122m in sales activity, and 962 jobs²³. From this base, the council and LEP is seeking to develop a place-based, economic transformation agenda around water technology: the world's first sustainable coastal city region cluster ('AquaFutures'), specialising in marine impacts, river clean-up and water smart infrastructure.

23 WSP and Infrangilis, 2014, Understanding Water Innovation Capacity in the Liverpool City Region

5. Funding options

Developing the business case locally

Councils can and are developing the business case to fund climate resilience. Council leaders are routinely faced with competing demands to fund an array of public services. The chances of a successful business case being made will be enhanced²⁴ by designing a project proposal to deliver multiple outcomes, particularly where these are aligned with key local priorities.

Often one of the barriers to gaining funding for action is uncertainty around the scale and nature of future climate impacts. Designing a project to deliver multiple outcomes is also critical in this respect, e.g. the wider benefits of a carefully designed flood risk management project (habitat creation, amenity benefits) can make such a project largely robust to the future level of flood risk, i.e. the measures bring net benefit even if lower levels of future damage are realised²⁵.

As this report clearly illustrates, many responses to manage severe weather and a changing climate are low cost but making a business case for funding will still be crucial. In preparing the business case it is vital to be clear on who will fund the intervention (including identifying match-funding where it is available) and who will benefit from it (which may also help to identify other potential funding sources), what the initial and ongoing capital or revenue expenditure will be, and also when these costs and benefit occurs over time. It is often assumed that investment in managing the impacts of severe weather will not generate benefits in the short term nor generate direct benefits to councils. The case studies in this report illustrate that neither of these assumptions is necessarily correct.

Types of funding

A variety of funding options are available for both small- and large-scale projects. These involve varying levels of investment and return, including nil or low costs for the council itself. The figure overleaf presents 4 funding categories which a council may choose to use (a brief explanation of each instrument is provided in the glossary):

- Facilitate or regulate - zero or low-cost policy interventions which incentivise and equip residents and businesses to develop their own resilience.
- Public funds – European and national government or other public support through grant or enabling policy, and the sharing of resources with other like-minded councils.
- Equity stake - contributions to profit-making ventures which are controlled and owned in full by the council or jointly with the private sector.
- Debt finance – a promise to repay or reward some kind of loan with interest – financial or non-financial - to a creditor or investor.

²⁴ Monaghan, P., 2010, Sustainability in Austerity

²⁵ Frontier Economics, 2013. The economics of climate resilience: Appraising flood management initiatives - a case study.

Funding options for local councils

The Portsea Island Coastal Strategy sets out the long term strategic approach to managing Portsmouth's coastline. It is expected to be part-funded by the council's Community Infrastructure Levy.

Kent: cost recovery from the development of SWIMS by building the evidence base to secure external grant e.g. £7m from Dept. for Transport.

Facilitate or regulate

- Cause-Related Marketing
- Crowdfunding and open source
- Environmental Upgrade Agreements
- Land Readjustment
- Local Plan supported by Sustainability Supplementary Planning Documents (SPD)
- Land Value Capture or developer tariffs
- Pollution charges

Public funds

- Revolving funds or cost recovery
- Joint purchasing agreements
- Pooled financing agreements or municipal bank
- Government grant and EU growth funds

Equity stake

- Financial contribution to Public Private Partnerships (PPPs) or Special Purpose Vehicles (SPVs) delivering infrastructure, delivering services or developing land
- Low Carbon Enterprise Zones (EZ) or Accelerated Development Zones (ADZ)

Debt finance

- Climate derivatives
- Green municipal bonds
- Public or private loans
- Social impact investors and micro-creditors
- Sukuk
- Tax Increment Financing

Newcastle: 24-Acre Science Central development, part of a £92M investment unlocked through the City deal/ tax incremental financing (TIF), is being delivered in partnership between Newcastle University and the City Council. It is aiming to be an exemplar of sustainable living, with buildings with living walls, and rainwater collection.

Peterborough: Cross Keys homes with the council's support as a board member, issued a £150m bond to build 250 adapted properties e.g. greywater recycling.

(Source: adapted from UNEP, forthcoming 2015. Credits: case studies in appendix; ADB, 2012; BLP, 2013; Monaghan, 2010; UN-Habitat, 2013; Cross Keys, 2014/ Sustainalytics, 2014; Portsmouth City Council, 2012)

“

This is the first [green] bond issued in the social housing sector and allowed Cross Keys Homes to effectively highlight its environmental credentials to the UK investor base. Cross Keys homes' track record, its strong credit rating and the environmental and social aspect of the bond ensured investors demonstrated a keen appetite to invest.”

Grant Vaughan, Director Corporate Debt Capital Markets,
Lloyds Bank Commercial Banking, September 2014²⁶

With regard to public funds, at least 20% of the EU budget for 2014-2020 is in principle committed to being spent on climate action, including resilience. Climate resilience requirements are included in all relevant EU funding streams and encourage councils to integrate resilience into their policy planning and implementation. Climate resilience is integrated into the EU's sectoral policies, including into the 4 European Structural and Investment Funds (ESI Funds): the European Regional Development Fund (ERDF), European Social Fund (ESF), European Agricultural Fund for Rural Development (EAFRD), and European Maritime and Fisheries Fund (EMFF). In addition, other instruments also exist to promote and support research, development and action on climate resilience. These include Horizon 2020, the EU's biggest research and innovation programme, with nearly €80 billion over 7 years, and the LIFE instrument which finances a wide range of projects related to environment and climate mitigation and resilience, and has dedicated €860 million to climate resilience.

