

Mayor of London's

Draft Climate Change Adaptation Strategy

Sustainability Appraisal Report

Part A: Sustainability Context



February 2010

Prepared for the Greater London Authority

by

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with Centre for Research into Environment and Health (CREH)

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February 2010

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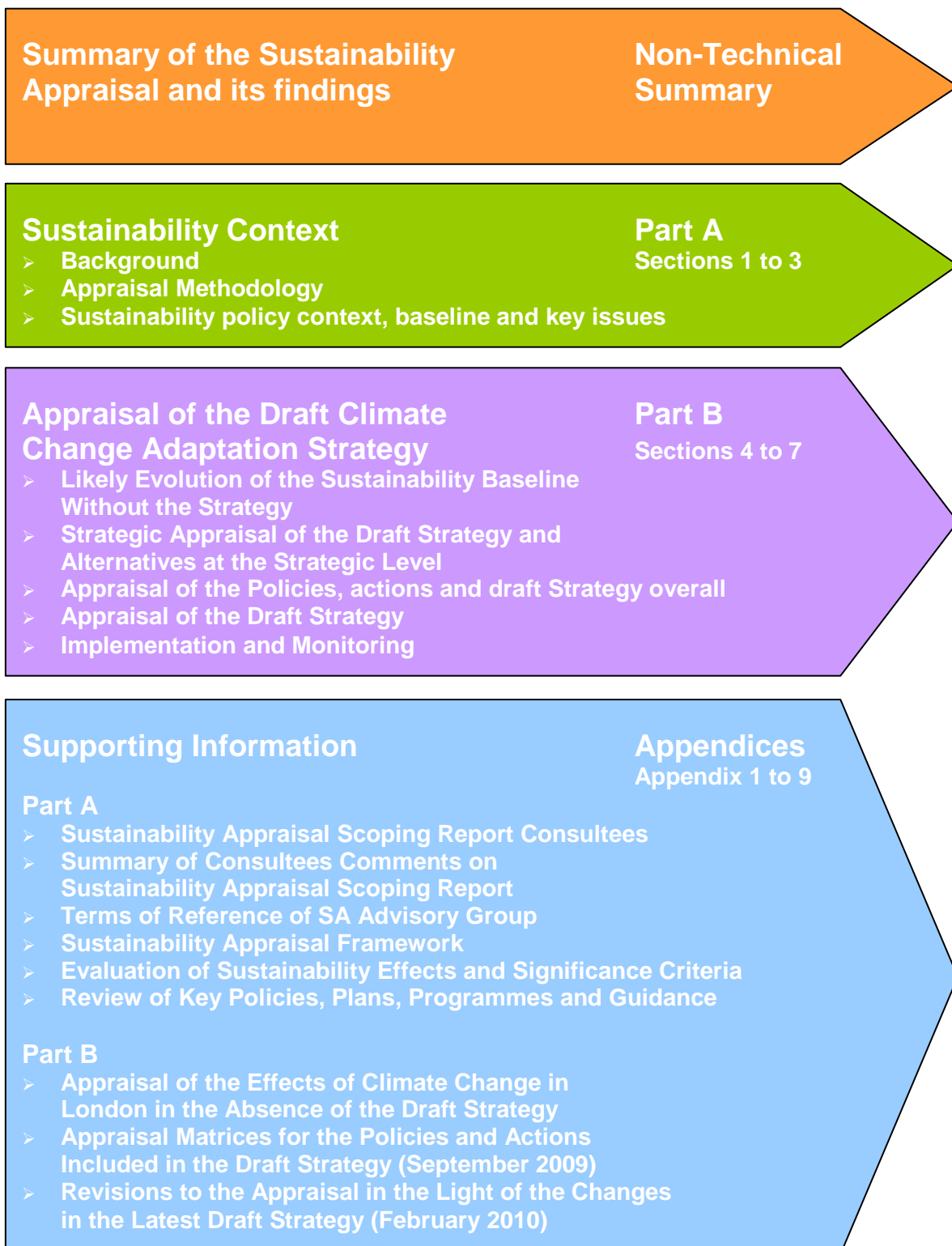
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ABBREVIATIONS

ABI	Association of British Insurers	IIA	Integrated Impact Assessment
AQMA	Air Quality Management Area	IPCC	Intergovernmental Panel on Climate Change
BAP	Biodiversity Action Plan	km	Kilometre
BAU	Business as usual	LCCP	London Climate Change Partnership
BAU+50	Future business as usual in 50 years time	LDA	London Development Agency
BME	Black and minority ethnic	LDF	Local Development Framework
BREEAM	BRE Environmental Assessment Method	LDD	Local Development Document
CAMS	Catchment Abstraction Management Strategy	LDEPA	London Fire and Emergency Planning Authority
CCAS	Climate Change Adaptation Strategy	LHC	London Health Commission
CCAS	Climate Change Adaptation Strategy	LSC	London Skills Council
CEP	Collingwood Environmental Planning	LSDC	London Sustainable Development Commission
CET	Central England temperature	MEP	Member of the European Parliament
CFMP	Catchment Flood Management Plan	MPA	Metropolitan Police Association
CIWEM	Chartered Institution of Water and Environmental Management	MPS	Metropolitan Police Service
CIRIA	Construction Industry Research and Information Association	NO ₂	Nitrogen Dioxide
CO ₂	Carbon Dioxide	NO _x	Nitrogen Oxides
CO ₂ e	Carbon Dioxide Equivalent	ODPM	Office of the Deputy Prime Minister
COMEAP	Committee on the Medical Effects of Air Pollution	OFWAT	Office of Water Services
CREH	Centre for Research into Environment and Health	PLA	Port of London Authority
CSO	Combined sewer overflow	PM10	fine particulate matter
DCLG	Department for Communities and Local Government	PPG	Planning Policy Guidance
DCLG	Department for Communities and Local Government	PPS	Planning Policy Statement
DEFRA	Department for Environment Food and Rural Affairs	RBMP	River Basin Management Plan
DMA	District metering area	RFRA	Regional Flood Risk Appraisal
DTI	Department of Trade and Industry	RPHG	Regional Public Health Group
EC	European Commission	SA	Sustainability Appraisal
EDS	Economic Development Strategy	SAC	Special Areas of Conservation
EEA	European Environment Agency	SEA	Strategic Environmental Assessment
EEC	European Economic Community	SFRA	Strategic Flood Risk Assessment
EqIA	Equalities Impact Assessment	SOER	State of the environment report
EU	European Union	SPA	Special Protection Area
FoE	Friends of the Earth	SPG	Supplementary Planning Guidance
GCSE	General Certificate of Secondary Education	SSSI	Sites of Special Scientific Interest
GLA	Greater London Authority	SUDS	Sustainable Drainage Systems
GOL	Government Office for London	SWMP	Surface Water Management Plan
GP	General practitioner	TE2100	Thames Estuary 2100
HIA	Health Impact Assessment	TfL	Transport for London
HMG	Her Majesty's Government	UHI	Urban Heat Island
HSE	Health and Safety Executive	UK	United Kingdom
		UKCIP	United Kingdom Climate Impacts Programme
		UKCP09	UK Climate Projections 2009
		UKWIR	UK Water Industry Research
		WFD	Water Framework Directive
		WHO	World Health Organisation
		WRMU	Water Resources Management Unit

