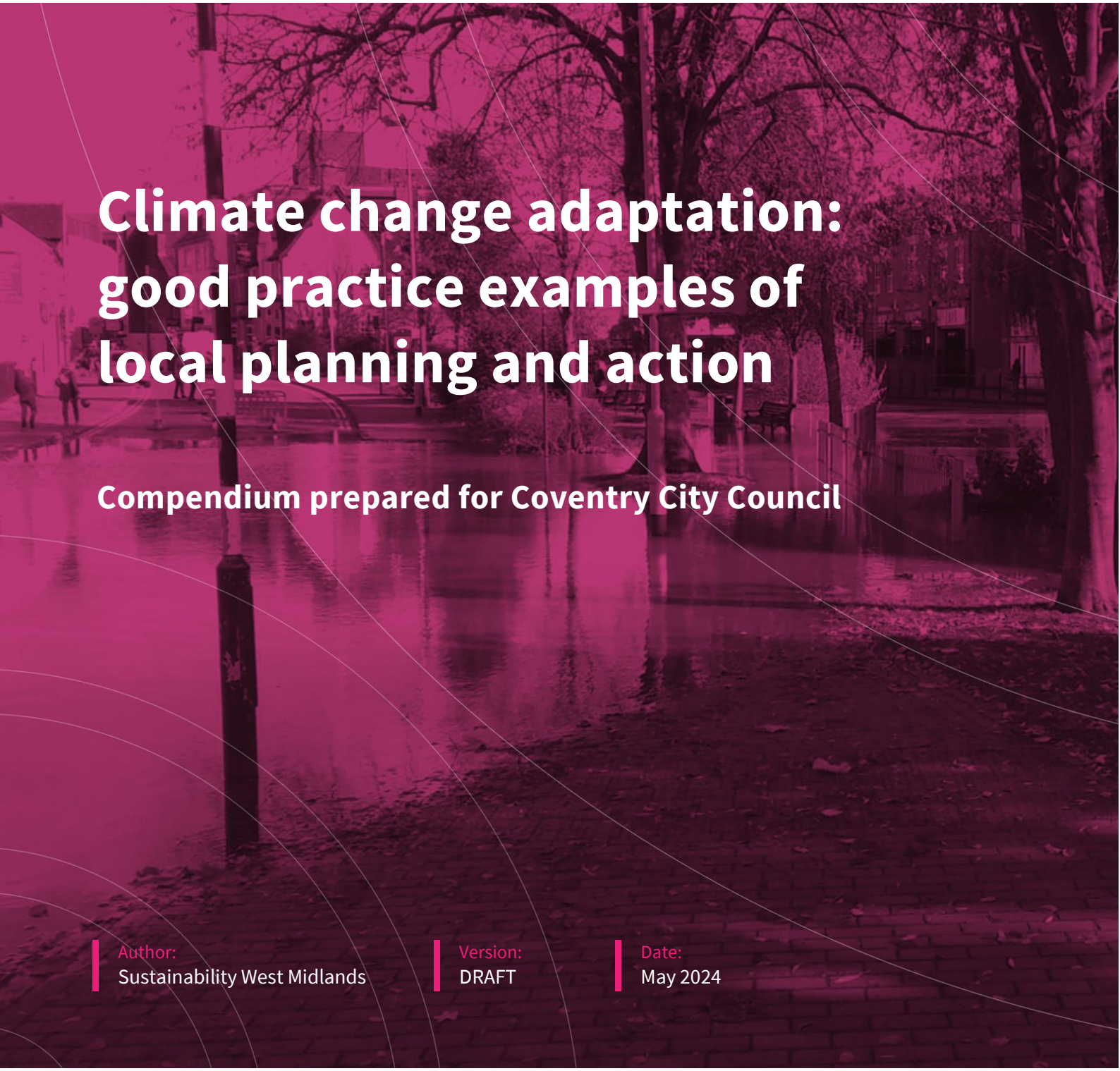

Climate change adaptation: good practice examples of local planning and action

Compendium prepared for Coventry City Council

Author:
Sustainability West Midlands

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sustainability west midlands

CAG CONSULTANTS

Coventry City Council

Report information

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Disclaimer: This report represents the independent advice commissioned by Sustainability West Midlands and partners and not necessarily that of the funders.

About Sustainability West Midlands

SWM was established in 2002 as an independent, not-for-profit company and is the sustainability adviser for the leaders of the West Midlands.

Our vision is that the West Midlands is leading in contributing to the national target of net zero greenhouse gas emissions by 2050 whilst addressing health inequality and driving inclusive growth. We monitor the West Midlands Sustainability 2030 Roadmap which acts as a framework that all organisations based or operating in the region can use to help them make changes to their activities in the knowledge that they will contribute to wider regional ambition.

SWM's support our members and other local stakeholders in the public, private and third sectors to implement these changes by enabling them to demonstrate innovation and leadership and provide opportunities to collaborate and celebrate success.

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Contents

1. Introduction

This document provides a compendium of good practice examples that demonstrate climate change adaptation planning and action that UK local authorities are taking.

SWM has been working in partnership with CAG Consultants to develop an Adaptation and Resilience Plan for Coventry City Council (CCC). As part of this, the council is interested in 'examples of best practice across the UK and beyond which the city could learn from and identify other local authorities with whom to benchmark the city's progress against in order to promote continuous improvement.'

This document sets out such examples and looks specifically at:

- What local authorities that border Coventry are doing
- Good practice adaptation plans from across the UK
- Examples of adaptation projects and actions from across the UK.

This document will be used to feed into the development of the Plan for Coventry, and provide the council with a strong indication as to which of their peers they can engage with to continuously learn from going forwards.

Key to symbols included in the case studies:

Climate risks addressed						Other areas of sustainability considered						
												
Heavy rain / flooding	Storms	Drought	Extreme heat	Strong winds	Sea level rise	Air quality	Nature	Health	Sust. travel	Energy	Carbon reduction	Sust. growth

2. Methodology

In order to put together the examples showcased in this document, we used a combination of sources and research. It is the case that some of the examples we were already aware of through previous research that SWM has undertaken, and we used this intelligence initially. However, to fill in gaps and to identify other examples of adaptation plans and projects, we looked at the following websites:

- Ashden
- CDP: make available spreadsheets of information that local authorities have submitted to their latest benchmarking exercise, including where they have indicated that they have an adaptation plan. We downloaded these spreadsheets to have a look at what was available.
- Centre for Cities
- ICLEI Local Governments for Sustainability Network
- Institute for Government
- Local Government Association
- Local Partnerships adaptation toolkit
- SWM's 'Climate change adaptation: practical examples for local authorities' report
- SWM's latest sustainability benchmarking report

We supplemented this with a general Google search for other plans, prioritising those authorities that are similar to Coventry in terms of population, type of council (unitary), that are urban in nature, that have a similar geography (e.g. not coastal) and similar demographics. However, it became clear that there are few published adaptation plans by local authorities in the UK, and we therefore had to be less restrictive in which examples we included.