Climate resilience as 'business-as-usual'

As well as identifying funding opportunities for individual initiatives, this report argues that climate resilience needs to become 'business-as-usual' by being mainstreamed in council decision-making, policy development and service planning and delivery. This will not always mean additional costs but will result in spending existing budgets – ranging from building new homes to repairing roads - in different ways through factoring in consideration of the impacts of severe weather and a changing climate.

20%

of EU budget for 2014-2020 is in principle committed to being spent on climate action

€80bn

Horizon 2020, the EU's biggest research and innovation programme

Hampshire's Operation Resilience aims to make more roads resilient to the effects of extreme weather and increasingly heavy traffic as part of a long-term strategy to future-proof the network. The resurfacing is likely to last 10 – 20 years, whereas standard surface dressing is likely to last 5 years maximum. The business case for the project showed that this approach would be far more cost-effective.

26 As quoted in Cross Keys press release; the bond was issued with Peterborough City Council's support as a board member



Maximising the multiple benefits of sustainable drainage systems

© Simon Bunn



Highway repairs

© Highways England

6. Next steps

The case studies and examples in this report, and in the accompanying briefing sheets, provide an array of ideas and inspiration for action. However the actions your council should be considering will be dependent on your own situation and the specific climate-related risks and opportunities you face. The following steps will help to identify a way forward.

- 1. Build an understanding of key risks and opportunities.** The impacts of severe weather will vary from area to area. Risks and opportunities will therefore need to be determined locally. Regional summaries of the UK Climate Change Risk Assessment (CCRA) are available²⁷. More local work on risks and opportunities may have taken place through the development of the evidence base for the Local Plan or by emergency planning colleagues.
- 2. Identify priority areas for action.** Understanding key risks and opportunities will enable a better understanding of where your council's priorities should lie. Some of the key opportunities to respond to were identified by LGA, Defra and Department for Communities and Local Government (DCLG, see box) and further guidance is available from a range of sources (see below).
- 3. Secure senior-level buy-in.** The ultimate aim should be for climate resilience to be seen as a core council responsibility. Climate resilience considerations need to be mainstreamed into decision-making, policy development and service planning and budgeting. Gaining senior-level buy-in and commitment from members and senior officers will be a critical first step in moving towards this. The briefing sheets which accompany this report are intended to provide 'elevator pitch' messages for busy colleagues working across the range of council services. The PowerPoint presentation which accompanies the report will also be a useful tool in communicating the business case to colleagues and partners.

A range of other information and support is available, including:

- The Climate Local (www.local.gov.uk/climate-local) initiative, which includes resources for officers and members, and an online network.
- The European Commission's Mayor's Adapt initiative (www.mayors-adapt.eu), set up to engage cities in taking action to adapt to climate change and support them in doing so.
- Climate UK (www.climateuk.net), which supports councils and others to develop resilience through providing tools, guidance, training and support, including through their network of climate change partnerships (www.climateuk.net/network).
- The Climate Ready support service is led by the Environment Agency and works with partners to provide advice to help organisations adapt to a changing climate.

²⁷ www.climateuk.net/resource/regional-summaries-uk-climate-change-risk-assessment

LGA, Defra and DCLG have identified the following opportunities for councils to increase the resilience of local places and communities:

- building resilience into decisions on buildings, roads, businesses, parks and other public spaces
- building resilience into key services such as social care, emergency planning and public health
- making the best use of land, assets, investments and maintenance spending to manage risk better
- planning for the long term by reflecting climate risks and sustainable development in Local Plans
- increasing organisational resilience to extreme weather by building climate change risks into corporate risk registers
- supporting retrofitting, green-build and the design and management of green spaces
- encouraging local businesses to be climate ready to ensure they are resilient and competitive.

Other useful tools, guidelines and standards

- Delivering Resilient Growth (www.climateuk.net/news/delivering-resilient-growth) an information note for LEPs on delivering economic growth which responds to the challenges and opportunities of our future climate
- Association for Public Service Excellence (APSE) 'Local Water' report (www.apse.org.uk/apse/index.cfm/news/2014/local-water-stewardship-offers-environmental-and-economic-benefits-says-apse-report/) a study which demonstrates how councils can be effective local water stewards
- CDP Cities (www.cdp.net/en-US/WhatWeDo/Pages/investors.aspx) disclosure for institutional investors, a voluntary climate change reporting platform for city governments
- 'Severe Weather Impacts Monitoring System' (SWIMS) (www.climateuk.net/resource/severe-weather-impacts-monitoring-system-swims) a web-based tool that enables councils and their partners to measure the cost of severe weather events
- Joseph Rowntree Foundation's 'Climate Just' portal (www.jrf.org.uk/topic/climate-just) an information tool designed to help with the delivery of equitable responses to climate change at the local level
- 'Under the Weather' toolkit (www.sduhealth.org.uk/areas-of-focus/community-resilience/community-resilience-copy.aspx) to assist Health and Wellbeing Boards in integrating climate change adaptation into the local health economy
- HIRAM (Highways Infrastructure Resilience Assessment modelling tool), a tool for local highways agencies to identify their resilient highways networks, and how they might be managed in a changing climate, and help develop a business case for infrastructure funding.
<http://climatesouthwest.org/tools/transport>
- A guide for Registered Social Landlords: The Business Case: (www.climatelondon.org.uk/wp-content/uploads/2014/02/The-Business-Case.pdf) Incorporating adaptation measures in retrofits
- The Local Environment and Economic Development (LEED) Toolkit (www.ecosystemsknowledge.net/apply/local-economy/LEED) is designed to help LEPs and LAs meet their economic growth targets by fully realising the roles the environment can play.

