Croydon Climate Change Adaptation Action Plan

Croydon Environment and Climate Change Partnership

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Foreword

By Chair of the Croydon Environment and Climate Change Partnership, Cllr Jason Perry, cabinet member for planning, conservation and climate change

We can mitigate against the potential harmful effects of climate change by managing energy use and reducing green house gas emissions. Croydon has made a commitment to climate change mitigation in order to reduce the potential impact of climate change, taking advantage of the new low carbon economy and making a contribution to UK wide carbon reduction targets. This is set out in our Climate Change Mitigation Action Plan. However, it is inevitable that some climate change will occur over the next decade, affecting local communities, businesses and service providers. It is therefore essential to anticipate and adapt to the identifiable risks associated with climate change impacts. These include direct impacts such as extreme temperatures, flooding and drought as well as indirect impacts including the increased risk of weather damage to infrastructure and ground instability.

The Environment and Climate Change Partnership (ECCP) was established in 2008 as a successor to the Environment Partnership created in 2003 and is one of the themed partnerships within the Local Strategic Partnership (LSP). The ECCP oversees the delivery of environmental priorities which address key themes of Croydon's new vision and its translation through Croydon's Sustainable Community Strategy including tackling climate change, improvements to local environmental quality and adapting to the risks associated with projected climate change. The ECCP recognises that there is a financial imperative to take action to adapt to climate change, as the impacts will undoubtedly incur significant costs as a result of disruption to local service provisions and businesses.

This Adaptation Action Plan aims to build adaptive capacity within the borough, putting in place the support systems, legislative and policy frameworks which will allow the borough to safeguard and increase the resilience of public services as well as encouraging local businesses to deliver adaptation action. All actions will be carried out within the principles of sustainable development, improving the wellbeing of local residents in the borough. The Adaptation Action Plan builds on the Croydon Environment and Climate Change Strategy. The implementation of this Action Plan will be overseen by the Adaptation Strategy Group within the ECCP.

If you have any questions about this strategy or the work of the ECCP please contact Croydon Council's sustainable development service on **020 8760 5791** or email: **sustainability@croydon.gov.uk**

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Executive Summary

This document sets out the short and long term priorities and actions for climate change adaptation in Croydon. Actions have been produced to satisfy the guidelines for the National Indicator 188, 'Planning to Adapt to Climate Change.' This Action Plan is supported by the new Croydon State of the Environment report which will be annually reviewed, monitoring the progress of actions set out in this strategy document. The implementation of this strategy will be governed by the Environment and Climate Change Partnership (ECCP).

UKCP09 climate change projections show that temperatures are projected to rise up to 5°C by 2070 under a business-as-usual scenario. Under the same scenario, winter precipitation levels are forecast to increase by up to 40% by 2070 while summer precipitation levels are likely to decrease. Globally we have already seen a 0.7°C rise in temperature and this is set to rise as CO_2 emissions will continue to increase from the current level of 430 parts per million (ppm). Exceeding a concentration of 450 ppm will mean that limiting temperature rise to below 2°C is unlikely to be achievable. Despite efforts to mitigate these climate change impacts it is, therefore, likely we will experience an increase in global temperature at or above 2°C. We must therefore plan to adapt in order to limit the risk posed to local service provision and the costs that the impacts of this climate change impacts may incur in the future.

Croydon signed the Nottingham Agreement in 2002, formally committing the borough to long-term climate change adaptation. Level 1 of the NI 188 guidance has been achieved through the development of the Croydon Local Climate Impacts Profile. This has identified impacts from weather related events on service provision in the borough and thus the priority climate change risks. The key outcome from this work has identified the borough's vulnerability to surface water flooding as well as the impact of extreme temperatures on local infrastructure and biodiversity. The CREW (Community Resilience to Extreme Weather) research which is being conducted by 15 universities across the country is hoped to inform much of the forthcoming risk assessment work with regards to climate change adaptation.

A focus of the ECCP is developing a communications and marketing plan with the aims of:

- increasing local awareness of climate change risks and the requirement for adaptation in identified priority high risk areas
- consultation with residents about flood risk and related interventions
- encouraging 'growing your own' vegetables and fruit

The aim for the ECCP over the forthcoming year is to achieve Level 2 under the NI188 guidelines, the actions for which are defined in this document. A key aspect of this will be the development of a comprehensive assessment of climate threats and opportunities across the council and partners' operations for specific periods in the future, identifying priority risks and adaptation options. Work on this will begin with a partnership risk workshop in late 2010.

In order to drive progress on climate change adaptation in Croydon over the next 3 years a 'quick wins' action plan has been developed which sets out the body of work that is currently already underway to support climate change adaptation. This also includes a number of actions that can be easily achieved and that will contribute to the body of work that is required under the NI188 guidelines.

The 'quick wins' action plan has been structured by risk type. This documents the work currently being carried out to measure and reduce flood risk in the borough, including actions for the Drain London project, the de-culverting of the River Wandle, Norbury Park and the soakaway cleansing programme. Actions to monitor and increase the provision of green roofs in the borough are of paramount importance as these measures will not only attenuate flood water levels but also have a local cooling effect and provide habitats and green corridors for species migration.

Croydon is characterised by its large area of green open space and areas of nature conservation. This Action Plan sets out the requirements to maximise the opportunities for biodiverse habitats in the borough and prevent habitat loss from development and unsympathetic adaptation activities. Arid roundabouts planted with drought-resistant species have already been trialled in the borough and it is important to consider species choice in the management of green spaces in order to maintain an environment that will be able to withstand future extremes in temperatures and precipitation levels.

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Croydon's vision

The 'Imagine Croydon' visioning exercise took place in 2009 to derive a long-term vision for the borough. This consultation with over 20,000 local people has set the overall vision for Croydon (**http://www.croydon.gov.uk/planningandregeneration/croydons-planning-policy-framework/local-development-framework**).

By 2040, Croydon's vision is to be 'London's most enterprising borough – a city that fosters ideas, innovation and learning and provides skills, opportunity and a sense of belonging for all.'

'A **Sustainable City** is a place that sets the pace amongst London boroughs on promoting environmental sustainability and where the natural environment forms the arteries and veins of the city' (We Are Croydon; this is our vision', 2010).

Croydon is committed to sustainable economic growth. In 2040 more people will be living and working in Croydon. Growth has been planned carefully so that the town centre benefits from regeneration while local character is conserved. There will be sustained investment in core infrastructure to enable this growth while also helping to reduce carbon emissions and adapt to the impacts of climate change.

But sustainability is not just about development. Residents and businesses will also be inspired to take greater pride in their environment and to take responsibility for their environmental impact. (We Are Croydon; this is our vision, 2010)

1.1. Background

This document sets out the short and long term priorities for Croydon and defines the strategic framework through which the ECCP will conduct work to ensure that businesses and service providers across the borough adapt to climate change. All of the actions documented here are aimed at reducing the risk that climate change will pose to Croydon, and therefore the cost of climate change related damage, for example from flood events, heat waves and severe cold events during the winter.

In support of this Action Plan a State of The Environment Report (SER) has been produced. The SER is structured to provide information in support of both this Climate Change Adaptation Action Plan and the Climate Change Mitigation Action Plan. Indicators within the SER directly link to the actions set out in this Action Plan, thus allowing progress and the risks posed by climate change to be monitored. This will help the partnership to identify priority actions.

Emphasis is on long-term strategic work, taking into account changes in weather patterns in and around London over the next 50 years predicted to result from climate change.

The Climate Change Adaptation Action Plan (CCAAP) Links in with a number of existing documents as shown below. Fundamentally one of the routes for delivery of this Action Plan is the Council's Local Development Framework. The Core Strategy is the key document in the LDF that will set out the spatial vision for Croydon for the next 20 years or so and how it can be achieved. A further Regulation 25 consultation draft has been published that included the vision theme of Croydon as 'A Place with a Sustainable Future' and thematic strategies relating to 'Climate Change, Energy, CO_2 and Water Management' and 'The Green Grid and Rivers'. These attempt to ensure that the built and natural environment of the borough is capable of mitigating and adapting to climate change and ensuring residents have access to high quality usable green spaces rich in biodiversity. Spatial objectives to achieve this strategy support mitigation and adaption to climate change.

- LBC: Croydon's Green Infrastructure Report (2010) (draft)
- LBC: Croydon's Infrastructure Delivery Plan
- LBC: The draft Biodiversity Action Plan
- LBC: The Strategic Flood Risk Assessment (2008)
- LBC: Surface Water Management Plan. Phase 1 Scoping Study – Final Draft (2010)
- LBC: LCLIP
- London Climate Change Partnership, Adapting to Climate Change, Creating Natural Resilience, Technical Report
- City of London Climate Change Adaptation Strategy, Rising to the Challenge

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Document structure

This document first sets the scene for why a detailed Climate Change Adaptation Action Plan for Croydon is required, identifying key characteristics of Croydon and using regional London climate change projections, from the UKCP09, to assess requirements for adaptation.

The ECCP governance structure is described in Chapter 5, alongside the Climate Change Mitigation Action Plan and supporting State of the Environment Report, thereby setting out the strategic framework for the partnership.