The examples included in Section 5, that look at local adaptation projects, came about through another piece of research we undertook for this project, whereby we analysed a range of local strategies and action plans in order to pick out any existing adaptation activity. We supplemented this through projects found in the plans analysed for the above process.

3. Adaptation in neighbouring authorities

In order for effective implementation of Coventry's Adaptation and Resilience Plan, the City Council and core partners will need to engage with its neighbouring authorities and collaborate on actions. This is crucial, as climate risks and impacts do not stop at boundaries.

The challenge is that, because adaptation policy, guidance and support from Central Government is fragmented and piecemeal, this is translated into what is happening on the ground and it can often be challenging to keep track of what is going on in close-by areas.

As part of this good practice analysis, SWM has looked into what neighbouring authorities are doing on climate adaptation, and also captured any on-the-ground projects that we are aware of that are benefitting Coventry, that are being delivered by partners.

3.1 Adaptation plans

SWM has a good relationship with all West Midlands local authorities, the West Midlands Combined Authority (WMCA) and other public and third sector bodies. As such, we are already aware of what adaptation plans are being delivered and implemented locally. A summary of this is captured below, with further details, links and contact information where available.

Authority	Adaptation plan?	SWM opinion/ further explanation	Contact
Coventry & Warwickshire Integrated Care System	Currently in development for the whole ICS by consultancy Inspired, including University Hospitals Coventry & Warwickshire	As yet unknown as to what this will cover; important for the City Council to keep abreast of developments as many of the challenging climate risks are health-related	Clive Robinson (email)
North Warwickshire Borough Council	No specific plan; adaptation integrated into overarching Climate Change Plan at a high level	While adaptation is integrated, the Plan only makes general statements that emphasise its importance, rather than outlining tangible actions	Rob Snape (email)
Nuneaton & Bedworth Borough Council	No adaptation plan and no overarching climate change/ sustainability plan identified	Latest SWM benchmark submission suggests a 'sustainability strategy has reached draft stages,' but not yet known whether this will include adaptation	Maria Bailey (email)
Rugby Borough Council	Adaptation plan currently in development by SWM	This will be based on the West Midlands Adaptation Plan and tailored to Rugby; estimated completion is June 2024	Dan Green (email)
Solihull Council	No adaptation plan and not embedded into council's Net Zero plan	Latest benchmark submission suggests that lots is being done on embedding climate risks and reactive actions (e.g. dealing with flood risk), but no adaptation plan mooted	Andrew Greenall (email)
Warwick District Council	Adaptation plan completed but not yet published; SWM has obtained a confidential copy	This is one of the few district-level adaptation plans in existence and is clear and concise; it focuses mainly on what the DC can deliver within its own control	Becky Davies (email)

Authority	Adaptation plan?	SWM opinion/ further explanation	Contact
Warwickshire County Council	Adaptation plan completed by consultancy AECOM in 2022	It's important for CCC to be aware of and note the key priorities of this plan, however, there are many gaps and omissions and as yet not a huge amount of delivery has taken place	Arfa Shahid (email)
WMCA	Adaptation plan completed by SWM in 2022 but not published	CCC's plan must be aligned with the WMCA's plan given the enveloping nature of the authorities. Actions are now being taken forward as set out in the plan by their Adaptation Officer	Beth Haskins (email)

3.2 Adaptation projects

Through our relationships outlined above, and the stakeholder engagement programme undertaken for CCC, we have uncovered a range of projects that either partly or wholly deliver on climate adaptation objectives. This list may not be exhaustive, and it would be worthwhile CCC engaging with various stakeholders on a frequent basis to keep this list up to date.

The benefit of being aware of these existing projects is:

- It will allow CCC to focus efforts elsewhere where projects are already being delivered, and support with prioritisation
- It will allow for the scaling up and/or replication of projects where successes have been demonstrated
- It will prevent duplication and unnecessary resource allocation
- It can help towards identifying where CCC can most effectively provide support to its partners

Lead organisation	Project title	Project detail	Contact/ more info
Warwickshire Wildlife Trust	The Sherbourne Valley Project	"Re-writing the future of Coventry's River Sherbourne by establishing an urban living landscape in which people, nature and culture can thrive." One of the benefits of the project is to reduce flood risk by re-wilding and re-routing the river.	Caroline Bailey (email)
Coventry City Council	Green Spaces Strategy	The strategy states that it will "Seek to improve access to and promote blue and green corridors as important linear routes including those of the Coventry Canal, River Sowe and Sherbourne corridors. It is unclear if this includes reduction in flood risk, but may link to the above project.	See here (page 77)
Severn Trent	Coventry catchment SUDS project	"Holistic catchment level flood resilience in four catchments through delivering nature-based solutions to remove surface water from our sewerage network" to benefit Coventry; project funding to be confirmed by 2024.	Rebecca McLean (email)
Network Rail	Strategic Rail Resilience Improvements	Network Rail is delivering a nationwide programme of works to improve resilience, including in Central England. From their submission to the latest Adaptation Reporting Power round, they have outlined relevant activities, albeit with no specific reference to	See here (page 96)

Lead organisation	Project title	Project detail	Contact/ more info
		Coventry. Overall connections on the railway network could, however, be improved.	
CSW Prepared	Advice on emergency planning for severe weather	CSW Prepared provides emergency planning advice to communities and businesses; while this does not specifically reference climate change adaptation, it gives guidance on how people can cope in floods, storms and heatwaves.	CSW Resilience website

4. Good practice UK adaptation action plans

Despite the piecemeal approach to adaptation in the UK as described above, there remains some strong examples of adaptation planning at the local and place level that have been produced by local authorities. This section collates and describes a selection of these plans.

Initially, we prioritised our research on 'like' authorities to Coventry, that is, they are similar in size, population, demographics, geography, highly urbanised, land-locked and a unitary authority. Some of the examples match these criteria, however, we were required to open the door to other examples as good practice adaptation planning is not easy to come by.

It is also worth mentioning that Defra convenes the Local Adaptation Advisory Panel (LAAP) which has been running for at least 13 years. This Panel consists solely of local authorities and is designed to influence and inform central Government's approach to climate change adaptation. It may be that:

- The authorities who are represented on the LAAP are worth engaging with, as they tend to be those that are making headway on adaptation.
- CCC would benefit from joining the LAAP to become fully integrated into how national decisions affect the local level; this could be crucial in taking the adaptation plan through to implementation.

SWM has contacts at Defra who could be engaged with to discuss this further.

4.1 Standalone adaptation plans

The following examples are where local authorities have published standalone adaptation action plans that are separate from wider sustainability or Net Zero strategies.

Reading Borough Council | Berkshire, England | Unitary authority

Adaptation Plan overview: The plan covers in-depth the weather events that have hit the Borough in recent years, the impacts that climate change could have on each sector and specific development sites, case studies and recommendations for next steps. Impact themes are broken down into water resources, low carbon development, health, transport, nature and consumption.