7. Case studies

Kent County Council: weather impacts monitoring

Business case for action:

Through accurately monitoring the impacts of severe weather, Kent County Council and its partners have generated an evidence base which is informing decision-making and underpins the business case for external fundraising to address the risks from future events. Through the Severe Weather Impacts Monitoring System (SWIMS) Kent partners are working together to jointly understand the financial, reputational and social impacts of severe weather and use this knowledge to underpin long term planning and responses to events.

Dealing with the effects of severe weather is not a new challenge for Kent. However, projected changes indicate that the duration, severity and frequency of these events may change - posing new risks for the future. The county has a long coastline and with approximately 8.3% of Kent's population already at risk from surface water flooding. Kent is also one of the driest parts of England, has high population density with an ageing demographic and high household water use, so the prospect of more 'very hot' days creates further risks to the health of the Kent community and to Kent services.

As part of the Kent Environment Strategy, Kent County Council and partners are committed to ensuring the county is prepared for severe weather into the future and can continue to deliver effective services for the county. However, historically the Council has lacked a robust evidence base for embedding resilience into strategy and planning.

Type of action:

Kent have therefore developed, in partnership, the web-based SWIMS. SWIMS is a monitoring system and evidence tool used to inform decisions by the Council and its partners on the management and preparedness of local severe weather impacts. The logging of responses to incidents of drought, heatwaves, flooding, and storms in Kent has enabled estimates to be made of the total costs to public service providers, which in turn guides future investments to meet long term resourcing requirements.

It is a partnership tool, incorporating councils, police, fire and rescue, and the NHS, amongst others. So far 36 severe events have been captured, demonstrating that thousands of properties and land have been affected by severe weather events; 34,732 calls and call outs have been managed across services, 130 services have been involved in these events, spending the equivalent of 1438 officer days to deal with the impacts experienced (e.g. evacuations, tree works, pothole repairs, etc).

Benefits and costs:

The comparatively modest costs of the tool have been more than recovered through successful external grant applications, supported by evidence logged through the tool. For winter 2013/14 alone, costs of £11.2m - to repair roads, affected rights of way and develop flood defences - have been captured through the tool. Using the evidence generated by the tool, £7.6m has been secured externally through grant funding from the Department for Transport (£7m) and Environment Agency (£0.6m). The balance is financed through the Council's planned spend for the road network and public rights of way across Kent and Medway.

Financing mechanism:

The initial resourcing of SWIMS was shared between Improvement & Efficiency South East and the Council, with 0.5 FTE officer time required to manage the tool, in the form of training and education. The tool is now being rolled out nationally at no cost to local authorities through Climate-UK (www.climateuk.net).

Role of the council in regards to severe weather:

The Council's role takes two forms. First, to act as a direct service provider in partnership with other public agencies providing services including emergency assistance, highways management, advice on flood risk and rogue trading, public health and social care services and a public contact point. Second, as project lead for SWIMS, the Council provides training and facilitates for the collection of a robust evidence base on the effects of severe weather, to support business cases for adaptive action and funding.

Stakeholders involved:

Over 100 public services are signed up to SWIMS, incorporating councils, police, fire and rescue, and the NHS, amongst others. Outputs from the tool feed into key decision making internally and externally of the Council, including the Environmental Strategy Implementation Group and ISO14001 Environmental Management System, Community Risk Register, Kent Resilience Forum, Water Task Group, Joint Strategic Needs Assessment and Health & Wellbeing Board.

Transferable lessons:

Investing in the monitoring of the costs of severe weather events can generate a return in the short term through an improved evidence base and justification for spend and funding.

The monitoring tools used need to be flexible, to account for the constantly changing operating environment of public service providers. In addition, regular reviews of the data and information ensures on-going engagement and the ability of partners to use the information in both individual and joint planning and decision making.

Bringing partners together to establish SWIMS was a useful step in building strategic understanding and communication around resilience and climate change.

Hampshire County Council: Resilient communities and resilient roads

Business case for action

Improving resilience is seen to make good business sense, saving money for the council and the communities they serve. This is particularly true in key areas such as estates and transport. This work is also driven by more immediate pressure to maintain and enhance service provision in the context of the increasing disruption brought by extreme weather events. A further driver of activity stems from the fact that the council, under the Civil Contingencies Act, recognises climate change as an emergency, which therefore must be planned for.

Type of intervention

Hampshire County Council (HCC) has been seeking to incorporate resilience into decision-making across all departments. This case study focuses on 2 examples of their work: the work by the Emergency Planning team, in conjunction with Hampshire Fire and Rescue and other partners within the Hampshire and Isle of Wight Local Resilience Forum (LRF), to develop community resilience; and Operation Resilience, which aims to make more of Hampshire's roads resilient to the effects of extreme weather and increasingly heavy traffic as part of a long term strategy to future-proof the network.