Croydon's activity under National Indicator 188 is documented in Chapter 6 and an action plan following the guidelines set out in NI 188 has been produced in Chapter 8. This sets out the strategic process through which actions will be implemented. These actions are documented in a 'quick wins' action plan in Chapter 9 which has been developed to drive progress forward.

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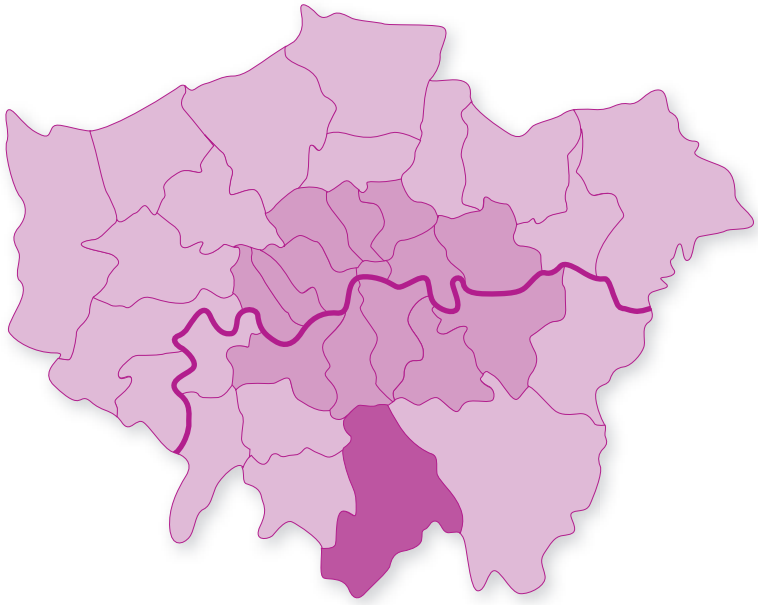
About Croydon

Croydon is the southern-most borough of London, bordered by Surrey to the south, Bromley to the east, Sutton and Merton to the west and the boroughs of Lambeth, Lewisham and Southwark to the north. To the south are the Surrey districts of Reigate, Banstead and Tandridge. It is one of the largest boroughs in London, covering an area of 8662 hectares, 2770 hectares of which is green belt.



Croydon has the second largest population out of all London Borough and it is the ninth largest unitary authority in the country. The borough has a population of 341,800, with an average population density of 39.6 people per hectare which is greatest in the north of the borough. The population size is projected to increase to 380,000 by 2031 (draft LBC Core Strategy 2010). Out of the existing 341,800, 82,000, almost 25%, are under the age of 18. 36% of Croydon residents are from black and minority ethnic (BME) communities predominantly focused in the northern wards. With respect to the diversity of the borough, over 100 languages are spoken. There are also significant numbers of refugees and asylum seekers within Croydon. Around 40% of children and young people are from BME groups. The London Borough of Croydon ranks as the 15th least deprived Borough, out of 33 authorities in London.

Croydon is one of London's largest retail and commercial centres and benefits from good rail, tram and road links. It is one of the country's largest commercial centres and is home to more than 20 'blue-chip' companies. The employment rate, at 74.6% is among the highest in London, but the borough as a whole has a relatively weak skills base in comparison to other London boroughs and wages are relatively low. Over the next five years significant developments (residential and commercial) are either planned or in the pipeline for Croydon.

Croydon benefits from over 120 parks and open spaces and has some of London's most expensive housing. Large parts of the borough also have inner-city characteristics.

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Risks posed by long term climate change in Croydon

There is common scientific consensus that the climate is changing. Climate change may pose potential risks to the economic activity and standards of living within Croydon; it is essential for local authorities and communities to act now to reduce carbon dioxide emissions if these risks are to be minimised. The cost of mitigation action now is small in comparison to the cost the impact of climate change will incur if action is delayed and average global temperatures exceed a 2°C increase.

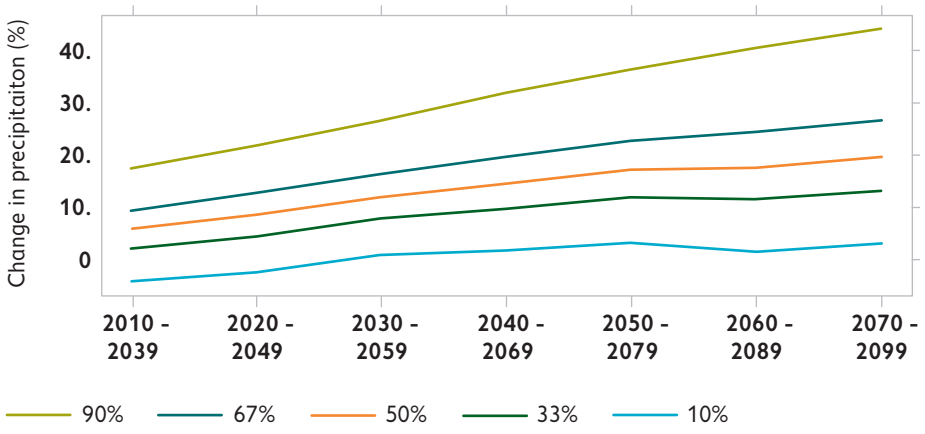
To accompany this warming the magnitude and frequency of extreme weather events will also increase, putting Croydon at a higher risk of floods and droughts. Therefore it is essential that Croydon develop a strategic action plan for the implementation of adaptation measures to limit the effect of an increase in temperature on local residents, and reduce the risk of flooding.

In 2009, the Department of Food and Rural Affairs (DEFRA) documented UK Climate Projections using models based on a range of emissions scenarios from the IPCC (Intergovernmental Panel on Climate Change) Special Report on Emissions Scenarios (SRES). The projections for London, shown below, are based on a 'medium emissions scenario'; they assume business-as-usual with no political intervention, while regional carbon emissions continue to increase. Due to the uncertainty attached to modelling climate change the graphs demonstrate the varying levels of probability of the projected outcomes. The table below defines what is meant by each probability level.

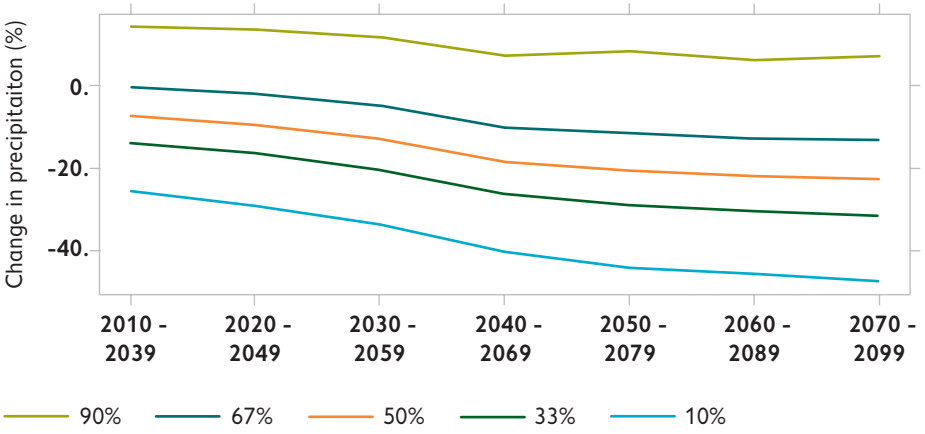
Defined probability levels for climate change projection (UKCP09)

Probability level	Description
10%	Very unlikely to be less than
33%	Unlikely to be less than
50%	Central Estimate
67%	Unlikely to be greater than
90%	Very unlikely to be greater than

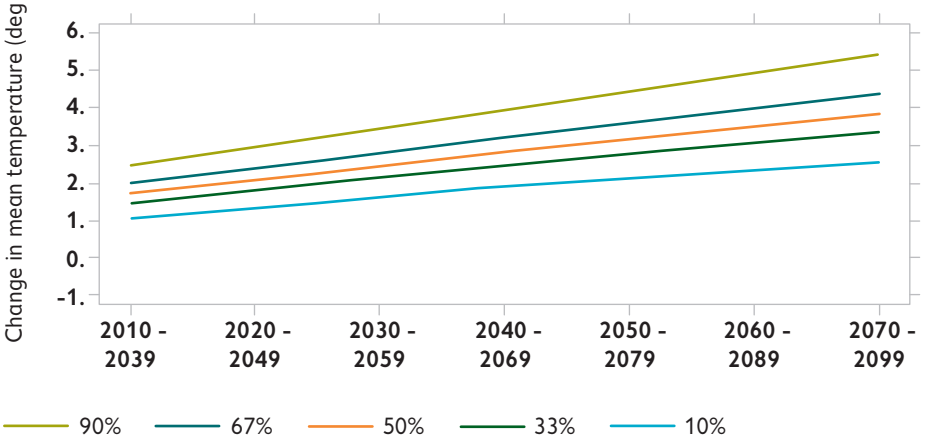
% probability of winter precipitation levels, based on a medium emissions scenario, SRES (UKCP09)



% probability of summer precipitation levels, based on a medium emissions scenario, SRES (UKCP09)



% probability of degrees Celsius Temperature change, based on a medium emissions scenario, SRES (UKCP09)



Globally temperatures have already risen by 0.7°C and all but one of the warmest years on record has occurred since 1990. This rise in temperature has been accompanied by a rise in extreme weather events including the unseasonal localised flooding which occurred in Croydon during the summer of 2007 after drought during 2006.