HOW TO FIND YOUR WAY AROUND THE SUSTAINABILITY APPRAISAL REPORT



HOW TO COMMENT ON THE SUSTAINABILITY APPRAISAL REPORT

Details on how to comment on the Sustainability Appraisal Report are provided below.

Public consultation on the draft Climate Change Adaptation Strategy and the Sustainability Appraisal Report runs from **09 February 2010** for 3 months.

All the comments must be received by **5pm on 09 May 2010**.

Comments can be provided by:

Post: London Climate Change Adaptation
Post Point 19
Freepost LON15799
City Hall
The Queen's Walk
London
SE1 2BR

Email: adaptation@london.gov.uk

Web: <http://www.london.gov.uk/climatechange/strategy> where copies of this SA Report can be downloaded along with the draft Climate Change Adaptation Strategy.

When you comment please include:

- Your full name
- Full postal address
- Your email address
- Where possible, the pages, section titles and paragraph numbers (and/or appendix numbers) of the Sustainability Appraisal Report your comments / concerns relate to; and
- Any suggested detailed amendments to the Sustainability Appraisal Report to reflect your comments / concerns and any amendments to the preferred options you think should be made as a result.

NON-TECHNICAL SUMMARY

[see separate volume]

PART A: SUSTAINABILITY CONTEXT

1. BACKGROUND

The Mayor's Draft Climate Change Adaptation Strategy

Background to the Strategy

- 1.1 The Greater London Authority Act (GLA Act), which gained Royal Assent on 23 October 2007, gives the Mayor of London and the London Assembly a new set of additional powers including a lead role in tackling climate change. Under the GLA Act 2007 the Mayor will '*be subject to a duty to address climate change, and publish a London climate change mitigation and energy strategy and an adaptation to climate change strategy for London*¹.
- 1.2 In preparation for the new climate change duties, the Mayor of London and the GLA began drafting a Climate Change Adaptation Strategy (CCAS) in October 2006. The aim of the Mayor's draft CCAS is '*to assess the consequences of climate change on London and to prepare for the impacts of climate change and extreme weather to protect and enhance the quality of life of Londoners.*²
- 1.3 The Mayor's draft CCAS seeks to undertake seven key tasks³: It
- analyses London's vulnerability to weather related risks;
 - uses climate change projections to identify how climate change accentuates existing risk and creates new risks and opportunities;
 - prioritises key climate risks and opportunities for London;
 - provides a framework that identifies actions where the GLA is uniquely placed to act, actions for other stakeholders and collaborative working and priorities for further work;
 - establishes a strategic process by which London can put in place the measures necessary for climate change adaptation;
 - recommends how London should capitalise on opportunities presented by climate change and become an international exemplar on adaptation; and
 - demonstrates how London can become an international exemplar on adaptation.

Draft Climate Change Adaptation Strategy Objectives

- 1.4 The draft CCAS⁴ has the following overall objectives:
1. to identify and prioritise the climate risks and opportunities facing London and understand how these change through the century
 2. to identify and prioritise the key actions required to prepare London, and to define where responsibility for delivering and facilitating these actions lies
 3. to promote and facilitate new development and infrastructure that is located, designed and constructed for the climate it will experience over its design life
 4. to improve the resilience of London's existing development and infrastructure to the impacts of climate change

¹ CLG (2007) The Greater London Authority (GLA) Act 2007 Available: <http://www.opsi.gov.uk/acts/acts2007a.htm> Accessed: 07/07/09

² Climate Change Adaptation Strategy for London, Public Consultation Draft, 28 January 2010

³ This corresponds to the scope of the Strategy, as set out in the Introduction to the Public Consultation Draft CCAS, 28 January 2010

⁴ Climate Change Adaptation Strategy for London, Public Consultation Draft, 28 January 2010

5. to ensure that tried and tested emergency management plans exist for the key risks and are regularly reviewed
6. to encourage and help business, public sector organisations and other institutions prepare for the challenges and opportunities presented by climate change
7. to promote and facilitate the adaptation of the natural environment
8. to raise general awareness and understanding of climate change with Londoners and improve their capacity to respond to changing climate risks
9. to position London as an international leader in tackling climate change.

Climate Change Adaptation Strategy Programme

1.5 The key stages in the development of the Strategy are detailed below:

- **Start** of drafting the CCAS – April 2006
- **Evolving drafts** of the CCAS – June 2006 to September 2006
- **Developing the draft CCAS** for consultation with the London Assembly and functional bodies – August 2008
- **Consultation with the London Assembly and functional bodies** – August to October 2008
- **Further revisions to the draft CCAS** for public consultation – during 2008 and 2009
- **Finalising the draft CCAS for public consultation** – June 2009 – January 2010
- **Public consultation** – February – April 2010
- **Launch** of the Mayor's CCAS – Autumn 2010.

Outline of Contents of the Draft Climate Change Adaptation Strategy

1.6 The main sections of the draft CCAS are set out below⁵:

- **Introduction:** Sets out the aims, objectives and scope of the draft Strategy

Part I. Understanding the climate of the future

- **Chapter 1 London's Future Climate:** provides a summary of the causes of climate change, the future predicted climate for London and the key impacts these changes are expected to bring.
- **Chapter 2 Mapping adaptation:** describes who is responsible for promoting and enabling adaptation in London, and identifies where the critical gaps are.