Benefits and costs

In 1994 and 2001, the village of Hambledon flooded. On both occasions, approximately 100 properties were flooded (including those with flooded cellars) and the response was costly to Hampshire Fire and Rescue Service, the County, District and Parish councils, as well as the homeowners and businesses affected. In 2012 and 2013, the LRF worked with Hambledon's Flood Action Group to develop community resilience, establishing a community flood response (using Cabinet Office guidance) alongside a wider multi-agency response. The early part of 2014 saw the highest volume of rainfall in 250 years but just 10²⁸ properties in Hambledon experienced flooding in the accommodation areas of the building. This reduction was likely due to preparedness and privately owned pumps, meaning that a response from an external agency was substantially reduced. Overall, the extreme weather in winter 2014 is estimated to have cost the council £5.7m for the property response and recovery, plus a further £62.7m in longer term capital costs for remedial works. In this context, the value of low-cost investment in community resilience in flood-prone communities like Hambledon is clear.

In 2014/15 the HCC Highways Maintenance budget is approx. £56m, and this budget includes its Operation Resilience programme. The resurfacing carried out by Operation Resilience is likely to last 10 - 20 years, where as surface dressing, the standard approach, is likely to last a maximum of 5 years, and is more susceptible to severe weather. The business case developed for the project showed that it would be far more cost effective to undertake a programme of longer-term repairs rather than simply patching. A key benefit in terms of efficiencies is that Operation Resilience is now linked to HCC flooding database, so that highways flooding issues can be assessed at the same time as highway maintenance, thereby streamlining the process and maximising efficiencies. As well as savings to the repairs budget, significant savings are also achieved in terms of staff time dealing with complaints. In addition, Hampshire County Council came out top of all county councils in an independent National Highways and Transport(NHT) survey of residents' satisfaction with local Highway Maintenance services.

²⁸ Figures supplied by Hampshire and IoW LRF compiled from info taken from Hambledon Flood Action Group and the content of multi agency meetings held during the flooding incidents.

Financing mechanism

The community resilience work is low cost, mainly comprising of staff time. Operation Resilience is funded largely from the council's revenue budget for highways maintenance, with an additional £2.3m in government funding in 2010. Included in the 14/15 budget is £6m that the government allocated from the 'Pothole fund' – HCC received the highest amount in the South East due to good practice, and £11.5 for repair to flood damaged roads.

Role of the council

HCC is solely responsible for developing and delivering Operation Resilience as part of the highways maintenance function. With regard to the LRF, HCC is a member (as a category 1 responder) and had undertaken substantial work with the LRF to make strong links between the emergency planning and climate change agendas.

Stakeholders involved

The LRF is a multi-agency organisation involving HCC alongside the emergency services, the NHS and the Environment Agency. The LRF secretariat is council-based. Hampshire Fire & Rescue Service have been particularly closely involved in the community resilience work.

Transferable lessons learned

Fires and extreme weather events comprise the bulk of serious incidents to which LRF's have to respond. The low cost resilience-focused measures taken forward in Hampshire will therefore have resonance across the country. A key strength in Hampshire's case was that the LRF collated records of weather-related incidents and this is considered to be a critical starting point for understanding the importance of the issue and developing appropriate responses elsewhere.

With regard to Operational Resilience, the principal lesson derived from Hampshire's experience is that, particularly with increasingly unpredictable weather events, a whole life approach to highways maintenance is needed.

Cambridge City Council: Sustainable drainage systems

Business case for action:

Challenges of severe weather and strains on historic drainage systems arising from urban growth mean innovative new solutions to water management are needed in Cambridge, particularly in the context of 12,500 new homes being built between 2006 - 2016.

Furthermore, as a result of the Enclosures Act, many watercourses have been awarded to the city, so it is in the council's own interest to make sure surface water management works well.

Type of action:

Cambridge City Council is promoting the use of sustainable drainage systems (SuDS) through its Local Plan as one key way to manage surface water risks. The main purpose of the SuDS is to mimic the natural drainage of the site before development. This is achieved by capturing rainfall and allowing as much as possible to evaporate or soak into the ground close to where it fell. The rest is directed to the nearest watercourse to be released at the same rate and volumes as before development.

The Local Plan requires the implementation of SuDS on all major growth sites. The council has also taken the decision to adopt SuDS that are located within public open space. To assist this process it has produced the Cambridge Sustainable Drainage Design and Adoption Guide, which sets out the council's requirements for developers, based on the general principles of the 'CIRIA C697 SuDS Manual'.

Benefits and costs:

An options appraisal report for the area's Surface Water Management Plan concluded that the promotion of SuDS will result in significant savings for council services, homeowners and industry (e.g. evacuation, infrastructure measures, and disposal of materials to landfill). At one site appraised, in Cherry Hinton, a net value of £3.7m could be achieved by avoiding damages worth £5.8m through engineering measures costing £2.1m. SuDS generally replace traditional underground piped systems that use grates or storm water drains at street level, which means any problems with the system are quicker and easier to identify than with a conventional system and are likely to be cheaper and more straightforward to rectify. SuDS can also provide other benefits in developments such as enhancement of visual impact and amenity, passive cooling, and pollution reduction. Developers increasingly see the merit of this argument in the form of higher property values.

Financing mechanism:

The Local Plan regulates or facilitates investment in SuDS. SuDS are funded by developers directly for private land or indirectly through Section 106 Agreements for public land. Officer time to promote SuDS across service functions is estimated to be 1 FTE or approximately £40,000 per annum, a cost which is recovered via an internal recharging system on developer fees at pre-planning application and performance agreement stages.