Current average global CO_2 concentrations are at 430ppm, a dramatic increase from the pre industrial concentrations of 285ppm. If concentrations are stabilised at around 500 to 550ppm the probability of a 2 to 3°C temperature rise is very high as demonstrated by the table shown below:

Concentration levels and temperature increases. Likelihood, in percentages, of exceeding a temperature increase at equilibrium relative to 1850 pre industrial concentrations (Stern, 2010).

Stabilisation Level (ppm CO_2)	2°C	3°C	4°C	5°C	6°C	7°C
450	78	18	3	1	0	0
500	96	44	11	3	1	0
550	99	69	24	7	2	1
650	100	94	58	24	9	4
750	100	99	82	47	22	9

A cautious estimate of the consequences if we continue with businesses as usual will see CO_2 concentrations reaching approximately 750 ppm. With emissions currently at 430ppm it is generally considered that we have missed the chance of stabilising CO_2 concentrations at 450 ppm, this will give us a much higher probability of a 2°C increase in temperature which is often advocated as the acceptable limit, on the grounds that anything higher would be dangerous (Stern, 2009).

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Governance

5.1. Where we are now: the Environment and Climate Change Partnership (ECCP)

The ECCP is one of the themed partnerships within the Local Strategic Partnership (LSP). The ECCP is comprised of environmental stakeholders including Transport for London, the Energy Saving Trust, local businesses, schools and representatives from the faith and voluntary sector. The ECCP works to deliver the key environmental priorities for Croydon, namely:

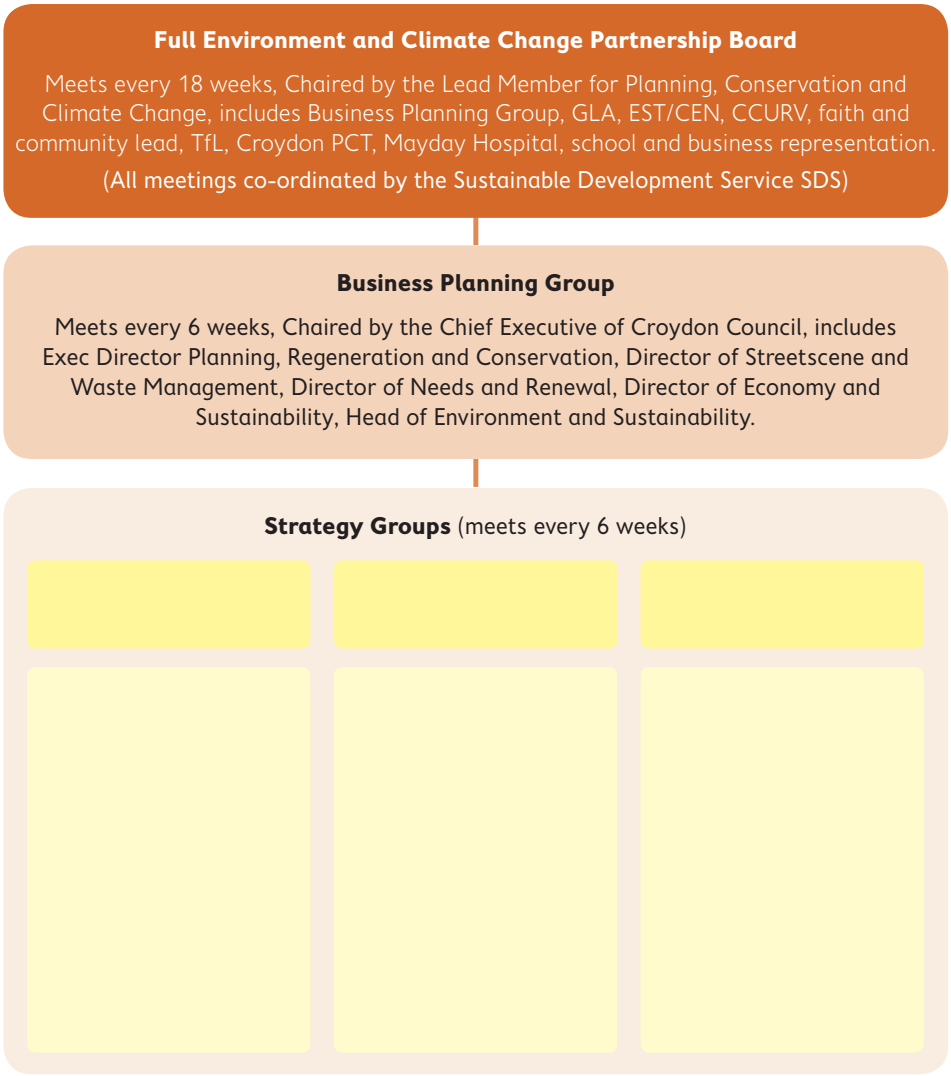
- tackling climate change by reducing CO_2 emissions, including domestic emissions
- facilitating a modal shift to sustainable transport
- effective management of our natural resources to ensure climate resilience
- addressing waste and improving environmental quality
- effective communications and marketing for individual behaviour change
- supporting the low carbon economy

These environmental aims deliver wider benefits in terms of saving money and improving the health and wellbeing of local communities.

The ECCP co-ordinates environmental activity by partners at a strategic level and brings this together as part of a single integrated programme. This enables overarching work on communications and marketing for behavioural change to be co-ordinated by the partnership board and aligns timescales for different strategy work in relation to the long term carbon reduction targets for the whole borough.

The structure of the ECCP is presented in the table below, demonstrating the collaboration of work between strategic groups working on climate change mitigation within the residential housing, transport and waste sector, as well as district energy, carbon reduction in local schools and businesses and climate change adaptation.

5.1.1. The structure of the Environment and Climate Change Partnership



The Adaptation, Residential and Low Carbon Economy Strategy Groups have been established especially to deliver the aims of this strategy and the Climate Change Mitigation Strategy. The Strategic Transport Board, South London Waste Partnership and District Energy Programme Board are pre-existing groups that will feed into the Partnership.

This Action Plan will be monitored by the ECCP Executive Group on an approximately 6 weekly basis and updated and reported annually to the Croydon LSP and other regional and national bodies.

6

What has been done

6.1. National Indicator 188, 'Guidelines For Planning to Adapt to Climate Change'

Croydon Council signed the Nottingham Declaration in 2002, thus formally committing to long-term climate change adaptation. The council's approach to adaptation is underpinned by an emphasis on partnership. Through the Croydon ECCP the need for action can be communicated across different sectors within the borough. The Environment and Climate Change Strategy, written in 2008, sets out the implications climate change may pose to Croydon and outlines priorities for action.

Following the national guidelines, the ECCP has developed the essential foundations upon which a coherent strategy for climate change adaptation can be built. This includes building awareness of requirements for climate change adaptation across the borough and LSP partners, and assigning resources to the tasks defined in national guidance. The key climate change risks and vulnerabilities in Croydon have been identified to inform LSP partners and guide the next stages in adaptation actions. The ECCP has set a target of achieving the Level 2 of the national standard, NI 188, for 'Planning to Adapt to Climate Change' by April 2011. This will set out the strategic framework through which actions can be implemented.

Climate change projections are only forecasts and therefore contain uncertainties. Because of the natural variability of the climate and the uncertainty inherent in forecasting the future a risk-based approach is being adopted, as defined in the NI188 guidelines. This is therefore a continuous process marked by the monitoring of adaptation actions, climate change projects, weather events and associated impacts.

6.2. LCLIP Summary: priority climate change risks in Croydon

Scott Wilson's Climate Change and Policy team was commissioned by London Councils to prepare a Local Climate Impacts Profile for the London Borough of Croydon, as part of the 'Local Climate Impacts Profiles (LCLIPs) for the London's Local Authorities' project.

The LCLIPs for the London Local Authorities Project is part of a wider programme of work being delivered by London Councils and the London Climate Change Partnership (LCCP) which aims to gain a better understanding of weather-related impacts and their associated costs on infrastructure and services across London.

One of the key drivers for local authorities to address adaptation is the government's national adaptation indicator (NI 188). Undertaking an LCLIP is recommended as one of the first steps that a local authority can undertake towards achieving Level 1.