Link to Plan

Date: 2019

Climate risk assessment? No

Pros:

- There is a strong evidence base that has been produced that looks at past impacts and future projections to enable informed decision making
- Case studies embedded that demonstrate good practice
- Recommended next steps included

Cons:

- No obvious evidence of engaging stakeholders
- No tabular, clear and prioritised action plan
- Quite wordy and dense, and not very accessible to the layperson

(All images included are from free-to-use websites)

Edinburgh Council | Midlothian, Scotland | Unitary authority

Adaptation Plan overview: Despite expiring in 2020, the layout and structure of this plan is commended and very clear. Action plans are developed for each core theme, including Governance, Natural Environment, Built Environment/ Infrastructure, Flood Prevention and Society and Economy. Local case studies are also included.

Link to Plan

Date: 2016-2020

Climate risk assessment? Yes, here (2014)

Pros:

- Actions very clear, well defined and accessible.
- Actions allocated to a range of partners.
- Partnership approach to the development of the plan; it appears to be co-developed with a vast range of actors.

Cons:

- It expired four years ago and there's no evidence of an up to date version.
- No obvious prioritisation of actions, i.e. which are more urgent/ quick-wins/ less resource heavy etc.

Blackburn with Darwen Borough Council | Lancashire, England | Unitary authority

Adaptation Plan overview: This is a very action orientated plan and is informed by a risk assessment and what the current/ recent historic picture is in the area. Actions are split by hazard type, rather than by sector, i.e. flood and heat-related actions, and there's also a focus on winter hazards unlike most plans.

Link to Plan

Date: 2013

Climate risk assessment? Yes, as an appendix to the Plan

Pros:

- Clear and concise actions with simple language and allocation to different council departments.
- Analysis of whether the actions can be delivered within current budgets.

Cons:

- It's over ten years old with no evidence of a new version.
- Many of the actions lack substance and clarity on detail as to how they will be implemented.
- The design makes the plan look quite amateur!

Cambridge City Council | Cambridgeshire, England | Unitary authority

Adaptation Plan overview: This plan takes the dual approach of a) lifting the adaptation actions that arise in the Council's wider sustainability plan and using these as a basis for this standalone plan, and b) categorising these actions into the risks of CCRA2. The actions provide both future priorities and a commentary on activities that have already taken place.

Link to Plan

Date: 2018

Climate risk assessment? Using national CCRA2

Pros:

- The use of the CCRA framework is a good practice way of separating and categorising actions.
- The document includes a lot of detail on what has already happened as evidence of change.

Cons:

- No obvious evidence of engaging stakeholders
- No tabular, clear and prioritised action plan
- Quite wordy and dense, and not very easy to tell apart the actual future committed actions.

Aberdeen City Council | Aberdeenshire, Scotland | Unitary authority | ★ OUR FAVOURITE

Adaptation Plan overview: This is a Framework that uses an evidence base and risk assessment, local and national drivers and overarching principles (Prevent, Protect, Inform, Collaborate, Innovate) to form actions that are categorised into Buildings & Infrastructure, Flooding and Coastal Change, Natural Environment, Society & Economy and R&D.

Link to Plan

Date: 2022

Climate risk assessment? Yes, here, using CCRA3 as framework

Pros:

- Drivers for action are clearly articulated, linking adaptation with existing policy and practice.
- Each action sets out a quantitative measure of success.
- Strong evidence of framework co-development.
- Actions set out in a clear manner and into priority categories.

Cons:

- Not clear if and how the actions/ objectives are prioritised
- Actions and objectives are not allocated to specific organisations to deliver.

Adaptation Plan for Devon & Cornwall & IoS | Unitary (Cornwall), Top-tier (Devon)

Adaptation Plan overview: This in-depth strategy and action plan is overseen by the Devon & Cornwall Climate Impacts Group (CIG), which is led by the three councils (including Isles of Scilly (IoS)). The plan itself is split into levels of Policy, Organisation, Community and Individual, and is further categorised by sectors, following the CCRA3 themes.

Link to Plan

Date: 2023-2027

Climate risk assessment? Yes, based on CCRA3.

Pros:

- Action plan clear and synthesises a lot of information, including a risk assessment, well.
- By working with the CIG, the plan has had buy-in from stakeholders and has been consulted upon.

Cons:

- Actions are not prioritised and it is quite hard to pick out what should be actioned with most urgency.
- The action plan is in an annex; greater priority should be given to this.

Glasgow City Council | Lanarkshire, Scotland | Unitary authority

Adaptation Plan overview: Glasgow has recently produced two plans; one for the City Region (GCR), which provides high-level actions and interventions which should build capacity and lay the ground for action, and a more specific list of practical actions that the City Council (GCC) has a more direct influence over.

GCR Plan | GCC Plan

Date: 2020 (GCR), 2022 (GCC)

Climate risk assessment? Yes, here

Pros:

- A huge amount of work has gone into how to mobilise, finance and implement adaptation action.
- GCR plan is brought to life by looking at what successful implementation would look like.
- GCC plan is clear and includes KPIs for each action.

Cons:

- Both documents are quite text heavy and hard to pick out responsibilities, and which actions to prioritise.
- It is also not immediately clear how the two plans are linked, which may lead to some confusion.

Cork County Council | County Cork, Ireland | Top-tier authority

Adaptation Plan overview: This plan is informed by a risk assessment and both are broken into categories: Governance & Operations, Infrastructure & Built Environment, Land-use & Development, Flood Management, Natural Environment & Heritage and Communities & Health. It also includes case studies which are showing tangible action already taking place.

Link to Plan

Date: 2019-2024

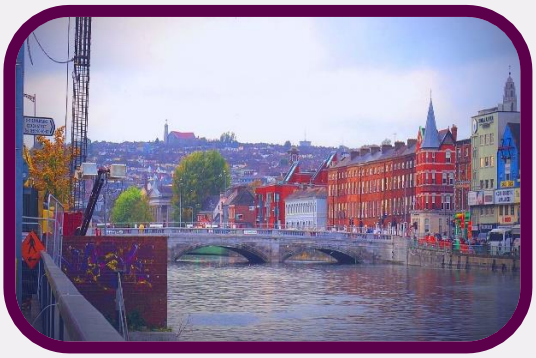
Climate risk assessment? Yes, within the plan

Pros:

- Clear action plan that includes responsible delivery organisation and budgeting.
- Actions categorised according to place-based needs.
- Detailed is an approach to monitoring and evaluation.

Cons:

- Not clear exactly how stakeholders were engaged with.
- The plan is largely within County Council responsibilities; not clear on how they will work with external actors.
- Prioritisation of actions yet to take place.



4.2 Integrated adaptation actions

The following selection of examples are where adaptation actions have been integrated into plans that have a wider focus, namely sustainability.