Part II. Understanding and managing the impacts

- **Chapter 3 Flooding:** describes the extent of flood risk in London and its likely sources. It details the consequences of flooding in London, and the extent to which different cohorts of Londoners are exposed to flood risk. The chapter also includes the Mayor's vision, proposed policy and actions to reduce the risk of flooding and mitigate the negative consequences of a flood.
- **Chapter 4 Drought:** describes where London gets its water from, and what the demands on this water are now and are likely to be in the future. The description of current and projected demand also outlines the vulnerability of water resources in London, and the effects of climate change on water infrastructure. The chapter also includes the Mayor's vision, proposed policy and actions to address the effects of drought in London.
- **Chapter 5 Overheating:** describes the effects on London of increased average temperatures and more frequent and intense heatwaves. The chapter also sets out the

⁵ Ibid.

potential impacts on vulnerable groups in London, and what measures might be taken to reduce the negative effects of elevated temperatures. The chapter also includes the Mayor's vision, proposed policy and actions intended to address overheating, the urban heat island effect and the effects of higher average temperatures.

Part III. Assessing the impacts on cross-cutting issues

- **Chapter 6 Health:** sets out the complex potential effects of climate change on the health of Londoners. The chapter also includes details of the indirect effects of climate change on health.
- **Chapter 7 London's Environment:** describes the ecosystem services provided by green and blue spaces in London, and what actions the Mayor intends to take to enhance these ecosystem services. The chapter also describes the likely impacts of a changing climate on London's ecosystems.
- **Chapter 8 London's Economy:** describes the vulnerabilities of London's economy to climate change, due to both local and global effects. The potential for London to lead on climate change adaptation is also outlined.
- **Chapter 9 Infrastructure:** This chapter examines the impact of climate change on London's infrastructure – transport, energy and waste. Specifically, it includes the likely effects of flooding, higher temperatures, and changes to the seasonal pattern of energy demand on London's infrastructure.

Part IV. Implementing the strategy

- **Chapter 10 Roadmap to resilience:** Sets out all of the targets and actions included in the preceding chapters and identifies lead responsibility, partners and dates for each action to be delivered by. The Roadmap also includes a number of actions for *mainstreaming adaptation across the GLA group and key sectors in London.*

The Sustainability Appraisal and the Sustainability Appraisal Report

Sustainability Appraisal of the Draft Climate Change Adaptation Strategy

- 1.7 The GLA commissioned Collingwood Environmental Planning (CEP), in association with Centre for Research into Environment and Health (CREH), in August 2006 to undertake the Sustainability Appraisal (SA) of the Mayor's draft CCAS.
- 1.8 At the same time CEP was also commissioned by the GLA to undertake the SA of the Mayor's draft Water Strategy which is being developed simultaneously, with the CCAS. As there has been some overlap with the programmes, whilst being separate SAs, some efficiencies have been realised by combining meetings and other tasks as appropriate during the appraisals. This is also discussed in the methodology section below.
- 1.9 The first stage of the SA, the scoping stage, (see methodology in Section 2) was undertaken in-house by the GLA. A Scoping Report was produced in July 2006 and consulted upon for five weeks. The subsequent steps of the SA of the draft CCAS were undertaken by CEP independently of the GLA, whilst working closely with them.
- 1.10 The overall purpose of the SA was to ensure that sustainability considerations were fully taken into account as part of developing the Strategy. The SA considered the implications of the draft CCAS, from a social, economic and environmental perspective, by assessing alternatives and the draft CCAS against available baseline data and sustainability objectives.
- 1.11 When this work was commissioned in 2006 the GLA required that the draft CCAS be assessed using SA, incorporating Strategic Environmental Assessment (SEA) and Health Impact Assessment (HIA). In part due to the passing into law of the GLA Act in 2007, which

required the GLA to consider effects on a broader range of issues (including community safety, health inequalities etc.) strategies developed by the GLA since 2007 have generally been subject to Integrated Impact Assessment (IIA), including Equalities Impact Assessment (EqIA) and Community Safety as well as SA, SEA and HIA. As the appraisal of the draft CCAS pre-dated this more integrated approach, it was completed as originally proposed using SA (incorporating SEA and HIA) with an EqIA carried out separately by the GLA.

- 1.12 The approach adopted for the SA followed the Department for Communities and Local Government's (DCLG)⁶ SA guidance⁷ which integrates the requirements of the SEA Directive⁸ and Regulations⁹.
- 1.13 The SA approach was adapted where necessary to meet the GLA's requirements and programme and to reflect the differences between the draft CCAS and spatial planning documents. The SA also integrated health and equality of opportunity and in particular addressed the following issues:
- health and equality determinants and effects;
 - positive and negative health and equality effects;
 - effects on particularly vulnerable groups; and
 - the implications for the attainment of national and international goals.
- 1.14 The approach to the SA is described in more detail in Section 2.

Purpose and Scope of the Sustainability Appraisal Report

- 1.15 The purpose of the SA Report is to set out the findings of the SA process and the proposed next steps. It provides information on the draft Strategy's sustainability implications, for stakeholders and consultees responding to the consultation.
- 1.16 The purpose of the SA Report is also to ensure compliance with the requirements of different forms of appraisal (SA, SEA and HIA) which include the requirement for a report to be prepared. Furthermore, the SA Report incorporates the requirements for an Environmental Report under the SEA Regulations (see Table 1 below).
- 1.17 The SA Report sets out an assessment of:
- the relationship of the draft CCAS with other relevant policies, plans, programmes and strategies;
 - the relevant sustainability objectives established at the national, regional or local level;
 - the current sustainability baseline and likely evolution thereof (i.e. the evidence used as part of the assessment);
 - the characteristics of the area which are most likely to be affected by the draft CCAS;
 - the key sustainability issues for London relating to the draft CCAS and its potential areas of impact;
 - the compatibility of the draft CCAS objectives and sustainability objectives;
 - the potential effects of different draft CCAS alternatives to deliver its objectives;
 - the potential effects of the draft CCAS, including potential health effects;
 - the measures to mitigate adverse effects and maximise beneficial effects of the draft CCAS; and
 - measures to monitor the significant effects of implementing the CCAS.

⁶ Formerly the Office of the Deputy Prime Minister (ODPM)

⁷ ODPM (2005) *Sustainability Appraisal of Regional Spatial Strategies and Local Development Documents* and ODPM et al (2005) *A Practical Guide to the Strategic Environmental Assessment Directive*

⁸ European Directive 2001/42/EC

Structure and content of the Sustainability Appraisal Report

- 1.18 The diagram at the beginning of this document: “*How to Find Your Way Around the Sustainability Appraisal Report*” provides a summary of the SA Report’s contents. Part A of the SA Report provides the sustainability context and the evidence base for the appraisal. Part B details the appraisal of draft Strategy.
- 1.19 This SA Report is made up of four main parts:
- **A Non-Technical Summary**, which sets out in relatively simple language and in a précis form, the key findings and recommendations of the Sustainability Appraisal, and is available as a stand-alone document.
 - **Sustainability Context (Part A of the SA Report, Sections 1 to 3)**, which provides background information relevant to the appraisal, such as baseline data, key sustainability issues and the policy context for the draft CCAS. This part of the report also sets out the methodology and other issues.
 - **Sustainability Appraisal of the draft CCAS (Part B of the SA Report, Sections 4 to 7)**, which presents the findings of the appraisal of the draft Strategy, including the policies and actions it contains. This includes details of mitigation and enhancement and recommendations for monitoring.
 - **Appendices**, which provide detailed information and supporting documents relevant to the report. This ensures that important information and messages are as accessible as possible, while providing detailed evidence and background for all assertions and comments made.
- 1.20 As outlined in Table 3 below, close liaison took place throughout the SA process with GLA officers, including frequent telephone and email communication and formal and informal meetings in City Hall and at CEP’s offices. This SA Report is the final output from this process.