Role of the council:

There is a lack of awareness of sustainable drainage issues and measures for historical and new sites alike. The council have sought to overcome this by ongoing training inside and outside of the council, alongside the production of the SuDS Design and Adoption Guide.

Stakeholders involved:

Key internal stakeholders included ecologists, architects, landscapers, building control, planning officers, and the streets and open spaces team. External partners ranged from Anglia Water and Countryside Properties, through to Cambridgeshire County Council, Cambridgeshire Horizons (which administered the Housing Growth Fund), and the Environment Agency.

Transferable lessons:

Requirements for the use of SuDS can result in significant savings for council services, homeowners and industry.

The council has found that there is a need to discuss the sustainable drainage requirements with developers early, as this can lead to higher quality schemes where the SuDS are integrated into the initial designs.

Suffolk Coastal and Waveney District Councils: Multiple benefits from coastal management

Business case for action:

Suffolk Coastal District Council and Waveney District Councils shared management responsibilities include a lead role for coastal management as set out under the Coast Protection Act 1949 and Flood and Water Management Act 2010. Through their Coastal Management Team (CoMT) they seek to manage the risk to life, property and the environment from coastal erosion and related flooding. In doing so, they also seek to contribute to the economic growth agenda. To give a national voice to this work with government, the Councils are the lead authority for the LGA's Coastal Special Interest Group (SIG).

Type of action:

The SIG champions and takes forward a joint coastal strategy 'On the Edge' and represents the collective interests of 57 maritime local councils by seeking to secure funding to deal with current and future problems and full involvement in policy formulation.

Benefits and costs:

Suffolk Coastal and Waveney District Councils pay membership fees for the SIG of £300 per year, or less than £1 per day. The return on this investment for the 2 councils is access to government ministers and leverage of private investment. Leveraging new public and private funds for coastal management is important not just to manage risk to life and property in the 2 councils, but also to contribute to the Anglia LEP's new economic vision. By ensuring the 2 councils have sustainable communities ready to serve the offshore wind energy supply chain, key sites including Lowestoft have the potential to benefit from the creation of 13,500 jobs and attraction of 200 businesses during the lifetime of the enterprise zone.

Financing mechanism:

Officer and councillor time allocated to leading the SIG is part-time and included in planned service spend.

Role of the council:

The principle work of the CoMT is intelligence and information, engaging and enabling, sustaining communities, and finance and funding. This includes, for instance, the production of Shoreline Management Plans.

Stakeholders involved:

Responsibility for managing the coastline is split between the Environment Agency (largely for floodable areas), private ownership and the Maritime planning authorities (largely for erodible coastline).

Transferable lessons:

Managing the risks from severe weather and a changing climate is key to protecting current and future growth prospects.

Working in partnership is key to delivering a strategic approach both in terms of strategy and funding.

Liverpool City Council: Community resilience pathfinder

Business case for action:

Liverpool is currently ranked as 4th highest in the country in terms of risk from surface water flooding. This has been evident on the ground with a number of localised surface water flooding events over recent years. Elected members' determination to develop these communities' capacity for self-help led initially to Environment Agency funding and subsequently to a successful application to participate in Defra's Flood Community Resilience Pathfinder programme.

The council's emergency planning responsibilities are also a key driver. 50% of the very high risks for Merseyside's Community Risk Register are listed as being water- or flooding-related.

Type of action:

The council has developed a holistic approach that has sought to engage the community, raise awareness of both climate change and flooding and deliver some practical property level flood protection to vulnerable homes. The Environment Agency funding helped to deliver property level flood protection to a total of 63 homes. The subsequent Defra programme saw the City Council link with the National Flood Forum and engage with residents to adapt and protect a further 27 properties to prepare for flooding through the installation of flood doors and smart air bricks (which self-seal with rising external water levels). The National Flood Forum also provided advice and guidance to residents, particularly on flood insurance.

This work was complemented by partnering with the Mersey Forest to deliver some localised tree planting to further reduce the risk of surface water flooding. Working with the National Flood Forum, local residents were mobilised to act as community champions. A Flood Group was established and projects were carried out to engage young people through schools and youth clubs.

Benefits and costs:

Helping to develop local residents' capacity to respond to emergencies and adapt to cope with recurring events (e.g. flooding) allows residents to 'be prepared' and also helps to alleviate financial and resource strain on council services.

The implementation of the flood improvement programmes was informed by advice from the National Flood Forum which has calculated that for every £1 invested in Property Level Protection, £8 worth of damage and clean up are avoided. Following the initial flooding in 2008 many residents in the flood hotspots were unable to get house insurance for flooding, or faced having to accept insurance with up to a £5,000 policy excess on their property for flooding. Several residents were left with uninsurable homes as they could not afford to pay for the adaptive measures required to reduce the risk of flooding. Retrofitting properties with flood protection can range from between £3,000 to £10,000 and upwards per home (depending on the number of doors and types of measures installed). In addition to this cost burden, the lack of insurance and alternative accommodation meant that some families were forced to live upstairs in their properties for months at a time whilst the flood damage downstairs was repaired.