The NI 188 guidance highlights that in order to understand current vulnerability, it is necessary to gather information on the following:

- the nature and the magnitude of the **consequences** of recent weather events
- the identification of the **agency(s) and/or local authority service areas** responsible for managing the consequences of events

- the **preparedness** of responsible agencies and/or local authority service areas to deal with the consequences of local weather events
- the details of the **weather events and impacts** that caused these consequences
- together, this information will allow an initial judgement to be made on what were **significant** consequences for a local authority/organisation and its locality

Through this LCLIP Croydon observed a wide variety of impacts and consequences from weather events. Every service area interviewed was found to have been affected by weather events in different ways. The results from this are summarised below:

- the borough is vulnerable to surface water flooding which regularly caused disruption to transport (road closures, speed restrictions and lane restrictions); damage to property; and disruption to sporting events. Surface water flooding was regularly contaminated with sewage
- extreme heat events had significant consequences for the police force as there was an increase in burglaries where burglars took advantage of open doors and windows. Public transport links were affected by the heat as temperatures on all modes were unbearable. Sports events were cancelled; and dress codes were relaxed
- there has been an increase in damage to council infrastructure caused by weather events (e.g. trees, roads, pathways) and an increasing propensity for insurance claims against the Council. The cold weather experienced during the winter of 2009 to 2010 has caused an estimated £1,000,000 of damage to roads as a result of freeze/thaw weathering
- snow events, while less common, have a considerable impact on all service areas. Severe disruption on roads (affecting cars, buses, and emergency services), rail and tram lead to transport difficulties. This impacts services such as rubbish collection, hospitals and schools, which postpone appointments and operations, and close respectively
- high winds can affect the highways and drainage teams as leaves block gullies leading to surface water flooding. Fallen trees must also be attended to by the green spaces and highways teams to ensure main transport networks are not disrupted.

All the service areas questioned have adapted their response to events as well every day practices accordingly. For example:

- as a result of property damage caused by adverse weather, all new council stock will incorporate climate change adaptation features, such as flood resilience
- council-run passenger vehicles have started introducing climate control to reduce temperatures during hot weather
- the police have started to actively warn residents about the dangers of leaving doors and windows open during hot weather
- as a consequence of hot weather and prolonged periods of dry weather, Croydon actively collect rainwater for watering green spaces within the borough
- arid (i.e. with water-resistant plants) roundabouts have been trialled as a better option to cope with drought conditions and reduce water usage
- the council (green spaces team) request water resistant planting where possible within planning applications. Green roofs are actively encouraged by the council
- the highways team are training more gritter drivers and introducing a three shift system to increase standby capability and flexibility.

The results from the LCLIP study will now aid the progression towards Level 2 under the NI188 indicator and the development of a more comprehensive risk assessment in line with the corporate risk register.

6.3 CREW: 'Community Resilience to Extreme Weather'

The project 'Community Resilience to Extreme Weather' (CREW) is a research project, established to develop a set of toold for improving the capacity for resilience of local communities to the impacts of future extreme weather events. CREW consists of a consortium of researchers drawn from 14 universities around the country. Croydon is one of the areas for this research program and this is likely to aid the council in developing a comprehensive risk assessment of the borough and potential adaptation pathways.

The key objectives of this body of work have been to:

- gain a better understanding of the impacts of extreme weather events (current and future) on local communities, based on three community groupings: householders, Small and Medium Sized Enterprises (SMEs) and decision makers
- integrate social and physical research to develop an improved understanding of risk from Extreme Weather Events (EWEs) at the community level
- study the complex inter-relationships between community groups in order to improve our understanding of the risks, vulnerabilities, barriers and drivers that affect the resilience of a local community to extreme weather events
- quantify and rank a number of technical and adaptive coping measures for reducing vulnerability to extreme weather
- develop web-based information dissemination tools for integrating the project outputs. This will deliver maps, reports and guidance on impacts and resilience measures for extreme weather

Those that will benefit from this work will include decision-makers for community resilience, property owners and insurance companies. The information will be of great use to the ECCP in the mapping of risk across Croydon and must be included in the Level 2 NI 188 risk assessment.

7

Behavioural change

It is important that the public are not misinformed about the degree of climate change and its potential impacts. Seasonal fluctuations in the climate's natural behavioural patterns can mask the long-term climate changes. For example the winter of 2009/2010 was characterised by temperatures below average, and extensive snow and ice cover across the UK, which would not appear to the general public to be characteristic of a warming climate.

It is these short term fluctuations that may confuse people's understanding of the long-term global warming trend - a reason why it is important to address behavioural change within this adaptation Action Plan.

7.1. What are our aims?

The work of the ECCP in Croydon provides opportunity for considerable outreach to many partner agencies that will be required to adapt to the changing climate to ensure the efficiency of their service is sustained.

The ECCP's overarching communications aim is to achieve behavioural changes in Croydon, through:

- the identification of climate change impacts on the borough
- the identification of potential risks for energy security across the borough in relation to climate change impacts
- demonstrating the benefits of early action as it is through economic investment that the impact of future climate change and the additional economic costs this would incur can be minimised
- provide advice to residents and local businesses

With climate change it is expected that EWE will increase in frequency and magnitude. In order to increase the resilience of a community to weather events and the changing climate it is important that emergency services, businesses, individuals and local policy makers are aware of the risks that EWEs pose to service efficiency. Adaptation is about long term preparation for these changing weather patterns and the alteration of service planning to provide capacity to cope with extreme events, whether that is heavy rainfall and surface flooding or severe heat wave events.

7.2 Actions

Objective: Behavioural change: communications and marketing for climate change adaptation, ensuring that local communities are aware of the potential impacts of climate change

Aims:

- to engage local communities and businesses to ensure awareness of potential climate change impacts and how these risks can be reduced through the adoption of adaptation measures
- to advise businesses on how to develop their own adaptation action plans
- to help local businesses and communities access advice and toolkits to aid their decision making process when developing action plans and considering adaptation measures
- to produce heat wave action plans
- to produce flood warning action plans
- encourage 'growing your own' vegetables and fruits

Action	Deadline	Audience	Outcomes
B1. CREW (Community resilience to Extreme Weather) data to be made publically available on-line	2012	Croydon residents and businesses	This will provide access to a database on the distribution of risk across the borough for a number of risks caused by extreme weather events. This will increase the awareness of climate change and related adaptation approaches that individuals can take.
B2. Ensure that the community is aware of the potential impacts of climate change and aware of their own responsibilities towards building personal resilience to the risks			Increased awareness and resilience will come from: • An awareness raising media campaign launched in local papers by 2012, this can be linked with the launch of the CREW online resource. • Information booklet produced • An information point on the council website will be available with links to the CREW online resource
B3. Encourage the uptake of flood warning action plans in high risk areas	Ongoing	Croydon residents in areas of risk from fluvial and surface water flooding	Increased uptake of flood warning action plans from: • An awareness raising media campaign launched in local papers by 2012, this can be linked with the launch of the CREW online resource. • Information booklet produced for areas in areas of high risk of surface water flooding • An information point on the council website will be available with links to the CREW online resource
B4. To encourage the use of heat wave action plans for businesses and communities	Ongoing	Croydon residents and local businesses	Increased uptake of heat wave warning action plans from: • An awareness raising media campaign launched in local papers by 2012, this can be linked with the launch of the CREW online resource. • Information booklet produced • An information point on the council website will be available with links to the CREW online resource

Action	Deadline	Audience	Outcomes
B5. Engage with local businesses to ensure adaptation measures and an adaptation action plan is embedded within businesses plans, highlighting adaptation and climate change resilience measures as appropriate	Ongoing	Local businesses	Provide a toolkit through the council adaptation webpage providing guidance through which businesses can develop adaptation action plans and adopt resilience measures where appropriate
B6. To encourage 'growing your own' to the local communities including schools and private businesses through articles in 'Your Croydon' and via Envibe	2020	Schools Businesses Residents	This will encourage market land share schemes. More local residents will be encouraged to grow their own in their gardens and will learn of the health and the environmental benefits in doing so.

8

Actions under NI188 guidelines

This Action Plan table has been constructed to indicate key actions, deadlines and partners responsible for the completion of each action. Often there is more than one partner responsible for the completion of the action and when this is the case lead partners are identified. The success criteria as milestones for the completion of each action have been listed breaking up the work required for each action into a project plan; this will also help the partnership to monitor progress. Targets have been set for each action in consultation with the lead partner responsible. Any progress to date will be documented, again this allows progress to be continually monitored against the planned milestones and targets.

This action plan sets out the strategic process through which actions will be implemented in order to satisfy the guidelines as part of the National indicator 188.