Slough Borough Council | Berkshire, England | Unitary authority

Plan overview: Slough's Climate Change Strategy and Action Plan is highly detailed and, unlike many plans where adaptation is only mentioned in passing, it is fully integrated into this plan which otherwise largely focuses on Net Zero. Actions are categorised by hazard and are sub-categorised by Strategy, Nature, Economy and Social. Risks, financing and case studies are also touched upon.

Link to Plan

Date: 2021

Climate risk assessment? Yes, within Plan but based on 2017-18 info

Pros:

- One of the few climate change/ sustainability strategies where adaptation is of equal focus.
- Action plan clearly set out and tabulated.
- Adaptation financing options discussed.

Cons:

- It's possible that adaptation was lost in the wider stakeholder engagement programme.
- Most of the actions are council-specific.
- Prioritisation of actions is not clearly articulated.

Darlington Borough Council | County Durham, England | Unitary authority

Plan overview: Darlington have produced a Climate Change Action Plan into which adaptation is incorporated. Actions are listed and include coverage across council priorities and themes, such as nature, health and buildings. Most actions are 'early-stage,' i.e. assessing, research and data gathering.

Link to Plan

Date: 2023

Climate risk assessment? No

Pros:

- It is a key priority of the overall climate change plan.
- The actions are simple and clearly set out, and allocated to different council teams.

Cons:

- The adaptation element is not comprehensive and only covers high-level, council-led actions. The limited detail is symptomatic of the disadvantages of not developing a separate adaptation plan.
- There's no evidence of prioritisation, stakeholder engagement or implementation at this stage.

Bournemouth, Christchurch and Poole Council | Dorset, England | Unitary authority

Plan overview: Bournemouth, Christchurch and Poole (BCP) Council has produced a Climate Action Strategy which is broken into themes such as transport, water, people, resources and buildings. While there is no separate section on adaptation, each section (which largely focus on Net Zero) includes a statement outlining 'how they will adapt.'

Link to Plan

Date: 2023-2028

Climate risk assessment? No

Pros:

- This is a unique way of integrating adaptation, so that it cuts across all elements of the overall plan.
- Adaptation is also part of its SMART goals, along with nature and ecology.

Cons:

- Each action is, however, light on detail and it is not clear whether they are being implemented.
- As with Darlington above, the absence of a standalone plan restricts committed actions and, as such, there are only a handful.

Dundee City Council | Angus, Scotland | Unitary authority

Plan overview: Dundee's action plan includes a very clear pathway to responding to the threat that climate change poses and includes a detailed section on resilience and adaptation. Actions are woven throughout the document, and summarised in a table towards the end. It is encouraging that as much thought appears to have been put into actions related to resilience as they have other areas of sustainability.

Link to plan

Date: 2019

Climate risk assessment? Yes, here

Pros:

- Clear action plan that's well set out within a visually attractive document.
- Resilience given as much attention as mitigation.
- Specific emphasis on the plan being co-developed with stakeholders.

Cons:

- Would have been good to see a closer link between the resilience actions and the risk assessment.
- Some omissions in the adaptation part of the plan, which perhaps is inevitable when a separate plan has not been produced.

Kirklees Council | West Yorkshire, England | Unitary authority

Plan overview: In this plan, adaptation is not in a separate section, rather, it features as part of broader thematic sections such as buildings, transport and natural environment. It is one of the most integrated plans that we have found.

Link to plan

Date: 2022

Climate risk assessment? Yes, here

Pros:

- This integrated approach suggests that adaptation is put on an equal footing to mitigation.
- The plan is very action orientated and very clearly set out in tabular form.
- The council has also set an adaptation target, to be climate ready by 2038...

Cons:

- ...But it is unclear as to how this is going to be measured.
- Despite this integration, there are still much fewer adaptation actions compared to mitigation.
- It is also not immediately clear how actions have been prioritised.

5. Examples of place-based adaptation actions

SPONGE2020

- **Local authority lead:** Essex County Council
- **Location:** Basildon, Essex
- **Partners:** Basildon and Thurrock University Hospitals with assistance from Dutch, British and Flemish local governments and water authorities
- **Funded by:** Interreg 2 Seas which is part financed by the European Regional Development Fund

Image: Bowers Marsh near Basildon (Unsplash)

Climate risks addressed:

Other areas of sustainability considered:

Summary

SPONGE2020 set out to retrofit the Essex Cardiothoracic Centre courtyard with a Sustainable Urban Drainage System (SuDS), which manages rainfall in a natural way by reducing run-off and, therefore, minimising flood risk. SuDS can also help to reduce water pollution and provide green spaces and habitats to enhance the biodiversity in a local area.

Key outcomes

The project will increase resilience against surface water flooding, whilst also improving the communal space at Basildon Hospital for both patients and members of staff. The project included extensive stakeholder engagement and the council worked alongside these stakeholders and the hospital in the development of the scheme. An event also took place to understand what local people wanted from the project and their feedback was integrated to ensure a bottom-up approach to its outcomes.

Feedback was that the local community wanted a SuDS scheme that is easy to maintain, uses natural materials and includes permanent seating areas. This led to the creation and delivery of innovative solutions to make surface water easier to manage, making the site resilient to climate change but also creating a more pleasant place for patients and staff to visit.

Grey to Green

- **Local authority lead:** Sheffield City Council
- **Location:** Castlegate area of Sheffield
- **Partners:** Sheffield City Region Combined Authority, The Canal and River Trust and Yorkshire Water
- **Funding:** European Regional Development Fund; phase one of the project cost around £3.6 million and phase two cost around £6.3 million

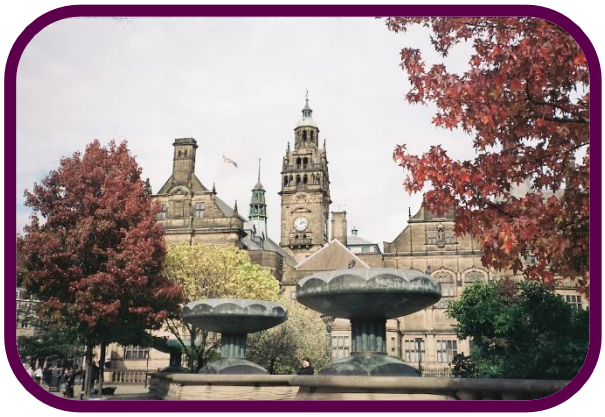


Image: Sheffield (Unsplash)

Climate risks addressed:

Other areas of sustainability considered:

Summary

The Grey to Green project combined environmental and economic benefits to develop the Sheffield City area. It was developed to deal with three key issues; the need to re-use redundant highways, reduce future flood risk (the area was impacted by floods in June 2007) and the need to reconnect the Castlegate area to the rest of the city of Sheffield.

Key outcomes

This project was split into two phases, with phase one taking two year and being completed in 2016, and phase two being completed in 2022, taking three years to complete. Upon completion, the project has already been described as having a positive impact both economically and environmentally. From a climate change adaptation perspective, the scheme has improved surface water management. Grey to Green's innovative drainage system reconnects the Castlegate part of the city with the rivers, flowing rainwater back to them in a way that mimics nature.