Now in the final stages of the pathfinder scheme in 2015 there have, as yet, been no new requests for council services assistance by the affected communities and the call on council resources for response support has decreased. The flood improvement works have brought multiple additional benefits for both residents and landlords. The new flood doors are reported by residents as being more thermally efficient and contributing to warmer homes. The doors have also helped to 'lift' and visually

improve the front façade of houses, improving the value of some properties and additionally reducing road traffic and external noise. The programme of work has also helped to bring some empty properties back into use, thus preventing social blight. Financially, the investment into the flood mitigation measures has been sound. The flood damage and associated costs from the unprotected Churchdown site flooding in 2010 which affected approximately 20 properties was estimated as being close to £250,000. By comparison a similar sum (£246,000) was able to install flood protection measures into 3 times as many properties, offering flood protection and peace of mind to residents for years to come.

Financing mechanism:

Core external grant funding was received for work to date that totals £552,600. This included 2 phases of funding from the Environment Agency and subsequent Defra monies for the pathfinder scheme. In total these programmes provided property level flood protection to 90 vulnerable homes. Financially this was complemented by City Council officer time mainly within the environment and emergency resilience team but also, to a lesser degree, by staff within neighbourhoods, highways, drainage, legal and procurement services.

Role of the council:

Under the Defra programme, environmental and emergency resilience teams joined forces with local resident groups, the National Flood Forum and ward councillors to: raise awareness of the value of taking action (door knocking exercises and local surgeries); to source the best adaptive measures (procuring installers willing to tailor kitemarked solutions to each householders needs); and finally to help establish a voluntary Community Flood Warden group to increase the community's resilience to future flood events (local people taking local action and delivering local messages). This work provided a platform to extend the resilience message to other scenarios such as severe weather or power outages and to help make the community more resilient to a range of possible future scenarios.

Stakeholders involved:

Lead by officers within the environmental and emergency resilience team, participation in the Defra pathfinder was a combined piece of work between a number of additional City Council services including neighbourhoods, highways, drainage, legal and procurement. Collectively through the lead of the environmental and emergency resilience team the council worked in partnership with a number of key external stakeholders including the National Flood Forum, the Environment Agency, United Utilities, Registered Social Landlords, and local residents to make the programme a success.

Transferable lessons:

Developing community resilience can avoid significant costs to communities and council services.

Installing property-level protection can make sound financial sense in flood-prone communities, and deliver wider benefits.

Engaging with established community groups is key to success in developing community resilience.

Leeds City Council: vulnerability mapping to protect residents from temperature extremes, flooding and storm

Business case for action:

A risk assessment for West Yorkshire identified the main hazards as temperature extreme, flooding and windstorm. Leeds City Council and the Core Cities have developed an innovative mapping tool to identify those residents most vulnerable to the adverse impacts of such extreme weather events. The tool was developed with the aim of increasing the level of preparedness both in terms of prioritising emergency responses and strategic planning of adaptation actions.

Type of intervention:

The tool uses GIS to graphically represent statistical indicators relating to climate vulnerability. The factors that contribute to climate vulnerability are commonly understood to be a combination of exposure, sensitivity and adaptive capacity.

The tool is at trial and rollout stage, and so the full benefits are still being realised. However, it is anticipated that the tool will help to identify vulnerable populations where adaptation action could reduce exposure, and assist the emergency services in prioritising vulnerable people who are unable to rescue themselves during severe weather events through the confidential sharing of data.

Benefits and costs:

An example of an early and powerful output from the project is in relation to a map of elderly access to GPs in heat waves. This is important as heat accounts for excess deaths every year, with the effects overwhelmingly concentrated in the elderly. In July 2006 a heat wave contributed to over 100 excess deaths in Yorkshire and Humber alone. Heat also increases the number of visits to GPs and hospitals, calls to the NHS, and social care referrals. This can lead to costs of £266 to £625 per patient per day, part of which falls upon councils. As a result of the Health and Social Care Act 2012, local councils are now responsible for working with Public Health England to improve the health of their local population, and so understanding the proximity of the elderly to GPs is key in preventing harm and helping to identify efficiency savings for health and social care budgets.

The tool cost £63,000 to develop.

Financing mechanism:

The project received grant funding from DEFRA on behalf of Core Cities worth £50,000, which was matched by £13,000 in-kind funding from Leeds City Council. This match funding was a percentage of officer time already allocated to climate change strategy and action planning or IT support services.

Role of the council:

Leeds City Council volunteered to be responsible for end-to-end delivery of the project on behalf of Core Cities, with support from consultants Acclimatise.

Stakeholders involved:

The key users and partners have shaped the design specification of the tool. In terms of emergency response this is Leeds City Council’s emergency planning department, Fire & Rescue services, ambulances and the police. In terms of strategic planning, key stakeholders are Leeds City Council’s planning team and the council’s Children’s and Adult Services.

Transferable lessons:

Climate vulnerability can be expressed in terms of statistical indicators, and so representing these graphically using GIS can be a simple way to communicate complex issues and inform decision-making.

Open data can be accessed for this purpose, which is crucial in an age of spending austerity.

Robust project design and delivery requires upfront clarity and regular reviews between developers and users to avoid project challenges in relation to data sharing, data ownership and server capacity.