8.1. Level 1 NI188

Level 1

Objective: Public commitment and impacts assessment: assembling an evidence base

Aims:

- to demonstrate the leadership role of the authority by **making a public commitment** (amongst the local community, LSP partners, etc.) to respond to the threats and opportunities of a changing weather and climate
- to develop an **understanding of current vulnerability to weather**, including extreme weather events
- to **identify significant potential impacts** associated with future weather and climate, particularly those that are not adequately addressed by existing policies
- to ensure that **relevant managers / elected members are aware** of these and other potential impacts, and are preparing to address them
- supplementary aim; to develop and maintain a monitoring system to collect information on the impacts of weather events, particularly recording the impacts on the delivery of authority services

Action	Deadline	Partners (Those responsible in bold)	Milestones and Targets	Progress to date
1.1. Make a public commitment to identify and manage climate related risks	2010	• **PRC: SDS** • NHS: public health • LBC: Social services	• Define milestones, how they will be achieved and when • Place Action Plan on website	• Signed Nottingham declaration 2002 • Action plan completed
1.2. Undertake local risk-based assessment of significant vulnerabilities and opportunities to weather and climate, both now and in the future.		• **PRC: SDS** • **Risk Management and Emergency Planning** LSP: • EA: external relations • Thames Water: water efficiency • Natural England: planning and advocacy		• Winter services review workshop May 2009 • Scoping for 'Drain London', producing flood database • Strategic Flood Risk Assessment • Multi Agency Flood Plan completed March 2010 • Planning for 'Exercise Watermark' March 2011 • Flood Risk Advisory Service launched April 2009 • Heat Wave Planning • Green Infrastructure Study drafted May 2010
1.3. Identify significant impacts as a result of future weather events	2010	• **PRC: SDS** • **Risk Management and Emergency Planning** LSP: • EA: external relations • Thames Water: water efficiency • Natural England: planning advocacy	• To identify priority impacts and service areas that may require immediate action	• LCLIP drafted March 2010
1.4. Risk communication to authority and LSP partners	March 2010	• **PRC: SDS** • **Risk Management and Emergency Planning** LSP: • Thames Water: water efficiency • EA: external relations • NHS: public health • Natural England: planning and advocacy	• Distribute LCLIP study within the council and to LSP partners	• LSP Workshop: raising risk awareness date March 2010

8.2. Level 2 NI188

Level 2

Objective: Comprehensive risk assessment (with some prioritised areas)

Aims:

- to ensure that the authority now has a **comprehensive assessment** of climate threats and opportunities across its operations for specified periods in the future
- to identify using a risk-based method, preferably already employed by the authority, the **priority risks** that need to be considered
- to establish methods and procedures for **identifying adaptation options** and develop some priority 'quick-win' actions
- to begin **implementing some priority actions** which will include both 'practical adaptation actions' and 'building adaptive capacity'
- to **encourage activity amongst LSP partners** to undertake risk based assessments of their significant vulnerabilities and opportunities

Action	Deadline	Partners (Those responsible in bold)	Milestones and Targets	Progress to date
2.1. Establish evidence base upon which risk prioritisation and adaptation decisions are based: • Establish decision-making criteria for risk prioritisation and adaptation planning • Scoping to identify and understand the sectors, places and communities / people that will be the subject of the risk assessment • Identification and selection of evidence base material	March 2011	• **PRC: SDS** • **Risk management and Emergency Planning** LSP: • Thames Water: water efficiency • EA: external relations • NHS: public health • Natural England: planning and advocacy	• Evidence base in place by March 2011 • To be reviewed annually, or following an extreme weather event or emergence of significant evidence • Collate a data base of weather events and associated impacts over time, for monitoring purposes	• LCLIP drafted March 2010
2.2. Produce a comprehensive list of potential impacts in each department/service area/business unit/LSP partner, undertaking individual impacts assessment, considering timescales over which impacts are assessed related to policy changes, socio-economic changes and provision of climate change data	March 2012	• **PRC: SDS** • **Civil Contingencies Team** • **Risk management and Emergency Planning** LSP: • Thames Water: water efficiency • EA: external relations • NHS: public health • Natural England: planning and advocacy	• All active units within the LSP to undertake an impact assessment, using a consistent risk based methodology	• Flood Risk Advisory Service • Winter Services Review • The Business Impact Assessment template, used as part of Croydon Business Continuity Management, is to be used to answer questions that would be raised in the risk assessment on climate change. This will build a picture of the impacts potential risks could have on services and different business areas.

Action	Deadline	Partners (Those responsible in bold)	Milestones and Targets	Progress to date
2.3. Risk based assessment applying decision making criteria to identify priority risks to be taken forward. • Assessing likelihood and severity of occurrence over clearly defined time scales. • Risk assessment to be incorporated into corporate risk register • This should be outcome based to focus on risk management	March 2011	• **PRC: SDS** • **Risk management and Emergency Planning** LSP: • Thames Water: water efficiency • EA: external relations • NHS: public health • Natural England: planning and advocacy	• Risk workshop for ECCP • Risk assessment framework to be developed, populated and risks prioritised by March 2011 • To be reviewed to determine any changes in evidence base (climate change data and weather patterns) and new business in the borough	
2.4. Embedding climate change adaptation into risk management frameworks of partner organisations and then into local plans, service plans, corporate plans, community strategy, LDF, Infrastructure Delivery Plan and other key documents by all partners.		**PRC: SDS** LSP: • Thames Water: water efficiency • EA: external relations • NHS: public health • Natural England: planning and advocacy		
2.5. Identify priority actions (high risk climate change impacts). • Identify 'quick wins' and implement adaptation action • Define methodology/procedure for adaptation • Assessment of benefits of adaptation and monitor effectiveness of adaptation	Review completed by September 2010	• **PRC: SDS** • **Planning Policy/Urban Design** LSP: • Thames Water: water efficiency • EA: external relations • NHS: public health • Natural England: planning and advocacy	• Action Plan/ adaptation strategy for quick wins • Review of climate change adaptation quick wins completed by September 2010 • Incorporate SUDS (Sustainable Drainage Systems) into a range of services across the borough (schools, new development, existing housing estates, parks), prioritising high risk areas	• SPD on Floods • Sustainable Drainage, London Rivers Action Plan • Wandle Valley Regional Park • IDP • Quick wins Action Plan completed

Action	Deadline	Partners (Those responsible in bold)	Milestones and Targets	Progress to date
2.6. Develop adaptation pathways: • Identify adaptation actions for priority risks • Develop adaptation pathways • Assign actions • Monitor actions	March 2011	• **PRC: SDS** • **Risk management and Emergency Planning** LSP: • Thames Water: water efficiency • EA: external relations • NHS: public health • Natural England: planning and advocacy	• Adaptation pathways identified, developed and actions identified by March 2011	
2.7. Provide information to local businesses on climate change impacts to ensure preparedness	March 2012	• **Civil Contingencies Team** • **CEDC** LSP: • Thames Water: water efficiency • EA: external relations • NHS: public health • Natural England: planning and advocacy	• Risk workshop for ECCP • E-Bulletins/newsletter includes information • Number of key local businesses (e.g. NHS, Metropolitan Police) with climate change adaptation actions plans	• The civil contingencies team will implement the awareness of climate change within its business continuity promotional strategy to local businesses and the voluntary sector. This will also be incorporated into the Emergency Planning Warning and Informing Strategy, which is currently under review.
2.8. Monitoring and review of the strategy and actions.	Annual Review	• **PRC: SDS** • **Risk management and Emergency Planning** LSP: • Thames Water: water efficiency • EA: external relations • NHS: public health • Natural England: planning and advocacy	• Annual scrutiny to review performance and ensure departments remain on tract • The climate change strategy should be reviewed annually to ensure it is in line with climate change trends and technological advances • Every 3 years the strategy should undergo a comprehensive redrafting, ensuring long-term planning (40 years) is maintained	

9

'Quick wins' additional action plan

This action plan is categorised by climate change risk, indicating the 'quick win' actions required for climate change adaptation in Croydon over the next 3 years, some of which are already underway. This 'quick wins' action plan has been developed in addition to the NI188 guidelines action plan to allow for progress to be made now and to document existing streams of work within the council that are already contributing to adaptation to climate change over the long term.

9.1. Where we are now?

9.1.1. Flood and water management act, April 2010

One of the priority risks in Croydon, as identified in the LCLIP is surface water flooding. The Flood and Water Management Act 2010 and Flood Regulations 2009 have great implications for the management of water resources and infrastructure as well as the responsibilities of the water companies for surface water flooding. The Act introduces new requirements affecting the development and use of land. This will provide better, more comprehensive management of flood risk for people, homes and businesses. It will also help tackle bad debt in the water industry, improve the affordability of water bills for certain groups and individuals, and help ensure continuity of water supplies to the consumer.

The Act and Flood Regulations give local authorities statutory responsibility as the Lead Local Flood Authority (LLFA), this means that attention to future flood risk is now of paramount importance. LLFAs will be responsible for ensuring coordinated management of flooding from surface water, groundwater and ordinary watercourses (including lake, pond, and other areas of water which flow into an ordinary watercourse). This is the first time surface water flooding has been assigned in law. Responsibility for rivers, coast and reservoir remains with the Environment Agency.

Each LLFA has to deliver a Preliminary Flood Risk Assessment (PFRA), this identifies areas where flood risk is significant. The LLFA must also produce Flood Risk / Flood Hazard Maps and ensure that a Flood Risk Management Plan is produced for its area in order to develop, maintain, apply and monitor a strategy for local flood risk management. In addition LLFA will have a role to investigate flooding events and develop and maintain a public register of Flood Risk Management Assets. The Environment Agency, Local Authorities and Internal Drainage Boards, are 'designating authorities' who may designate features with a Flood Risk Management role. This means that owners of structures included on a register of structures must seek formal approval prior to alteration, demolition or replacement. The LLFA will have a duty to assess applications and issue decisions in these circumstances. The LLFA is also now responsible for approving drainage systems. The LLFA will have to determine approval for drainage schemes linked to new development. This puts emphasis on the Sustainable Urban Drainage Systems (SUDS) as part of new developments.