Compliance with the SEA Directive and Regulations

- 1.21 This SA Report incorporates the requirements for an Environmental Report under the Environmental Assessment of Plans and Programmes Regulations 2004 No. 1633 which implement the requirements of the European Directive 2001/42/EC, known as the SEA Directive. The place or places in the SA Report where components required in relation to the Environmental Report, in particular under Regulation 12 and Schedule 2, are sign-posted in Table 1 below. This approach to meeting the requirements for an Environmental Report is recommended in Government guidance on SA¹⁰.

Compliance with Health Impact Assessment Requirements

- 1.22 The Mayor of London is committed to undertake a HIA on all his strategies. As noted in paragraph 1.11, the GLA required that the draft CCAS be assessed using SA incorporating SEA and HIA within a single appraisal.
- 1.23 In order to ensure that health is fully integrated in this appraisal, a health specialist¹¹ was involved in all stages of the SA (see Section 2 on methodology below). Additionally, a

⁹ Environmental Assessment of Plans and Programmes Regulations 2004 No. 1633

¹⁰ ODPM (2005) *Sustainability Appraisal of Regional Spatial Strategies and Local Development Documents* and ODPM et al (2005) *A Practical Guide to the Strategic Environmental Assessment Directive*

¹¹ Professor Ian Matthews from the Centre for Health and Environmental Research and Expertise (CHERE), University of Cardiff

member of the London Health Commission's Urban Development and Regeneration Forum¹² sat on the SA Advisory Group and was involved in the SA process.

- 1.24 In 2005 – 2006 the London Health Commission's Urban Development and Regeneration Forum undertook an Integrated Impact Assessment (IIA) of the Sub Regional Development Frameworks in London. This pilot project integrated Health Impact Assessment into the statutory process of SA and SEA. This integrated approach was adopted for the SA of the draft CCAS. In addition, the appraisal follows the principles for integrating health in SEA set out in the draft Department of Health SEA guidance¹³.
- 1.25 The appraisal has also benefited from the findings of a wider health stakeholder workshop that took place in London in March 2007. The aims of this workshop have been included in Section 2 and a separate report on the workshop is available from the GLA.

Compliance with Equality Impact Assessment Requirements

- 1.26 The Mayor also requires that the impacts of any of his Strategies on equality of opportunity are taken into account through an EqIA. In this case the EqIA is being undertaken in-house by the GLA.
- 1.27 The GLA is committed to improving the lives of the people in London and one way it can achieve this is through its commitment to being an equality and diversity champion and leader. It uses EqIAs as a tool to help to integrate achieving positive outcomes for the people of London into its strategies, policies, services and major projects. EqIAs provide a framework for assessing whether what they do, or intend to do, has, or will, have a negative or positive impact on equality target groups and meeting their needs. EqIAs help the GLA meet its legal requirements under the Greater London Authority Act 1999 and other legislation such as Race Relations Act 1976 (statutory duties) Order 2001 and both amendments to the Disability Discrimination Act and the Equality Act.
- 1.28 The GLA, and the other organisations in the GLA group, have specified Equality Target Groups as: women; Asian or Asian British; Black or Black British; people of mixed race; Irish people; Chinese and other minority ethnic communities; disabled people; older people (60+); children and young people (0 – 17); young adults (18 – 25); lesbians, gay men and bisexual people; trans people; and, faith groups. The GLA's EqIA process includes all the specified equality target groups.
- 1.29 In the case of the draft CCAS the GLA will undertake and publish the results of an EqIA separately to the SA. However as part of the SA, the above target groups have been considered as far as possible within the appraisal of effects to consider whether they will be differentially affected by the implications identified.

Consultation on the Sustainability Appraisal Report

- 1.30 Consultation on SA Report is being undertaken alongside consultation on the draft CCAS. Comments on this SA Report have been invited from the three consultation bodies¹⁴ required by the SEA Regulations together with other key consultees representing sustainability interests in London, including non-governmental organisations, and the general public.

¹² The London Health Commission (LHC) was set up by the Mayor in October 2000 with the specific aims of reducing health inequalities and improving the health and well being of all Londoners

¹³ DoH (2007) Draft Guidance on Health in Strategic Environmental Assessment, Draft for consultation

¹⁴ Note that English Nature and the Countryside Agency were merged in October 2006 to create Natural England

Table 1: Components that make up the Environmental Report

Information to be included in an Environmental Report under the SEA Regulations (Regulation 12 and Schedule 2)	Relevant parts of the Sustainability Appraisal Report
An outline of the contents, main objectives of the plan, and its relationship with other relevant plans and programmes;	Section 1 - contents and main objectives of the plan Section 3 and Appendix 6 - relationship with other relevant plans and programmes
The relevant aspects of the current state of the environment and the likely evolution thereof without implementation of the plan;	Section 3 - current state Section 4 - evolution without the strategy
The environmental characteristics of areas likely to be significantly affected;	Sections 3, 4 and 6
Any existing environmental problems which are relevant to the plan including, in particular, those relating to any areas of particular environmental importance, such as areas designated pursuant to Directives 79/409/EEC and 92/43/EEC;	Section 3 (including Boxes 3, 5, 7, 9, 11, 13 and 15)
The environmental protection objectives, established at international, Community or Member State level, which are relevant to the plan and the way those objectives and any environmental considerations have been taken into account during its preparation;	Section 3 and Appendix 6
The likely significant effects on the environment, including short, medium and long-term effects, permanent and temporary effects, positive and negative effects, and secondary, cumulative and synergistic effects, on issues such as: biodiversity; population; human health; fauna; flora; soil; water; air; climatic factors; material assets; cultural heritage including architectural and archaeological heritage; landscape; the interrelationship between the above factors;	Sections 5 and 6, and Appendices 7, 8 and 9
The measures envisaged to prevent, reduce and as fully as possible offset any significant adverse effects on the environment caused by implementing the plan;	Section 6 (see Table 33 for specific references to the location of mitigation and enhancement measures)
An outline of the reasons for selecting the alternatives dealt with, and a description of how the assessment was undertaken including any difficulties (such as technical deficiencies or lack of know-how) encountered in compiling the required information;	Section 2 (including paragraphs 2.44 - 2.50 on difficulties encountered) Section 6 (including paragraphs 6.114 - 6.116 on why the preferred options was selected)
A description of measures envisaged concerning monitoring in accordance with Regulation 17;	Section 7, including Table 35
A non-technical summary of the information provided under paragraphs 1 to 9.	See separate volume