There have also been benefits to biodiversity and reducing pollution, as Grey to Green's innovative planting beds capture and hold on to plastics from car tyres and road wear and other pollutants, preventing them from reaching the watercourses. Improved cycling and walking routes help the Sheffield population to use active travel and keep the city connected.

From an economic perspective, there have been new residential developments and an office space constructed alongside the scheme, with the likelihood of further development in the future. The new development is already said to have benefitted visitors, residents and workers.

Lamb Drove Residential SuDS scheme

- **Local authority lead:** Cambridgeshire County Council
- **Location:** Cambourne
- **Partners:** Cambridgeshire Horizons, Interreg North Sea Region
- **Funding:** Funded by the above partners

Image: Fast flowing water (Unsplash)

Climate risks addressed:

Other areas of sustainability considered:

Summary

The aim of this project was to demonstrate practical and innovative sustainable water solutions to reduce flood risk to the Lamb Drove site in Cambourne, which contains 35 homes.

Key outcomes

The SuDS scheme developed for this site included the following measures; water butts, permeable pavements, a green roof, swales, filter strips, wetland basins and a retention pond. It was a necessary response to the increasing number of properties in Cambourne, coupled with the region's relatively low-lying geography, making it vulnerable to flooding. The system took just over two years to design and implement, and the project was complicated by the fact that the site design principles had already been set before the SuDS were considered. This meant that the scheme needed to be built around the original plans, but ultimately the project generated a 10% saving on construction costs compared to traditional schemes. The site also provided a substantial improvement to biodiversity, ecology and quality of life for the local residents. Residents were also given training and education about the SuDS and there is also an information board next to the site to explain how the system works. Residents can also save £30 a year per household due to not having to pay for storm water disposal charges as a result of the scheme.

Lessons learnt from the project included the need to bring SuDS drainage experts on board as early as possible. Pre-planning should involve the local authority, regulators (such as the Environment Agency) and other authorities as necessary, and this is considered crucial when implementing SuDS within any development. It was also highlighted that the most cost-effective SuDS solutions are achieved through landform changes and other treatments within soft landscaped areas. It is also recommended that SuDS are kept simple, which can reduce maintenance costs.

Moulsecoomb Primary School SuDS

- **Local authority lead:** Brighton & Hove City Council
- **Location:** Brighton, East Sussex
- **Partners:** Southern Water, Environment Agency, The
- Ouse and Adur Rivers Trust, The Aquifer Partnership
- **Funding:** The project cost £110K, with contributions from all above partners

Image: Brighton beach © Unsplash

Climate risks addressed:

Other areas of sustainability considered:

Summary

The Aquifer Partnership (TAP) partnered with Moulsecoomb Primary School to renovate the courtyard space of the school to a beautiful water-friendly garden with emphasis on education and play opportunities. This school was selected as it is in a source protection zone, close to an extraction borehole, and in an area prone to flooding.

Downpipes draining a large area of roof space were disconnected and directed into a range of new SuDS features. Playful and sculptural features were installed in their place to convey the water through watering cans, spouts and poles. The total catchment of the rain garden is 637m^2 and total attenuation is 22.72m^3. The system should be able to cope with a 1 in 100 year rainfall event .

Key outcomes

- Attenuation during rainfall reduces flood risk to school buildings and surrounding area
- Provision of an important educational and play resource for the school
- Creation of a peaceful sanctuary which is used by many pupils who need additional time out of class during the school day
- An inspirational experience for pupils who were involved in the development of the garden from feasibility stage to planting, as well as the creative elements
- Improved access for a range of abilities
- Reduced maintenance requirements for the school
- Improved welfare for school chickens
- Creation of an exemplar rain garden which is used to encourage SuDS take-up in other schools and across the city and region as part of the climate emergency response.

Embleton Road SuDS

- **Local authority lead:** Bristol City Council
- **Location:** Little Mead Primary Academy, Bristol
- **Partners:** Sustrans and Arup
- **Funding:** The project cost £63,400 and was funded by Bristol Green Capital and Bristol City Council

Image: Clifton Suspension Bridge, Bristol (Unsplash)

Climate risks addressed:

Other areas of sustainability considered:

Summary

This SuDS scheme was completed in 2017 and had the objective of making roadways greener and more attractive, while also improving drainage and calming traffic outside Little Mead Primary Academy school. The area was selected for intervention because it had been identified as an area that needed improved surface water drainage.

Key outcomes

Key to the success of the project was the community engagement aspect, which included a street trial with school children and the local community. This was done to give stakeholders a clear understanding of what changes were going to take place, and to promote the benefits.

One of the main outcomes of the project was to reduce flood risk and improve water quality. This was achieved by increasing rainwater attenuation by 15,500%, using a rainwater attenuation system which is a large storage facility integrated into a drainage system. These systems store and slowly discharge water during storm events.

The project also highlighted that a build-up of leaf mulch was a particular problem and requires maintenance. A potential solution to this would be to involve the community to help manage the problem and reduce associated costs. Of the community members surveyed, 100% thought the street environment had been improved, 88% of children thought the road was safer and 60% of residents thought the new street design would encourage more people to meet.

Counters Creek Flood Alleviation Scheme

- **Local authority lead:** Royal Borough of Kensington and Chelsea
- **Location:** Arundel Gardens, London
- **Partners:** SEL Environmental, Atkins, Thames Water, Transport for London, FM Conway
- **Funding:** The project was funded by Thames Water

Image: The SuDS scheme being constructed © SEL Environmental

Climate risks addressed:

Other areas of sustainability considered:

Summary

As the number of paved surfaces in London increases, this reduces the amount of rainwater that can infiltrate into the soil leading it to drain into local sewers, increasing the risk of sewer flooding. In the worst cases, this can lead to overflowing of toilets and sinks in basement properties. To address this, the Counters Creek sewer flood alleviation scheme was born and part of its installation took place at Arundel Gardens via the construction of a SuDS scheme.

Key outcomes

Slowing the flow into sewers requires rainwater to be temporarily stored during a storm. However, space is at a premium in densely populated areas like London. Therefore, an innovative approach was used at Arundel Gardens whereby rainwater was stored below the road but above formation level to avoid existing services. A layer of the high strength sub-base replacement system (Permavoid) was installed within a Selflex welded membrane and a Controflow flow control chamber on the outlet to the sewer.

Rainwater is also treated when it enters the system which allows a passive irrigation system to be incorporated to use the treated rainwater to irrigate nearby Magnolia trees.

The scheme at Arundel Gardens was completed in four phases but took only 16 weeks, thanks to proactive and effective communication and, thus, cooperation with local residents throughout the process. Before completion, the existing flow rates into the sewer could be as much as 200 l/s during heavy storms. After the SuDS system was installed, the flow into sewer was reduced to around 6 l/s, a 97% reduction. More information can be obtained by contacting SEL Environmental.