Many of the new statutory requirements placed on the borough are being addressed through the borough's involvement in the London-wide Drain London project. This project will help deliver on some of Croydon's new responsibilities through the formulation of a Surface Water Management Plan (SWMP).

9.1.2 Drain London

Drain London is a GLA led project focussed on surface water flooding. A SWMP will be produced for each of the London boroughs to help identify surface water flood risk and reduce the vulnerability of specific areas to this form of flooding. Organisations responsible for the management of surface water will all be involved in Drain London.

A SWMP is a framework through which key local partners with responsibility for surface water and drainage in their area work together to understand the causes of surface water flooding and agree the most effective way of managing surface water flood risk. The purpose is to make sustainable urban surface water management decisions that are evidence based, risk based, future proofed and inclusive of stakeholder views and preferences. This programme of work is not just about mapping features and assets but also capacity, condition and flood risk and how this will change in light of climate change.

There are a number of challenges inherent in developing a programme of work such as this in greater London. If all boroughs were to prepare SWMPs in isolation, it would risk duplication of effort and expense, plus solutions which simply transfer problems to neighbouring areas. To avoid this, Drain London has grouped boroughs into planning areas, which share physical features such as river corridors, key drainage infrastructure and/or administrative links. They will then coordinate the delivery of plans by the different areas, provide project support and encourage the sharing of best practice. A key objective is to avoid solutions to flooding in just one borough. Croydon has been grouped into a planning area with neighbouring Sutton, Kingston and Richmond.

9.1.3. Strategic flood risk assessment

The Strategic Flood Risk Assessment (SFRA) provides information on flood risk, which enhances what is currently available, and raises and informs a crucial debate involving spatial planning decision makers and their development management colleagues. In the near future the CREW research will provide a valuable analysis of how this flood risk will change in light of climate change projections.

Croydon has undertaken a joint SFRA with the boroughs of Merton, Sutton and Wandsworth, which was carried out in accordance with Planning Policy Statement 25: Development and Flood Risk (PPS 25).

The objectives of the SFRA are listed below:

- Provide an assessment of the impact of all potential sources of flooding in accordance with PPS25 including an assessment of any future impacts associated with climate change and sea level rise
- Enable planning policies to be identified to minimize and manage flood risks for the whole of each borough
- Provide the information needed to apply the sequential test for the identification of land suitable for development in line with the principles of PPS25
- Provide baseline data to inform the sustainability appraisal of development plan documents (DPDs) with regard to catchment-wide flooding issues that affect the study area
- Allow each borough to assess the flood risk for specific development proposal sites thereby setting out the requirements for a site-specific flood risk assessments (FRAs)
- Enable each borough to use the SFRA as a basis for decision-making at the planning application stage
- Provide, where necessary, technical assessments and assistance to the authorities to demonstrate that developments located in flood risk areas are appropriate and in line with the requirements of the exception test.

9.1.3.1. Managing flood risk

There are a number of relatively simple measures that provide very effective flood alleviation as well as providing additional recreation, amenity and ecological improvements to an area. They range from the development of parks and open spaces through to river restoration schemes, for example the Norbury Brook and River Wandle de-culverting schemes. While an early prefeasibility study has been conducted for de-culverting the Norbury Brook in Norbury Park, de-culverting of the River Wandle in Wandle park is much closer to realisation with final funding being sought. These projects will provide wider ecological, biodiversity and sustainability benefits for the borough. The basic function of these techniques is to increase flood storage and the storage or conveyance of rainwater. Typical measures include various types of pools, ponds, and ditches which all have the added benefit of improving the ecological and amenity value of an area. They may also provide recreational areas and encourage activities such as walking, cycling or wildlife watching.

Where development in flood risk areas is unavoidable, the most common method of mitigating flood risk is to ensure habitable floor levels are raised above the maximum flood water level. The Environment Agency suggest a 300mm freeboard on the 1 in 100 year fluvial flood levels and 1 in 200 year tidal flood levels when setting finished floor levels in undefended areas (600mm freeboard is required for less precisely computed levels).

It is also necessary to ensure that proposed road levels are such that emergency access and evacuation routes are maintained where possible at the 1 in 1000 year flood level. As with the land raising option, it is imperative that any assessment takes into consideration the volume of floodwater potentially displaced by carrying out this work.

9.1.3.2. Flood resistance

Flood resistance measures aim to prevent floodwaters from entering a property and damaging its fabric. Following the UK floods in 2000, the use of demountable flood barriers and door flood guards for individual properties has become more common. If installed correctly, in advance of a flood event these measures can work effectively. This supports the requirement for a communications plan to run alongside the SFRA, targeting high risk priority flood risk areas.

The use of temporary resistance measures is considered appropriate for existing properties, however they are not recommended for new developments. This is because the temporary measures require human intervention and continued maintenance which cannot be guaranteed. Permanent flood resistance measures such as use of low permeability materials to prevent water ingress are therefore recommended for new developments.

9.1.3.3. Flood resilience

Increasing resilience to flood damage reduces the cost of flood events and ensures that buildings can be swiftly returned to normal use following a flood event. The DCLG has recently released the report 'Improving the Flood Performance of New Buildings' which provides guidance on appropriate measures for increasing flood resilience. These measures are applicable to both existing properties and new build and can reduce residual flood risk whilst also improving the insurability of homes in flood risk areas. The guidance identifies the key flood resistant measures as being:

- replace timber floors with concrete and cover with tiles
- replace chipboard/MDF kitchen and bathroom units with plastic equivalents
- replace gypsum plaster with more water-resistant material, such as lime plaster or cement render
- move service meters, boilers, and electrical points well above likely flood levels
- put one-way valves into drainage pipes to prevent sewage backing up into the house

9.1.4. Sustainable Drainage Systems (SUDS)

SUDS are a key focus of the new Flood and Water Management Act 2010, through which the Secretary of State will publish National Standards covering the design, construction, operation and maintenance of Sustainable Drainage Systems.

Traditionally built developments have used piped drainage systems to manage surface water and convey surface water run-off away from developed areas as quickly as possible. Typically these systems connect to the public sewer system for treatment and/or disposal to local watercourses. Whilst this approach rapidly transfers surface water from developed areas, the alteration of natural drainage processes can potentially impact on downstream areas by increasing flood risk and reducing water quality. Receiving watercourses are therefore much more sensitive to rainfall intensity, volume and catchment land uses after a catchment or areas of a catchment have been developed.

Due to the difficulties associated with upgrading sewer systems it is uncommon for sewer and drainage systems to keep pace with the rate of development/re-development and increasingly stringent restrictions are also being placed upon discharges to watercourses. As development continues and/or urban areas expand these systems can become inadequate for the volumes of surface water that are generated, resulting in increased flood risk and/or pollution to watercourses. This may be exacerbated by the impacts of climate change on rainfall intensities, which may lead to flash floods in catchments and the overloading of piped systems. In addition, as flood risk has increased in importance within planning policy, a disparity has emerged between the design standard of conventional sewer systems (typically 1 in 30 years), and the typical flood design standard (1 in 100 years) that should be considered for residential development. This has resulted in drainage inadequacies for the flood return periods considered for new developments, often resulting in potential flood risk from surface water and combined sewer systems.

PPS 25 indicates that regional Planning Bodies and Local Authorities should promote the use of SUDS for the management of surface water runoff generated by development. PPS 25 requires that new development does not exacerbate flood risk elsewhere, which means there is a need to control drainage and runoff to ensure there are no increases in overland flow as a result of the new development.

The Code for Sustainable Homes requires that the pre-development surface water run off for a site is not exceeded by the post-development run off for all levels of the Code. Additional credits are available for reducing the surface water run off below a certain percentage of pre-development run off. The incorporation of suitably designed SUDS into a development thus can contribute to other assessment criteria under the Code for Sustainable Homes, including credits under the ecology category.

9.1.5. Biodiversity

Croydon is well regarded for its large expanse of open space, much of which is managed for nature conservation. Over one third of Croydon has been designated as Metropolitan Green Belt, the majority of which is 'Heritage Land'. However, Croydon has seen huge development pressure in recent years and it is important that direct loss of habitat and species is not a result of this further growth and development in the borough. It is especially important that we prevent the fragmentation of these habitats in light of climate change as development can also impact negatively by isolating less mobile species.

With climate change projections forecasting a rise in average annual temperature and an increase in extreme weather events, species must be given opportunity to move from space to space enabling them to find suitable habitats that might provide more shelter and to avoid heat stress within a more dynamic climate. It is therefore essential that opportunities for enhanced biodiversity through initiatives such as habitat management and creation, SUDS and green roofs should be maximised.

These are objectives set out in the Croydon Council Biodiversity Action Plan (in preparation), and the overlapping themes have been documented in this Action Plan, expanding the targets to encourage more long term planning for climate change adaptation.

The proposed Green Grid and Rivers Strategy will also address many of these areas in providing new and/or enhancing existing public open spaces, reducing areas of deficiency. This strategy will provide better public access to green spaces and rivers for walking and cycling, providing more recreational areas through the promotion of healthy living. Many of the strands of work addressed in the Green Grid Rivers Strategy will target objectives related to climate change mitigation and adaptation in a holistic manner, incorporating all aspects of climate change adaptation as raised in this action plan, such as managing flood risk through the provision of multi-functional spaces.