2. THE APPRAISAL METHODOLOGY

Overview of approach adopted

- 2.1 The Government's guidance on SA for Regional Spatial Strategies and Local Development Documents advocates a five stage process to undertaking SA, with each stage divided into a number of tasks. The approach adopted for the SA of the draft CCAS broadly followed these stages (see Table 2). However the approach was adapted where necessary to meet the GLA's requirements and programme. For instance, intermediate stages were introduced: two SA commentaries were provided based on preliminary appraisal of early versions of the draft CCAS in January 2007 and August 2008. The second SA commentary in August 2008 was produced in time for the consultation with the London Assembly and functional bodies. These outputs provided the GLA with some initial comments on the strengths and weaknesses of the proposals and policies included in the draft CCAS. Further SA comments were provided to the GLA in November 2009 on an advanced draft CCAS. The SA commentaries are available, on request, from GLA.
- 2.2 The Scoping Stage (stage A) of the SA was undertaken in-house by the GLA and resulted in the production of a Scoping Report in July 2006 which was consulted on over five weeks. Stage B of the SA process started in August 2006 and was on-going through to stage C until the draft CCAS was published for consultation with the London Assembly and functional bodies between August and October 2008.
- 2.3 Following this consultation the original intention was to respond to comments, prepare a final draft Strategy and develop the final SA Report, for public consultation in November / December 2008. However due to the London Mayoral election having taken place in May 2008, and the resulting change in administration, there were delays in the process for the draft CCAS to be reviewed and revised in light of the new administration's priorities, as well as other external policy developments.
- 2.4 Stage D of the SA, "Consultation and post adoption", includes the period of public consultation on the draft Strategy and SA Report, and subsequent amendments to the SA and SA Report as necessary following any significant changes to the Strategy, the review of comments and the preparation of a Post Adoption Statement. Stages D and E (see Table 2) will be undertaken after the draft Strategy and SA report have been consulted upon.
- 2.5 The SA of the Mayor's draft CCAS is being undertaken alongside the SA of the Mayor's Water Strategy. This approach was adopted because the GLA identified some overlaps between the Strategies and therefore some synergies in the SA process. The Health Stakeholder Workshop in March 2007, for example, covered aspects of the appraisal of both strategies.

Table 2: SA Stages and Tasks

Stage A: Setting the context and objectives, establishing the baseline and deciding on the scope
<p>Task A1: Identifying other relevant policies, plans, programmes and sustainability objectives. Task A2: Collecting baseline information. Task A3: Identifying sustainability issues and problems. Task A4: Developing the SA framework.</p> <p>Output 1: SA Scoping Report</p> <p>Task A5: Consulting on the scope of the SA.</p>
Stage B: Developing and refining options and assessing effects
<p>Preliminary SA tasks</p> <ul style="list-style-type: none"> • Analysis of consultee's responses to SA Scoping Report • Revision of SA method and framework, including Sustainability Objectives and Criteria • Initial review of the strengths and weaknesses of the draft Strategy • Prepare SA commentary <p>Output 2: SA Commentary on the draft Strategy</p> <p>Task B1: Test the compatibility of the draft Strategy and SA objectives Task B2: Review (develop) the Strategy options Tasks B3 and B4: Predict and evaluate the effects of the draft Strategy, including options, which included:</p> <ul style="list-style-type: none"> • Advisory group meetings • Workshop with key health stakeholders <p>Output 3: Health Stakeholder Workshop report¹⁵</p> <p>Output 4: Draft appraisal of the draft Strategy and the key options</p> <p>Task B5: Develop mitigation measures Task B6: Develop the proposed monitoring measures</p>
Stage C: Preparation of the SA Report
<p>Task C1: Prepare draft SA Report and final SA Report (with involvement of Advisory Group)</p> <p>Output 5: SA Commentary on the draft Strategy for London Assembly and functional bodies consultation (August 2008)</p> <p>Output 6: Final SA Report [this report]</p>
Stage D: Consultation and post adoption
<p>Task D1: Consultation on the draft Strategy and SA Report (this report) Task D2: Appraisal of any significant changes to the Strategy and preparation of revised / addendum to SA Report Task D3: Preparation of Post Adoption Statement</p> <p>Output 7: Revised / Addendum to SA Report (if necessary)</p> <p>Output 8: SA Post Adoption Statement</p>
Stage E: Monitoring and review
<p>Once the CCAS is adopted and launched by the Mayor, there will need to be ongoing monitoring of the sustainability implications of its implementation. This should include periodic reporting as part of the monitoring process. The results of monitoring should be considered as part of future reviews of the CCAS.</p>

¹⁵ Combined workshop for both the Climate Change Adaptation and the Water Strategies

Programme and responsibility

- 2.6 Table 3 sets out the tasks and outputs of the SA processes for the draft CCAS to date, with a timetable showing when these tasks were undertaken. Table 3 also identifies the key SA outputs and provides details of the consultation and engagement processes undertaken, which formed a fundamental part of the SA. Further detail on the preparation of the key SA outputs is provided in the subsequent sections.
- 2.7 A Scoping Report was produced by GLA in July 2006 and consulted on for five weeks. Stages B and C of the SA of the draft CCAS have been undertaken by CEP independently of the GLA, whilst working closely with them.
- 2.8 As noted in paragraph 2.3 the original intention was to revise the draft CCAS following comments received on the London Assembly and functional bodies consultation (August – October 2008) to develop the CCAS for public consultation in late 2008 and publication in early 2009. The public consultation draft CCAS was to be accompanied by the SA Report. However the CCAS development process was delayed, and subsequently the SA Report was not developed at this time.
- 2.9 Between July and December 2009 CEP received revised versions of the draft CCAS, the SA was undertaken and the SA Report drafted accordingly. The final draft CCAS for public consultation was received 28 January 2010, and the SA findings and Report revised accordingly. The final draft CCAS, and accompanying SA Report (this report), were made available for public consultation on 9 February 2010.