Bristol City Council: Smart approaches to managing flood risk

Business case for action

Bristol has a strong political commitment to resilience, reflected in being chosen as one of the 3 UK cities in the 100 Resilient Cities (www.100resilientcities.org) network, pioneered by the Rockefeller Foundation. It is also European Green Capital 2015 (www.bristol2015.co.uk) and has been recognised for its approach to water management through improving water efficiency and quality. In addition there is a strong corporate commitment to developing Bristol as a “Smart City” (www.bristolisopen.com) using the latest digital tools. It sees the business case for resilience, and specifically for making the interventions described here as:

- helping ensure it delivers effective public services;
- developing capacity within communities; and
- making the best use of the tools it has to stop escalation of problems.

Type of intervention

Bristol has a well-established team and procedures to respond to severe weather events. Its recent experience over the winters of 12/13 and 13/14 has been of moderate level events that were effectively addressed by existing systems and budgets. However, this was at the expense of other work, including strategic work on resilience. The city is prepared for major events and through the Flood Plan²⁹, has protocols in place to manage the response to a major event. In funding terms, it can make the case for engineering solutions for reducing the risk of major events (e.g. 1 in 30 year annual chance, and above, events). This case study refers to 2 initiatives which aim to reduce the impact of such events, and reduce costs and improve efficiencies in responding to them.

Reducing surface water flooding. Sustainable Southmead water sensitive design is a SuDS retrofit project, included within the Local Flood Risk Management Strategy, which aims to reduce surface water flooding and improve water quality in an identified high risk area. The scheme will involve a mix of infrastructure changes, which are being developed with the involvement of local residents. The council is also developing a process for identifying and managing likely surface water flooding impacts from new development.

Intelligent information management. The council has installed a range of sensors such as rain gauges and trash screen monitors and has future plans for gully sensors. This will provide real time feedback on weather events and improve catchment response understanding, which will improve the prediction of flooding and therefore response activities. This draws on existing knowledge of key high risk areas such as particular trash screens and culverts. It is planned to make this information available to the public on Open Data Bristol (opendata.bristol.gov.uk).

29 [www.bristol.gov.uk/sites/default/files/documents/community_and_safety/emergencies/Bristol_City_Council_Flood_Plan_v3.1_\(web_version\).pdf](http://www.bristol.gov.uk/sites/default/files/documents/community_and_safety/emergencies/Bristol_City_Council_Flood_Plan_v3.1_(web_version).pdf)

Benefits and costs

The costs of the flooding events in 13/14 included over £500,000 on dealing with flooding damage to highways plus £25,000 from the Flood Risk Team and Civil Protection Unit budgets. The budget for the SuDS retrofit project is approximately £150,000. In addition to reducing flooding it will improve water quality in the River Trym, which is a typical urban watercourse and is classified as having “poor” water quality status (Water Framework Directive) in the Southmead area. The installation of sensors will lead to improved identification of problem areas as well as increased public involvement in flooding responses. As these projects are still being implemented, information is not currently available on the financial benefits. However, monitoring will be incorporated in the Southmead project to measure impacts and improve future assessment of financial benefits. One of the aims of the Southmead project is to build momentum and hopefully encourage other stakeholders/partners to contribute and help the scheme grow in scale and coverage.

Financing mechanism

The Southmead SuDS scheme includes funding from European Green Capital strategic grants, with the majority being provided by Bristol City Council. The existing rain gauges and water level monitors are relatively low cost items being funded from existing Flood Risk team budgets.

Role of the council and stakeholders involved

These projects are being developed by the council. The Southmead scheme has the active involvement of the local community and the Neighbourhood Partnership.

Transferable lessons learned

SuDS are an important tool for addressing surface water flood risk, but can also deliver wider benefits, including improved water quality.

Low cost measures, such as sensors, can help to improve efficiency in monitoring and responding to weather events.

Hull City Council: Collaboration to address upstream surface water flood risk

Business case for action

Hull is subject to tidal, fluvial, surface water and sewer flooding and the frequency and scale of flood incidence is expected to get worse as a result of climate change. Whilst a tidal surge represents the main threat, excess surface water is also a significant problem and one which disproportionately impacts upon some of the most socially disadvantaged areas within the City. The scale of the challenges facing Hull are recognised by the council, which focuses on ensuring the future economic viability of the City.

Type of intervention

The Willerby and Derringham Flood Alleviation Scheme (WaDFAS) has involved a collaboration with East Riding Council, leading to the establishment of a series of rainwater storage lagoons upstream of Hull. East Riding Council compulsorily purchased the farmland on which the lagoons are situated. The scheme has been designed to protect approximately 8000 properties (including 200 business premises), with 70% of these being in Hull and the remainder in East Riding. It is expected to be completed by the end of 2015.

Benefits and costs

A cost benefit analysis of the flooding damage from the 2007 floods revealed large costs for loss of irreplaceable items (£78m) and temporary accommodation (£33m). The social and health impacts on people were also considerable. The estimated cost of damage to physical and mental health as a result of the flooding was £2.5m, with the cost often bearing most heavily upon those least able to bear it.

Financing mechanism

The total budget for the project is £14.4m, 50% of which is being funded by FDGiA (Defra's flood defence grant in aid), with match funding from the European Regional Development Fund. One of the drivers for collaboration between the 2 Councils was that the FDGiA funding is awarded on the basis of properties protected and places extra emphasis on protecting those in deprived areas. Flooding in 2007 heavily affected the Derringham area of Hull - a densely populated and economically disadvantaged part of the City. However, to address the issue required action to be taken outside of the City boundary. The 2007 floods also affected Willerby in the East Riding, but the number of affected properties would have been unlikely to attract the necessary funding. The solution was for the 2 councils to develop a collaborative scheme.