Climate change will impact directly on biodiversity as well as people. For, example, hotter temperatures may lead to a change in species composition in certain habitats. Adaptation measures adopted to respond to flooding, drought and overheating could also benefit biodiversity. For example, measures to restore natural floodplain functions could restore habitats and benefit species, as could "urban greening" measures needed to keep London cool. However, if opportunities are not actively identified, such biodiversity benefits could be missed, or biodiversity benefits could be harmed by unsympathetic climate change adaption activities.

It is essential to preserve green spaces as well as street trees and woodland through the enhancement of natural resilience thus preserving local ecosystem services. These include the provision of clean water, soil fertility, air filtration, climate regulation, health and wellbeing as well as areas to grow food and provide residents with a sense of place.

Private and communal gardens as well as school gardens and allotments in Croydon, many under 0.25ha, are the most common settings where people come into contact with wildlife on an almost daily basis- and furthermore can directly influence the success of local biodiversity. The borough's network of private gardens also account for a large land area within the borough, and contain a number of ponds, grassland areas and flowering plant species. Estimates of the minimum total surface area of private gardens within the borough in 2003 placed these at 15.67 sq. km or 18% of the total borough surface area (86.46 sq. km), which represents a significant amount of land, and so potentially an important influence on the health or decline of local flora and fauna.

The face of the traditional 'garden' is changing, offering new opportunities for biodiversity to thrive with vertical gardens, habitat walls, and green roofs becoming increasingly popular. Gardening is an activity which can offer a wide range of rewards both to the gardener and to the physical and human environment. A challenge is to enable local gardeners and allotment holders to care for their patches in an environmentally sustainable manner.

In addition to this challenge one must consider the change in seasonality of rainfall as a result of climate change and how this will impact on the management of gardens for food growing and allotment sites. As a result on site water storage for allotments will need to be considered as well the marketing of drought resistant species.

There are 20 allotment sites in Croydon, all of which are of variable sizes and in high demand, with a two year waiting list for most sites. There are a number of sites which are of poor quality and would otherwise provide more productive space for growing. Addressing this would instantly free up more growing space for those on the 2 year waiting list.

Croydon has a long tradition of community action through the network of Friends of Park groups and other local conservation groups and societies. Local people are actively involved in looking after green spaces, woodlands and nature areas, as well as making wildlife improvements to local parks and other green open spaces. A monthly programme of free guided wildlife walks and events raises awareness and educates people about the importance of the variety of natural habitats found in Croydon and how they are managed. Newsletters, publications and illustrated talks are delivered by a variety of groups such as the Old Surrey Downs Project, Croydon Royal Society for the Protection of Birds (RSPB) and Croydon Natural History and Scientific Society. It is important that this communication to the public is continued.

9.2 Additional 'quick wins' action plan

Objective: To formulate all current actions and 'quick wins' for climate change adaptation

Aims:

- to reduce flood risk
- to expand local tree planting programmes and green roof and wall development to reduce heat stress and attenuate flood waters
- to secure the provision of good quality allotments and encourage 'growing your own' in household gardens
- to maximise opportunities for the expansion of biodiverse habitats in the borough and prevent habitat loss from development and unsympathetic adaptation activities

Risk 1. Flooding

Aims:

- to minimise flood risk within the borough from fluvial and surface water flooding
- to assess the impact of climate change on flood risk and how risk will change across the borough in terms of flood depth and area coverage
- to ensure that buildings are well equipped with flood resilience measures and are aware of the risks in their area

Action	Deadline	Partners	Milestones and Targets	Progress to date
1.1 Strategic Flood Risk Assessment	March 2012	**LBC: Spatial Planning** Defra / Environment Agency / Drain London / adjoining boroughs	To include data from CREW when available allowing the change in flood risk as a result of climate change to inform future long-term planning and policy decisions	• Joint Strategic Flood Risk Assessments completed in Dec 2008. Has informed preparation of the LDF Core Strategy Issues and Options Report (2009) and the Further Regulation 25 Core Strategy Report (consultation) • Latham's Way was identified as being located in Flood Zone3a with a high probability of flooding
1.2. Drain London Surface Water Management Plan (Green infrastructure report reference 3006.001)	March 2011	**LBC: Spatial Planning** / Environment Agency / Thames Water / Sutton and East Surrey Water / Drain London / adjoining boroughs	• Identify potential critical area projects to justify further investigation of pluvial flooding as part of tier 3 • Develop Critical Drainage Area Action Plans for high risk areas • Early SWMP Autumn 2010 • Mid SWMP Dec2010/Jan 2011 • Final SWMP March 2011	• Tier 2 Pre-qualification questionnaire completed mid June • Tier 2 Invitation to tender completed late June • Appointment of consultants completed Mid July • Surface Water Management Plan (SWMP) Scoping report completed: 2010 • Purley town centre has been identified as a critical drainage area
1.3 De-culverting the River Wandle Park	Early 2012	**LBC: Spatial Planning** / LBC Community Services / Environment Agency, Barratts	• Remove culverts and return back to a wetland area and floodplain	• Heritage Lottery fund secured • Archaeological survey started

Action	Deadline	Partners	Milestones and Targets	Progress to date
1.4 Soakaway cleansing and refurbishment programme	Ongoing	**LBC: Traffic and Engineering** / Private contractors	To treat priority areas for action from an ancillary drainage cleaning programme within the southern half of the borough and areas flooded in the past • 300 soakaways treated by end of 2010	• Programme started in 2008/09 and is well underway • Finance has been increased for 2010/11
1.5 De-culverting of Norbury Park	2013	**LBC: Spatial Planning** / Environment Agency	• Remove culverts and return back to a wetland area and floodplain	• Pre-feasibility study and report completed. • Funding is currently being secured. The progression of the project will be subject to Lottery funding (July 2010)
1.6 Flood Study of Purley to be commissioned	March 2011	**LBC: Traffic and Engineering** / Environment Agency	• Study to be completed by March 2011	
1.7 Purley Oaks pond pumping station pump refurbishment, cleansing and de-silting programme	March 2011	**LBC: Traffic and Engineering** / Environment Agency	• Testing. Samples from ponds to be analysed in laboratory • Apron Cleaning	
1.8 SUDS (Sustainable Urban Drainage Systems) implemented into sustainable water management strategies for new developments/ renovations /engineering works in the borough (Green Infrastructure Report reference 3006.003)	Ongoing	**LBC: Spatial Planning** / Environment Agency	• Develop a formal register for green roofs in the borough, this is a requirement under the Flood and Water Management Act 2010 • Ensure SUDS are built into planning policy for new developments and engineering works to be carried out on existing infrastructure. • The Thames Water sewer flooding records show that parts of Coulsdon, South Norwood, Streatham Vale and Selhurst are susceptible to significant sewer flooding. SUDS techniques should therefore be applied in these areas to ensure that existing sewer flooding problems are not exacerbated.	

Risk 2. Increasing the resilience of Croydon's built environment to the effect of climate change

It is essential that the built environment can be developed to withstand and reduce the risk of climate change impacts. The Mayor of London has made a proposal in the Mayor's Transport Strategy (2010) to work with Tfl, Dft and other stakeholders to help determine the vulnerability of transport assets and existing infrastructure. Green spaces and trees can not only provide flood attenuation but also a cooling effect which will reduce the impact of heat waves. These spaces will improve the connectivity of green spaces within the borough.

Aims:

- adaptation measures must be incorporated to ensure that the built environment and infrastructure can withstand hotter weather, drier summers and increased precipitation levels in winter
- to encourage the development of green roofs and walls in new build
- provide street trees in deficient areas
- promote 'growing your own' through the development of new allotment site, the improved quality of existing allotments and develop methods to manage these sites sustainably taking into account the impact of climate change on water availability

Action	Deadline	Partners	Milestones and Targets	Progress to date
2.1 The provision of green roofs.	Ongoing	LBC: Spatial Planning	• Develop method of data collection on the number of green roofs in planning applications • Gather data and provide an assessment of the number of green roofs in the borough • Identify the provision for additional green roofs and set targets for their inclusion in new developments • Green roof fund available to encourage green roof development in critical flood risk areas.	• 4,200sqm of green roofs have been mapped so far The following developments have incorporated green roofs into their design • Davidson Road • 'Bridge House' and 'the Exchange' – Surrey Street • Impact House – Edridge Road • Centre View Apartments – Whitgift Street • Mayday Road (Living Roof) • London Road • Barratts Development – Purley Way (deck garden) • Lloyd Park pavilion
2.2 The provision of Green Walls.	Ongoing	LBC: Spatial planning	• Develop method of data collection on the number of green walls in planning application • Gather data and provide an assessment of the number of green walls in the Borough. • Identify the provision for additional green walls and set targets for their inclusion in new developments	