Adaptation as part of Public Realm Schemes

- **Local authority lead:** Salford City Council
- **Location:** Salford
- **Partners:** None in addition to the council identified
- **Funding:** Carpino Place cost £340,000 and the William Street Public Realm Scheme cost £391,000

Image: Salford Quays (Unsplash)

Climate risks addressed:

Other areas of sustainability considered:

Summary

The local community had identified Bloom Street as an important pedestrian and cycle link to connect Salford Central Station and Manchester City Centre, and an opportunity for development. Meanwhile, nearby Carpino Place was highlighted as a demonstrator scheme for Salford to show how public realm, cycling infrastructure, green infrastructure and sustainable urban drainage systems can be integrated into schemes to maximise the environmental benefits of public investment in infrastructure.

Key outcomes

Bloom Street/William Street: Following consultation with the local community and key stakeholders, the Bloom Street and William Street proposals have been delivered to provide a completely refreshed street scene that includes rain gardens, tree planting, SuDS, a new seating area and cycle stands. The re-configuration of the street has provided space for more community interaction and a safer, more comfortable route for cycling.

Carpino Place: This scheme has been used to refine design details for integrating protected cycle tracks, bus stop bypasses and SuDS into the public realm. The scale of the scheme has meant that it was an excellent test-bed for creating a high quality template which can be rapidly scaled up and delivered across the city as necessary.

Both are good examples of how SuDS and flood resilience measures can be integrated into wider town planning projects. More information on the schemes can be obtained by contacting Salford City Council.

Co-investment in SuDS

- **Local authority lead:** Salford City Council
- **Location:** Dales Brow, Swinton, Salford
- **Partners:** City of Trees, Environment Agency and United Utilities
- **Funding:** The cost of the SuDS was £127,000. The Environment Agency funded £54,000 and Salford City Council funded £73,000

Image: Salford (Unsplash)

Climate risks addressed:

Other areas of sustainability considered:

Summary

This project which was managed by the City of Trees and was designed to turn a previously waterlogged greenspace into a multifunctional green asset, addressing surface water flooding in a residential area and enhancing biodiversity.

Key outcomes

Dales Brow is a fantastic example of co-financing by finding a nature-based solution to a problem that will financially benefit multiple parties. The investment benefits the local residents by making the community more resilient to climate change, improves pollution and transforms a disused space so that the local community can engage with nature.

SuDS are at the heart of the Dales Brow scheme and it highlights how a low-cost neighbourhood-scale SuDS project can serve as a vital drainage function, reducing pressure on the combined sewerage system while contributing to improved water quality. Essentially, the site provides climate change adaptation benefits at a low cost.

In addition, the new wetland site now enhances biodiversity and provides a high-quality recreation space which creates an attractive area for people to live and encourages inward investment.

Co-designing flood defences with residents

Image: Hull City and coastline (Unsplash)

- **Local authority lead:** Hull City Council
- **Location:** Hull
- **Partners:** East Riding of Yorkshire Council, Yorkshire Water, the Environment Agency, community groups and local residents
- **Funding:** Through the 'Water Companies investment programme'

Climate risks addressed:

Other areas of sustainability considered:

Summary

The City of Hull is situated on a floodplain putting local people and businesses at risk. To build resilience and adapt to climate change, the Council is designing a series of SuDS across the city and surrounding villages. To ensure the SuDS meet local needs, the Council is working with the communities who are co-designing the systems.

Key outcomes

The community engagement process, which included surveys and workshops, empowers local people by giving them input into decisions and involvement from the start of the process. From the engagement, the Council learnt that residents wanted their local areas to be more attractive, with green features and the ability to grow food. In addition, some residents highlighted the need for personal parking spaces. They were even keen to select the type of SuDS that they would like to see in the area. The council is also listening to what students think about potential flood measures and recording the reactions of children to them. They launched a social media campaign and are encouraging students to pass the messages about flood risk onto their parents.

To enhance engagement further, the Council used well established networks and local community groups. It was noted that this approach was particularly useful when engaging with people from a variety of backgrounds. 7,000 letters were sent to specific areas to make residents aware that the Council and partners would be engaging with them about the development.

One of the lessons learnt from this project was the need for significant revenue funding; more of this was needed than capital funding due to the extent of community engagement.

Our City Our River (OCOR)

- **Local authority lead:** Derby City Council
- **Location:** Derby City Centre
- **Partners:** Environment Agency, D2N2 LEP
- **Funding:** The project cost £95 million, with funding coming from the Local Growth Fund, the European Regional Development Fund and the City Council

Image: Derby City Centre (Unsplash)

Climate risks addressed:

Other areas of sustainability considered:

Summary

Our City Our River (OCOR), has been developed to reduce flood risk in Derby and create a high quality riverside, linking the city centre with the river. It includes plans for defences which would provide a greater level of protection up to a 1 in 100 year chance of occurrence and provide opportunities to release the economic potential of riverside brownfield sites.

Key outcomes

Previous to the construction of the first phase of flood defences, there was uncertainty associated with flood risk meaning that developers were less likely to invest in property or land in the area. The scheme has allowed for the unlocking of sites which are now investable, providing clear benefits to businesses and the city's economy.

However, alongside this, the council has ensured that there are additional benefits for the local community and for the environment. For example, areas on Duke Street, City Road and Etruria Gardens have been landscaped with trees, shrubs and grass being planted to enhance the areas adjacent to the river. Other advantages include a multi-user pathway which has been built along the west bank of the river, improving connectivity via sustainable forms of transport. New sports facilities have also opened, and the council and its partners have engaged with local schools so that more can be learnt about the OCOR Project through visiting the site. Visits also create the opportunity to find out more about careers in the construction industry.

When the scheme is completed in 2023, it will protect over 2,000 homes and 800 businesses from flooding.

Restoring Enfield's Rivers

- **Local authority lead:** Enfield Council
- **Location:** Enfield, North London
- **Partners:** Thames21
- **Funding:** The Green Recovery Challenge Fund, co-funded by Defra, the National Lottery Heritage Fund, Environment Agency and Natural England.

Image: Firs Farm wetland, one of Enfield's wetlands © Thames21

Climate risks addressed:

Other areas of sustainability considered:

Summary

Heavy downpours and droughts intensify existing agricultural and urban pollution problems in Enfield and make it harder for species to survive, and these weather events are happening more frequently due to climate change.

Many of Enfield's parks contain wetlands, creating an opportunity to soak up and filter pollutants before they reach the rivers. As well as improving water quality these wetlands are beautiful spaces, attracting wonderful wildlife like birds, frogs, newts and dragonflies.

Key outcomes

The project connect with London's largest reforestation project to restore Enfield Chase and the Salmon's Brook. As well as planting 100,000 trees, this reforestation project creates new wetlands and ponds to slow down rainwater before it enters the Salmon's Brook, reducing the risk of flooding downstream and reducing river pollution by filtering out pollution from nearby farms.