Role of the council

The role of the Lead Local Flood Authorities in this scheme was to establish the risk, cause, the mitigation options and the sources of funding. Through working in partnership the 2 LLFAs were able to pool resources, knowledge and expertise, leading to the development of a compelling business case for action.

Stakeholders involved

The key stakeholders in this project were officers from Hull City Council and East Riding of Yorkshire Council.

Transferable lessons

Flooding is a trans-boundary issue and the most cost effective solution to some forms of flood threat may require action outside of a local councils administrative boundaries.

This scheme focused on dealing with a specific problem but it is recognised that future schemes should give greater consideration to the delivery of other benefits in addition to flood protection.

Glossary of terms

	Instrument	Description
Facilitate or regulate	Advertising or Cause-Related Marketing (CRM)	Releasing the asset value of prime marketing space. (CRM is a form of advertising associated with Corporate Social Responsibility).
	Crowdfunding	The practice of funding a civic project or venture by raising many small amounts of money from a large number of people, typically via the internet.
	Environmental Upgrade Agreements (EUAs)	Voluntary programme to incentivise owners of largest buildings to improve environmental performance. Creditors loan building owners the funds for retrofitting projects at low interest rates; the council then charges the building owners a tax at the level of the loan payment and redistributes the revenue to creditors. The council guarantees the loan, thus reducing the risk. In the event of default the amount of tax is deducted from the sale of the building, reducing the risk for the council. The building owner benefits through increased property value and lower utility bills. The concept originated in Australia but could be considered in England.
	Land Readjustment	Re-plotting of urban parcels to rationalise urban space and create room for public infrastructure. Private land owners give up a portion of their land but gain access to valuable infrastructure.
	Land Value Capture or developer tariffs	Strategic taxes or charges on key sites to recoup capital costs in recognition of how their rental or sales price will rise upon development completion, such as a Community Infrastructure Levy or Section 106 Agreement. May involve selling developer rights as opposed to the land itself.
	Pollution charges	Cost recovery to pay for public services to clean up the impact of emissions and to invest in cleaner alternatives.
	Local Plans	Utilise local plans to set policy requirements related to the integration of climate change adaptation measures into new developments (e.g. sustainable drainage systems, measures to reduce water consumption in areas of water stress, green infrastructure, passive cooling strategies).
	Sustainability Supplementary Planning Documents (SPD)	Provide further guidance on climate change adaptation measures included within local plans.
	Public funds	Joint purchasing agreements
Pooled financing agreements		Councils coming together to co-invest in infrastructure at a reduced cost or lend to each other at soft rates.
Municipal or national development corporations or banks		Local or national agencies which have facilities to support general development financing, comprising non-reimbursable and reimbursable funds.
Low Carbon Special Enterprise Zones (SEZs) or Accelerated Development Zones		A geographically defined area offering certain incentives (e.g. tax breaks or grants) to businesses that choose to physically locate within the zone. Often one component of an overall economic growth strategy, aimed at enhancing the competitiveness of manufacturers and service providers, and also intended to realise agglomeration benefits from clustering industries in one area.
Revolving funds		Internal or soft loan scheme whereby the council spends or loans money at zero or low interest to fund eco-efficiency technologies in municipal buildings, which is then repaid from the utility savings made as a result.

Equity stake	Financial contribution to Public Private Partnerships (PPPs) or Special Purpose Vehicles (SPVs) delivering infrastructure, delivering services or developing land	Often a dedicated business that provides a range of services such as a Smart Grid, Energy Performance Contracting (EPC), or Energy Services Company (ESCO) that designs and implements utility saving or power generation project.
	In-kind contribution to PPPs or SPVs delivering infrastructure, delivering services or developing land	Similar to above but with non-financial contributions such as through a Gainshare model (whereby the private sector provides the upfront capital for a council's revolving fund) or the redirection of local municipal pension funds.
Debt finance	Climate derivatives	Carbon trading or credits such as the EU Emissions Trading Systems (EU ETS) and the Clean Development Mechanism (CDM), whereby finance is provided by companies seeking to reduce their emissions liabilities.
	Green municipal bonds	A bond is a promise to pay a loan with interest and issued by a council or government to fund capital expenditure projects. Some municipalities market the bond to the market as sustainable to attract new types of investors.
	Social impact investors or micro-creditors	Responsible investors or lenders who offer finance because of wider sustainability returns and/or at lower rates. Usually targeted at small or social enterprises during start-up phase or next-phase growth.
	Sukuk	A special form of bond that complies with Islamic law and investment principles which prohibit lenders from charging interest. The certificate constitutes partial ownership in a debt. Capital protection is provided by a binding promise to repurchase certain assets.
	Tax Increment Financing	A special form of bond which exacts current value from future tax receipts arising from a boost to GDP associated with a particular major development (e.g. housing, public transport).
	Regional development banks	The European Investment Bank has facilities to finance green projects, whether as part of infrastructure projects such as water management, energy or roads, or as standalone. A number of English local councils are also exploring how to facilitate the establishment of a local bank to follow the lead of Cambridge & Counties Bank, which is a unique partnership between Trinity Hall, Cambridge and Cambridgeshire Local Government Pension Fund.

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Climate Ready Councils:

The business case for managing the impacts of severe weather and a changing climate