Table 3: SA programme - key tasks, events and outputs

Date	Tasks, events and key outputs
Stage A: Setting the context and objectives, establishing the baseline and deciding on the scope	
Spring 2006	Preparation of SA Scoping Report by GLA
12 June 2006 - 14 July 2006	Consultation on Scoping Report
23 June 2006	Scoping Workshop (joint with draft Water Strategy)
Preliminary appraisal of the draft Strategy	
16 August 2006	GLA/CEP Inception Meeting
7 November 2006	Progress meeting to discuss SA methodology and timetable
9 January 2007	Internal team meeting to discuss health workshop and potential health effects of the draft CCAS
12 January 2007	Initial SA Commentary on the draft CCAS received in September 2006
Stage B: Developing and refining options and assessing effects	
November 2006	Development of SA methodology proposals for consideration by Advisory Group
6 December 2006	Advisory Group meeting
9 January 2007	Internal team meeting to discuss health issues
16 January 2007	Advisory Group meeting
9 March 2007	Workshop with health stakeholders (joint with draft Water Strategy)
5 April 2007	Draft health workshop report sent to participants
28 September 2007	Final health workshop report submitted to GLA and participants
9 October 2007	Meeting to discuss alternatives: Business as Usual (BAU), BAU + 50 years and Strategy
19 August 2008	Second SA commentary on the draft CCAS for the Assembly consultation
August – October 2008	Assembly and functional bodies consultation on draft CCAS

Date	Tasks, events and key outputs
26 November 2009	SA commentary on emerging final draft CCAS
Stage C: Preparation of the SA Report	
19 May 2009	CEP meet GLA to discuss revised draft CCAS and timetable for development and SA
2 July 2009	Revised draft CCAS received by CEP
7 September 2009	Near final draft CCAS received by CEP
28 January 2010	Final CCAS for public consultation received by CEP for appraisal
9 February 2010	Final SA Report and start of public consultation on the draft CCAS and SA Report

Stakeholder involvement - who was involved, when and how?

- 2.10 Stakeholder involvement is a fundamental part of SA. It enables those potentially affected by, or with a professional or personal interest in, the sustainability effects of the Strategy in question to engage with and input to the SA process.
- 2.11 Engagement and consultation during the Scoping stage included:
- Formal consultation on the Scoping Report for five weeks in July – August 2006. A full list of those consulted at the Scoping stage and a summary of comments received are included in Appendices 1 and 2. The GLA revised the scoping report in light of the comments received.
 - A scoping workshop on 23 June 2006 with key statutory stakeholders, the London Health Commission and the London Sustainable Development Commission (LSDC) facilitated by Forum for the Future. The key objectives of this workshop were to:
 - Agree a common set of objectives and appraisal criteria;
 - Review the objectives, indicators, targets and evidence base to be used during the SA of the CCAS and Water Strategy;
 - Review the significant environmental, economic, social and health issues for both strategies; and,
 - To give stakeholders an opportunity to shape the Scoping Report.
- 2.12 Engagement and consultation during stages B and C of the SA process up to the publication of the SA Report included:
- Meetings with GLA officers. Formal and informal meetings have been held throughout the SA process.
 - The SA Advisory Group met twice during the process and were invited to the Health Stakeholder Workshop (see below). The Advisory Group members were also kept informed of the SA progress by email. The terms of reference of the Advisory Group have been included in Appendix 3.
 - A Health Stakeholder Workshop was held in London on 9 March 2007. This workshop covered both the health effects of the draft CCAS and of the draft Water Strategy. A workshop report has been produced as a separate output¹⁶ (separate report available from the GLA). Key objectives of the workshop were to:
 - Raise awareness among key health stakeholders about the CCAS and Water Strategy;

¹⁶ *Sustainability Appraisals of the GLA's Climate Change Adaptation Strategy and Water Strategy: Write-up of the Health Stakeholder Event 9 March 2007*, Final Report September 2007 (CEP/CREH)

- Provide an opportunity for stakeholders and experts to consider the potential impacts of key aspects of the strategies on health determinants, health outcomes and health inequalities;
- Identify gaps in evidence and ways of addressing these gaps; and
- Provide some clear recommendations that will guide the SAs of the strategies.
- Formal consultation on this SA Report is being undertaken alongside that for the draft CCAS.

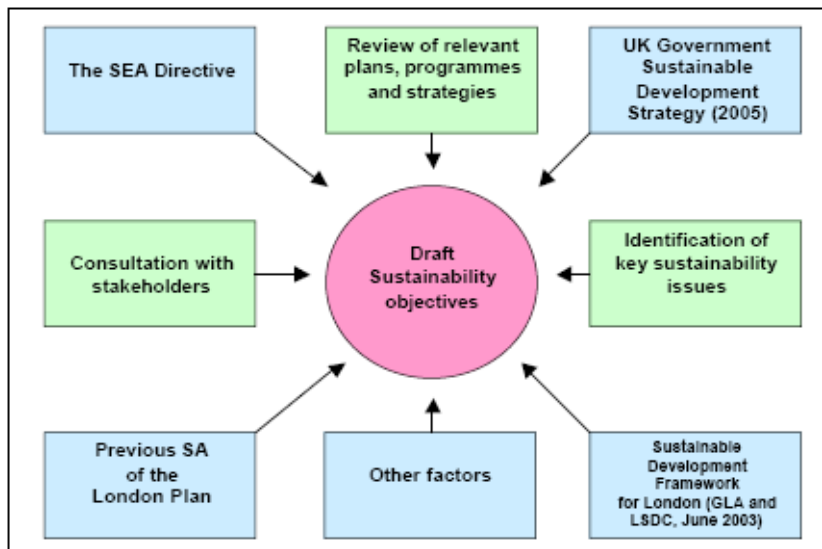
Sustainability Appraisal Framework

Sustainability objectives and criteria

2.13 The establishment of SA objectives and criteria provides a mechanism by which sustainability effects of a strategy or plan can be described, assessed and compared. The objectives for the SA were originally derived from a number of sources (see Figure 1) and a draft set were included in the SA Scoping Report (July 2006) under the four headings of the London Sustainable Development Framework which was used to help inform the sustainability priorities in London¹⁷:

- Taking responsibility
- Developing respect
- Managing resources
- Getting results

Figure 1: Sources of draft Sustainability objectives¹⁸



2.14 The SA objectives and criteria have been modified through the SA process to reflect the particular needs and issues identified as the draft CCAS evolved, consultee's comments received on the Scoping Report, meetings held with the GLA and comments received from the SA Advisory Group. The final set of SA objectives for the SA of the draft CCAS are presented in Table 4. The full list including the SA criteria under each objective can be found in Appendix 4.