Combined with natural flood management, these landscapes can hold and slow water flow and make the landscape more resilient to the extremes of climate change. There is also a nature prescribing programme for people who want to improve their physical and mental health by volunteering at various sessions and events.

The Houghton Brook Flood Storage Area

- **Local authority lead:** Luton Borough Council
- **Location:** North Luton
- **Partners:** SEMLEP, Central Government and Bam Nuttall
- **Funding:** The total cost is £8.5 million, and it is funded by Defra, Thames Regional Flood and Coastal Committee, SEMLEP and Luton Borough Council

Image: Fields near Luton (Pixabay)

Climate risks addressed:

Other areas of sustainability considered:

Summary

Prior to the development of this flood alleviation scheme the area was vulnerable to the impacts of climate change and had previously been flooded. The Flood Storage Area combats this by being able to hold up to 56 Olympic-sized swimming pools of water during periods of heavy rainfall.

Key outcomes

The scheme will reduce the risk of flooding for around 600 residents and commercial properties in Luton. It will also result in greater resilience of the key road network. In addition, the project has created a green corridor with public open space, recreational areas and cycle paths creating a better place for people and wildlife. Species rich grassland and meadows have been incorporated into the Flood Storage Area, benefitting bumblebees, bats, butterflies and birds.

As a means of reducing flood risk over a large area, the Flood Storage Area is designed to fill and hold water during periods of heavy rainfall, and the water will only drain away slowly when river levels reduce. This minimises the risk of flooding to areas downstream. The Flood Storage Area consists of an earth embankment which acts as a dam, holding the water back.

A key challenge for this project was engaging with the public, especially given it was being developed during the Covid-19 pandemic when Government restrictions were in place, limiting public interaction. To overcome this and to ensure engagement with stakeholders took place, the project used the Environment Agency's website to distribute information, along with encouraging feedback and answering questions about the project's development. Residents who will benefit from the project were contacted directly.

Making Margate a cooler greener place

- **Local authority lead:** Kent County Council
- **Location:** Margate
- **Partners:** Interreg 2 Seas Cool Towns Project and Defra
- **Funding:** Kent County Council funded the tree pits and Defra has provided funding through the Urban Tree Challenge Fund

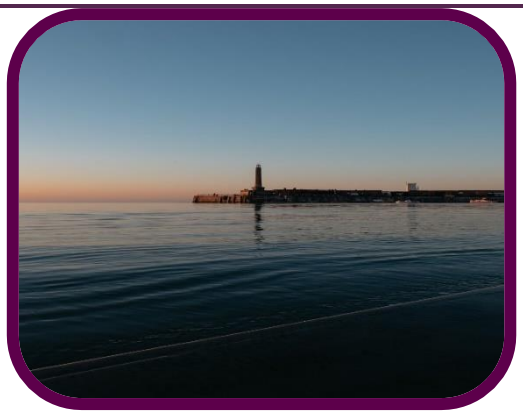


Image: Margate (Unsplash)

Climate risks addressed:

Other areas of sustainability considered:

Summary

Kent has been experiencing increasing heat stress from rising summer temperatures. As a result, two residential streets in Margate were selected to benefit from a tree planting programme that was specially designed to reduce heat stress during high temperatures, and surface water flooding following heavy rainfall.

Key outcomes

The solution to manage climate risk was to retrofit specialist SuDS 'tree pits' in the highway verges of the two identified streets. This solution would increase canopy cover to provide cooling during the summer months, whilst also reducing surface water flood risk in the residential areas. 30 trees have been planted, 11 of which are in specialist SuDS tree pits. These pits reduce surface water flooding by slowly infiltrating the water into the ground, reducing the volume of water flowing into the local sewage network. The trees were selected based on their canopy size, their ability to withstand drought and heavy rainfall, and their capacity to support biodiversity.

Instead of the drainage systems only being able to cope with one in five-year rainfall events, the new drainage system can now withstand one in 30-year events, and has reduced flood risk to 30 properties. The trees also provide natural cooling by reducing the air temperature in residential areas, as the leaves reflect sunlight and provide shade during the summer. The trees also provide cooling through evapotranspiration and provide essential food and habitat for local wildlife.

This project has brought benefits to both residents and visitors and has demonstrated how multi-functional climate change adaptation projects can provide cross-cutting benefits to communities previously at risk.

The Cambridge Canopy Project

- **Local authority lead:** Cambridge City Council
- **Location:** Cambridge
- **Partners:** Tree for Streets and Ashridge Tree nurseries; the wider 'Nature Smart Cities' programme includes eight city partners and three academic partners
- **Funding:** Project funded by Interreg II Seas 'Nature Smart Cities' programme

Image: Cambridge (Unsplash)

Climate risks addressed:

Other areas of sustainability considered:

Summary

This project aims to combat the urban heat island effect and lower the risk of flooding by utilising a nature-based solution, helping Cambridge adapt to and mitigate against the likely impacts that will be brought about under future climate change scenarios. The project also aims to increase Cambridge's urban forest from 17% to 19% by 2050 following the identification of 2,000 locations on council-owned land to plant new trees.

Key outcomes

It became clear that privately owned gardens would be a solution to the extensive tree planting required. To drive further action, 1,500 trees were gifted to residents and engagement activities took place to raise awareness of the benefits that trees can provide, such as carbon sequestration and filtering pollutants. The trees in Cambridge also reduce flood risk by reducing surface runoff by more than 97,000 cubic metres per year, and contribute to reducing the urban heat island effect during hot weather. Very young trees were also avoided due to their susceptibility to being affected by drought.

There are also other benefits such as the impact on physical and mental health. Some evidence has suggested that there are less anti-depressant prescriptions being issued in areas with lots of trees. Such areas also experience increased footfall and willingness to spend in retail areas, increased property values, enhanced social cohesion and a better sense of community. This emerging evidence shows that natural solutions can not only positively reduce climate risk, but also increase economic growth and benefit society across different aspects. The project in Cambridge learned that awareness raising is a key aspect when carrying out urban planting.

Cool streets and greening in the Square Mile

Image: London in a heatwave (Pixabay)

- **Local authority lead:** Greater London Authority
- **Location:** Across London
- **Partners:** The City of London Corporation
- **Funding:** £6.8M from The City of London Corporation

Climate risks addressed:

Other areas of sustainability considered:

Summary

Through the Cool Streets and Greening Programme, this project will aim to improve the resilience of its streets, parks and open spaces to the impacts of climate change. A range of urban greening, climate-resilient planting and sustainable drainage projects are being trialled, alongside sensor-based environmental monitoring, to evaluate the effectiveness of the schemes. These projects aim to tackle a number of risks from climate change, such as overheating, water stress, flooding and new pests and diseases while providing valuable data to inform future projects.