Action	Deadline	Partners	Milestones and Targets	Progress to date
2.3 To ensure that building design and infrastructure is developed to withstand the effects of climate change including increased heat stress and precipitation.	2012	LBC: Spatial Planning/ Transport and Engineering	• Adaptation criteria embedded into the planning stage for new build and infrastructure changes in the borough	• Heritage Lottery fund secured • Archaeological survey started
2.4 Tree planting programmes for streets and the provision of species that will cope with extreme weather conditions with regards to temperature and precipitation levels. (Green Infrastructure Report reference 3007.001)	2012	LBC: Trees and Woodland	• Agree funding for tree planting programme in areas of deficiency and new developments: North Wood, A23 North, South Wandle, CMC, New Addington, Purley, Coulsdon town centres, A23 South • Identify where there are suitable spaces within these areas for tree planting.	• The Green Infrastructure report has identified areas deficient in trees providing a cooling effect; this includes new developments where private funding can potentially be gained. • Tree planting programme already agreed for Broad Green. 60 trees planned for planting. Funding from the Mayor of London's Trees for Streets has been applied for (June 2010).
2.5 Make temporary spaces on brownfield and derelict land available for temporary allotments or grow bag schemes. (Green Infrastructure report reference 3005.003)	2017	LBC: Community Services	• Map brown field sites across the borough identifying potential sites, dependent on biodiversity value and fertility, for temporary lease. • Greening brownfields: temporary lease, landstock database available by 2017	
2.6 To encourage 'growing your own' to the local community, including schools and private business. (Green Infrastructure Report reference 3005.002/004/001)	2020	LBC: Community Services	• Grow Green: education, grant and know-how support for urban agriculture • Encourage Market Landshare schemes	• Addington Food Learning Centre
2.7 To provide more areas for growing in densely populated areas of the borough. (Green Infrastructure Report reference 3005.005)	2032	LBC: Community Services	• New allotment sites: South Norwood Park, Pollards Hill, expand Micklen Way • Promote the use of temporary 'Growing Bag Allotments' • To introduce productive vegetation (fruit trees) in public open spaces	• New allotment sites identified in the Green Infrastructure Report
2.8 Improve the quality of existing allotments. (Green Infrastructure Report reference 3005.006)	2017	LBC: Community Services	• Out of the 18 allotment sites, 6 direct lets run by the council, 10 within privately owned land and 2 which are being considered for direct management, identify sites within which there are empty, poor quality allotments.	

3. Biodiversity

Aims:

- ensure that biodiverse habitats and open spaces are preserved within the borough, ensuring that new developments and other adaptation measures do no result in the lost of open spaces and habitat
- promote the connectivity of green spaces across the borough
- encourage the use of species that will adapt to the changing climate, for example drought resistant plants

Action	Deadline	Partners	Milestones and Targets	Progress to date
3.1 Ensure that the biodiversity potential of green roofs is promoted through policy within the LDF. (as referenced in the BAP)	2011	LBC: PRC	PRC to confirm with LDF progress	LDF Core Strategy Issues and Options Report (2009) and the Further Regulation 25 Core Strategy Report (consultation) 2010 promote urban greening, including green roofs
3.2 Ensure threats to biodiversity and opportunities for biodiverse adaptations are fully incorporated into the management of the Croydon's parks and plans for new developments. (as referenced in BAP)	2012	LBC: Community Services	• Review all 127 parks management regimes for opportunities to create 'robust' grasslands and less close mown amenity turf. Exploring options for water management in light of climate change projections and opportunities for species selection e.g. drought tolerant acid grassland in place of amenity/neutral grass. • Increased risks of fire damage on biodiverse sites managed through creation of fire breaks.	• 10 hectares identified for new mowing regime to favour meadow creation
3.3. Monitor species diversity for species loss and gain in Green spaces	2015	LBC: Community Services	• Submit annual records to GIGL (Greenspaces Information for Greater London) and monitor trends. Specifically: • Butterfly transect in Happy Valley • London Bat Group transect Addington Hills, Happy Valley and South Norwood Lake	• Annual programme underway 2010
3.4. Monitor habitat loss/gain and success of any management changes	2015	LBC: Community Services	• Submit records to GIGL (Greenspaces Information for Greater London) and monitor trends. • Chalk downland • Heathland • Woodland • SSSI condition assessment for : • Farthing Downs and happy valley Croham Hurst.	• BAP monitoring to commence 2011

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Glossary of terms

BAP	*Biodiversity Action Plan*
BME	*Black and Minority Ethnic*
CCAAP	*Climate Change Adaptation Action Plan*
CREW	*Community Resilience to Extreme Weather (the project 'Community Resilience to Extreme Weather' (CREW) has been established to gain a better understanding of the effects of future climate change on extreme weather events, and to develop a set of tools for improving local-community resilience)*
CMC	*Croydon Metropolitan Centre*
The Code for Sustainable Homes	*A national standard for sustainable design and construction*
DCLG	*Department of Communities and Local Government*
DEFRA	*Department of Food and Rural Affairs*
EA	*Environment Agency*
ECCP	*Environment and Climate Change Partnership*
EWE	*Extreme Weather Events*
Freeboard	*Freeboard is a 'safety margin' to account for residual uncertainties in water level prediction and/or structural performance. It is the difference between the height of a flood defence or floor level and the design flood level. Freeboard should account for uncertainty in hydrological predictions, wave action, modelling accuracy, climate change, topographical accuracy, final flood defence levels and quality of the digital elevation models.*
GHG	*Green House Gas (gases in the atmosphere that absorbs and emit radiation within the thermal infrared range. This process is the fundamental cause of the greenhouse effect. The primary greenhouse gases in the Earth's atmosphere are water vapor, carbon dioxide, methane, nitrous oxide, and ozone)*
HEEP	*Home Energy Efficiency Programme (now known as RE:NEW)*
IPCC	*Intergovernmental Panel on Climate Change (This is a scientific intergovernmental body tasked with evaluating the risk of climate change caused by human activity. The panel was established in 1988 by the World Meteorological Organisation and the United Nations Environment Programme, two organisations of the United Nations)*

11 Glossary of terms

KtCO2	*Thousand Tonnes of Carbon Dioxide*
LAA	*Local Area Agreement (Local area agreements (LAAs) are three-year action plans for achieving better outcomes, developed by councils with their partners in local strategic partnerships (LSP)*
LCE	*Low Carbon Economy*
LCLIP	*Local Climate Impacts Profile*
LDF	*Local Development Framework*
LLFA	*Lead Local Flood Authority*
LSP	*Local Strategic Partnership (A local strategic partnership (LSP) is a non-statutory body that brings together the different parts of the public, private, voluntary and community sectors, to work at a local level. The lead role in the LSP is taken by the local council)*
NI	*National Indicator (the National Indicator Set is the only set of indicators on which central government will manage the performance of local government. It covers services delivered by local authorities alone and in partnership with other organisations like health like health services and the police)*
NRF	*Neighbourhood Renewal Report*
ppm	*Parts per million*
PFRA	*Preliminary Flood Risk Assessment*
PRC	*Planning Regeneration and Conservation*
RSPB	*Royal Society for the Protection of Birds*
SDS	*Sustainable Development Service*
SER	*State of the Environment Report*
SFRA	*Strategic Flood Risk Assessment*
SRES	*IPCC Special Report on Emissions Scenarios*
SUDS	*Sustainable Urban Drainage Systems (A sequence of water management practices and facilities designed to drain surface water in a manner that will provide a more sustainable approach than what has been the conventional practice of routing run-off through a pipe to a watercourse)*
SWMP	*Surface Water Management Plan*
UKCP09	*UK Climate projections 2009 (http://ukclimateprojections.defra.gov.uk/)*

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References

River Restoration Centre (2009) ***London Rivers Action Plan***

Environment Agency (2007) – ***The social impact of heatwaves,***

Environment Agency (2010) ***The benefits of green roofs***

Defra, 2009, ***UK Climate Projections*** *(http://ukclimateprojections.defra.gov.uk/)*

Stern, N, 2009, ***A Blueprint For A Safer Planet: How we can save the world and create prosperity****, Vintage Books, London.*

Scott Wilson, Dec 2008, ***London Boroughs of Wandsworth, Merton, Sutton and Croydon, Strategic Flood Risk Assessment****, Level 1 Final Report.*

London Climate Change Partnership, Oct 2009, ***Adapting to Climate Change; Creating Natural Resilience****, Technical Report*

City of London, 2010 update, ***Climate Change Adaptation Strategy, Rising to the Challenge***

The River Restoration Centre, Jan 2009, ***The London River Action Plan; A tool***

London Borough of Croydon, 2010, Draft ***Green infrastructure Report***

London Borough of Croydon, 2010, ***Draft Biodiversity Action Plan***

London Borough of Croydon, Scott Wilson, 2008, ***Strategic Flood risk Assessment***

*London Borough of Croydon, 2010, Final Draft S****urface Water Management Plan, Phase 1 Scoping Study***

London Borough of Croydon, 2010, ***We Are Croydon: this is our vision,***

London Borough of Croydon, Scott Wilson, Jan 2010, ***Local Climate Impacts profile for London Local Authorities; Croydon***

Mayor of London, 2010, ***The Mayor's Transport Strategy***

Croydon Strategic Partnership involves key decision makers from the public, private and the voluntary and community sector organisations in Croydon

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