¹⁷ London Sustainable Development Commission (2003) A Sustainable Development Framework for London, available: http://www.london.gov.uk/mayor/sustainable-development/susdevcomm_framework.jsp Accessed: 28/08/07

¹⁸ From SA Scoping Report, June 2006

2.15 The final SA framework is made up of 14 SA objectives. In order to simplify this framework and make this report more relevant to the SA of the draft CCAS, the SA objectives have been grouped into the following six topics for the description of the policy context and baseline data (see Table 4):

- People and health
- Place and quality of surroundings
- Climate change
- Water management
- Waste and resources
- Economy

Table 4: Sustainability Appraisal Objectives

People and health
1. Governance To deliver objectives transparently and effectively over the long-term, focusing on outcomes and informed by good evidence
2. Education and Awareness To maximise the education and awareness levels of the population in order to empower individuals to take responsibility
3. Health and Well Being To maximise the health and well being of the population and reduce inequalities in health
4. Equality and Diversity To ensure equitable outcomes for all communities and to celebrate the unique ethnic and cultural diversity of London's citizens as London's key strength
5. Safety and Security To have a place where everyone feels at ease and is able to enjoy life and to enhance community safety
Place and quality of surroundings
6. Liveability and Place To create and sustain liveable, mixed use physical and social environments that promote long-term social cohesion, sustainable lifestyles and a sense of place
7. Accessibility and Availability To maximise accessibility to key services and amenities and to increase the proportion of journeys made by public transport, walking and cycling
8. Landscape, Historic and Cultural Environment To enhance and protect the landscape and built and cultural environment, including buildings, townscape and the public realm
9. Biodiversity To conserve and enhance natural and semi-natural habitats and wildlife
10. Air Quality To improve both indoor and outdoor air quality
Climate Change
11. Climate Change 11i) To mitigate the causes of climate change 11ii) To adapt to the effects of climate change
Water management
12. Water Quality and Quantity 12 i) To improve the quality of surface waters and groundwater 12 ii) To improve the security of supply and to achieve the prudent management and efficient use of water resources 12 iii) To reduce the risk of flooding
Waste Management and Resource Use
13. Waste Management and Resource Use To minimise the production of waste across all sectors in line with the waste hierarchy and minimise the use of non-renewable materials
Economy
14. Economy To develop the economy in ways which meets society's present and future needs

Appraisal of the draft Climate Change Adaptation Strategy

Appraisal of alternatives

- 2.16 Given the nature of climate change as an issue, and the fact that the Mayor does not have powers in many of the areas required to be addressed to achieve adaptation, the draft CCAS represents a high-level strategy document. This is reflected in the draft CCAS objectives and the seven key tasks the draft Strategy is seeking to undertake (as set out in paragraphs 1.3 and 1.4). In addition the timescales of action and change required in relation to climate change adaptation are very long term (in many cases 30 – 50 years or more). Therefore, the first draft CCAS is focussed on actions that are preparatory, influencing and encouraging of collaborative working. As a result it was considered appropriate to consider alternatives which were of a similarly strategic nature.
- 2.17 Three broad strategic alternatives were examined as part of the appraisal:
- **Business as usual (BAU) alternative** – represents the future situation without the draft Strategy, but considering the influence of other existing and planned adaptation policies, plans, strategies and initiatives (i.e. what would happen anyway, if the Mayor decided not to produce a climate change adaptation strategy).
 - **The draft Strategy** – the draft Strategy, as articulated through the current set of visions, policies and actions.
 - **“Draft Strategy Plus” alternative** – builds on the draft Strategy, but incorporates a greater level of adaptation which seeks to minimise the potential negative sustainability effects and maximise the positive effects of the predicted climatic changes in London
- 2.18 Reflecting the timescales appropriate for climate change adaptation, the potential sustainability effects of these three strategic alternatives were considered over both the medium-term (2020s) and the long-term (2050s and beyond).
- 2.19 Considering the BAU scenarios was particularly useful in assessing whether the draft CCAS is likely to make a significant difference to sustainability in London. This was considered to be particularly important as the Strategy itself is responding to a specific external factor which will bring about significant change to the baseline. It also allowed understanding of what difference the draft Strategy will make in terms of policy and action compared to climate change adaptation relevant policies, plans and programmes already underway or planned.
- 2.20 Further description of the development and appraisal of the strategic alternatives to the draft CCAS is included in Section 5 (Part B).

Key steps in the appraisal of the draft Climate Change Adaptation Strategy

- 2.21 The SA of the draft CCAS was undertaken in a series of iterative steps shown in Figure 2. Regular meetings and email and telephone communication between CEP and GLA officers took place during the steps described below.

Sustainability appraisal commentaries on the draft CCAS

- 2.22 An initial SA commentary was produced in June 2007. The aim of this output was to provide comments on the sustainability issues, strengths and weaknesses raised by the proposals and priorities for management contained in an early draft of the CCAS. The commentary was used by the GLA to review the draft Strategy and to prepare the draft version upon which the London Assembly and the functional bodies were consulted and to further develop and refine the proposals and policies.
- 2.23 A second SA commentary was produced in August 2008 in time for the London Assembly and functional bodies consultation on the draft CCAS. The draft CCAS was reviewed in light of

this SA commentary and the comments received during consultation. A third SA commentary was provided to the GLA in November 2009 on an advanced draft CCAS. Copies of the SA commentaries are available, on request, from GLA.

Establishing an appropriate baseline and timescale for the appraisal of the draft CCAS

- 2.24 Unlike many other types of strategy or plan (e.g. a spatial development plan or housing strategy), which often propose specific actions to meet defined targets over a specific timeframe, the draft CCAS is seeking to provide a policy framework to address the negative and positive effects (risks and opportunities) from climatic change, over a timeframe which spans the rest of the century¹⁹. As a result the appraisal of the draft CCAS presented a particular methodological challenge: how to account for the timescales involved and diffuse nature of many issues and effects?
- 2.25 The first stage in the appraisal was to establish and understand the future “baseline” against which the draft CCAS and alternative could be appraised. This is set out in Section 4 (Part B). This future evolution of the baseline without the draft CCAS also formed the BAU alternative. Section 4 (Part B) includes the following:
- An overview of the sustainability and climatic change context, including:
 - the current sustainability baseline
 - the likely evolution of the sustainability baseline without the Strategy
 - the likely climatic changes in London in the medium (2020s) and long-term (2050+)
 - the existing and planned climate change adaptation
 - A summary of the appraisal of the potential sustainability effects of climate change on flooding, drought and overheating in London without the draft Strategy, including:
 - Identifying the potential sustainability effects using causal chain analysis
 - evaluating the potential sustainability effects using qualitative criteria and presented in a summary matrix
- 2.26 Further detail is provided below on the identification of effects using causal chain analysis and the evaluation of effects.