Key outcomes

Work already undertaken in previous and current phases has led to:

- An avenue of street trees on Vine Street to provide a shaded route to eliminate street-level overheating. Vine trees were select for their resistance to pests and diseases.
- Drought tolerant planting at the riverside planters outside the City of London School.
- Permeable paving and climate resilient planting as part of the Greening Cheapside Sunken Garden project.
- Sustainable drainage and tree planting close to the junction of Bevis Marks, Dukes Place and Creechurch Lane.
- Rain gardens, channels and footway reprofiling for surface water management, and new trees and hedge planting at Little Trinity Lane.
- In-ground, climate resilient planting, new trees and sustainable drainage as part of the City Cluster Vision Jubilee Gardens improvements.
- Trials of climate resilient planting in a number of planters and parklets.

Cool Spaces

Image: Greater London (Unsplash)

- **Local authority lead:** Greater London Authority
- **Location:** Greater London
- **Partners:** London boroughs, community groups, faith-based groups, cultural organisations and others
- **Funding:** Not stated

Climate risks addressed:

Other areas of sustainability considered:

Summary

London as a city is vulnerable to extreme heat due to the urban heat island effect and changing climate conditions. This project acknowledges this and provides some initial support to residents on how to keep cool in hot weather.

Key outcomes

The urban heat island effect can cause urban areas to be up to 10°C higher than surrounding rural areas. This occurs due to hard surfaces absorbing the sun's rays and radiating it into the air as heat, whereas vegetation reflects sunlight and provides shade.

In recognition of this, and in light of the increasing risk of heatwaves due to climate change, the Cool Spaces project allows stakeholders to add locations to an interactive map that are known to be 'cool' during periods of extreme heat and, therefore, where Londoners can take respite and minimise the risk of heat-induced health problems occurring. These areas are then validated by the Greater London Authority based on a set criteria.

The spaces are classed as indoor and outdoor spaces and include libraries, churches, leisure centres, parks and the location of water fountains.

Keep Bristol Cool Mapping Tool

- **Local authority lead:** Bristol City Council
- **Location:** Bristol
- **Partners:** Met Office, the Tyndall Centre for Climate Change Research and the University of Manchester
- **Funding:** The project was funded by the UK Climate Resilience Programme

Image: Bristol City Centre (Pixabay)

Climate risks addressed:

Other areas of sustainability considered:

Summary

Cities are areas with high concentrations of people, infrastructure systems and buildings which make them a risk area for heatwaves. This can cause homes to overheat, roads to melt, and can impact communities. Different people can be vulnerable to heat in different ways, depending on their sensitivity to heat, their ability to adapt to high temperatures, and their exposure to high temperatures both inside and outdoors.

Key outcomes

In recognition of this, and the likely increase in heatwave risk in the city of Bristol, the council and its partners has developed a tool for policymakers and practitioners in urban design, landscape architecture and emergency planning to understand how current heat vulnerability differs across the community, and how climate change might increase temperatures in the future.

The tool can provide insight into how urban heat risk varies and identifies areas that could impact people the most. The objective of the tool is to help the council and other decision makers build a city resilient to extreme heat.

The tool is a locally-focused version of the national Climate Just mapping tool, which looks at how climate change can impact those most vulnerable based on a variety of factors. Climate Just remains a useful platform to give decision makers initial direction as to how to improve an area's resilience to extreme weather.

Adapting West Bromwich outdoor market

- **Local authority lead:** Sandwell Metropolitan Borough Council
- **Location:** West Bromwich, West Midlands
- **Partners:** None in addition to the council identified
- **Funding:** The project cost £467,000 and was funded by the Towns Fund programme

Image: UK Market (Unsplash)

Climate risks addressed:

Other areas of sustainability considered:

Summary

This project delivered 36 new town market stalls to the town centre which feature transparent solar PV glass roofs that generate renewable electricity from sunlight, providing a net zero source of electricity and helping to keep the stalls cool in hot weather. This was the first application of this technology anywhere in the world.

Key outcomes

The market stalls were previously considered to be distracting from the visual amenity of the area, and were also considered a crime and a safety concern for the police given their propensity to making surveillance difficult. The new stalls are expected to provide a positive impact for their users and increase the amount of time spent in the area by shoppers. From a climate change adaptation perspective, the PV glass integrated onto the new stalls reduces heat gain and keeps the stalls cool during heatwaves. After installation, traders provided feedback to the council and said they were experiencing strong draught winds. The Council has since addressed these issues by weatherproofing the stalls and installing insulation.

This case study highlights how climate change adaptation and net zero objectives can be brought together alongside other areas of sustainability. It also highlights how stakeholder feedback is key to creating truly resilient developments, because it can be difficult to fully anticipate the impacts of weather and climate on such developments by data alone.

Developing Passive homes

- **Local authority lead:** Exeter City Council
- **Location:** Exeter
- **Partners:** Exeter University and Met Office
- **Funding:** not stated

Image: Exeter (Unsplash)

Climate risks addressed:

Other areas of sustainability considered:

Summary

Exeter City Council has been using a planned approach to low energy housing developments for the past 10 years, which has led to the creation of 103 certified Passivhaus homes. Consideration to the potential risk of overheating has been factored into their design.

Key outcomes

These homes have been built to be low energy, climate ready and improve health through building biology. They have been tested against future climate conditions to ensure resilience to 2080, and alongside this residents have already experienced health improvements and better indoor air quality.

Climate preparedness was a key aspect of the project. The majority of buildings constructed today will still be in use in the second half of this century when according to scientific evidence climate change will result in wetter winters and drier summers. Buildings must be adapted to these changing climatic conditions. However, many designers typically use historic weather data to optimise designs meaning that buildings are not suitable for the future climate.

However, Exeter City Council has used future probabilistic weather data to future-proof the building designs without necessarily adding cost to projects. The analysis highlighted that building designs typically seen in Southern European countries could become more applicable in the UK by the 2080s, a consideration taken into account in the development of these homes.

Red Hill Primary School Building Redevelopment

- **Local authority lead:** Worcestershire County Council
- **Location:** Red Hill School, Worcestershire
- **Partners:** UK Climate Impacts Programme (UKCIP)
- **Funding:** The total cost of the project was £2.7 million

Image: River Severn, Worcester (Pixabay)

Climate risks addressed:

Other areas of sustainability considered:

Summary

Red Hill Primary School in Worcestershire was one of the first schools in England to have had a climate change impact assessment carried out during the design phase. The assessment was supported by Worcestershire County Council's Principal Architect and has integrated a range of climate change adaptation measures.

Key outcomes

The adaptation measures were integrated to create a safe teaching environment and maintain comfort for both current and predicted climate conditions over the next 60 years, in line with the building's design life. Considering adaptation measures during the design phase is much more cost-effective when compared to retrofitting the building at a later date.

The adaptation approach provides no-regret and win-win options that will produce benefits regardless of the changing climate and the design of the building will help to reduce disruption to the school. The adaptation measures integrated were designed to address intense rainfall events, milder winters, hotter drier summers and increased wind speeds and extreme storms. The range of measures included rainwater harvesting, additional shade and zinc sheet roof coverings which are less vulnerable to high winds than typical roof tiles.