Appraisal of the draft CCAS and alternatives at the strategic level

- 2.27 The next step in appraising the draft CCAS was to identify the potential sustainability effects of the draft Strategy at the strategic level. These were compared with the potential sustainability effects of predicted climatic changes in London in the absence of the draft Strategy (the BAU alternative) as well as to an alternative strategy incorporating a greater level of adaptation (the “strategy plus” alternative). This is set out in Section 5 (Part B).
- 2.28 The likely effects of the BAU alternative and draft CCAS were appraised against the SA objectives (see Appendix 4). Detailed appraisal matrices were completed setting out the appraisal of the BAU alternative and draft CCAS, representing the key policy areas addressed by the draft CCAS: flooding; drought; and, overheating. The “strategy plus” alternative was set out in principle and the potential influence of the higher level of adaptation proposed on the likely sustainability effects considered. The results of the appraisal of the draft CCAS and alternatives at a strategic level were compared in a summary table, and overall comments and conclusions set out.
- 2.29 Further discussion of the methodology adopted, and the detailed results of the appraisal of the draft CCAS and alternatives at the strategic level is described in Section 5 (Part B).

¹⁹ The introduction to the draft CCAS states that it “considers the climate over the century, but particularly focuses on the period up to 2031”.

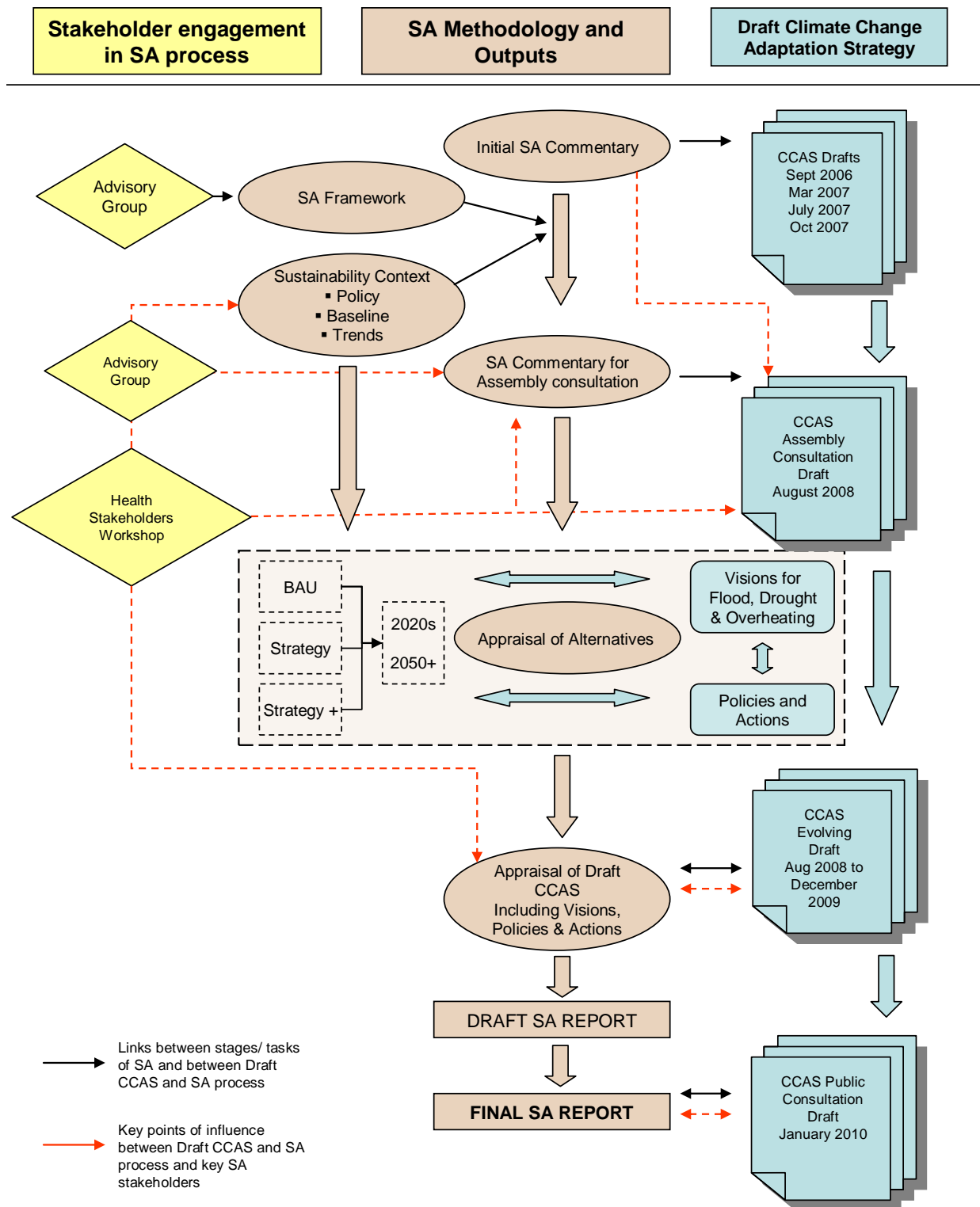
Appraisal of the visions, policies and actions included in the draft Climate Change Adaptation Strategy

- 2.30 Following the appraisal of the draft CCAS at the strategic level, the visions, policies and actions proposed in the draft CCAS for flooding, drought and overheating were appraised and specific recommendations made. The appraisal of the visions, policies and actions drew upon the appraisal of the draft CCAS and alternatives at the strategic level. The visions, policies and actions for flooding, drought and overheating were considered in turn, and a detailed appraisal commentary provided, including specific recommendations for mitigation and enhancement, and the identification of potential omissions, which if included could help address the negative sustainability effects identified, or enhance potential positive effects. These findings were presented in tables.
- 2.31 The outcomes of the appraisal, comments and recommendations on the draft CCAS visions, policies and actions are described in detail in Section 6 (Part B).

Overall appraisal of the draft Climate Change Adaptation Strategy

- 2.32 Finally, the findings of the appraisal of the draft Strategy described above were pulled together to identify the key significant sustainability effects, including key cumulative effects. In addition, key health and health inequality effects were identified and reported separately.

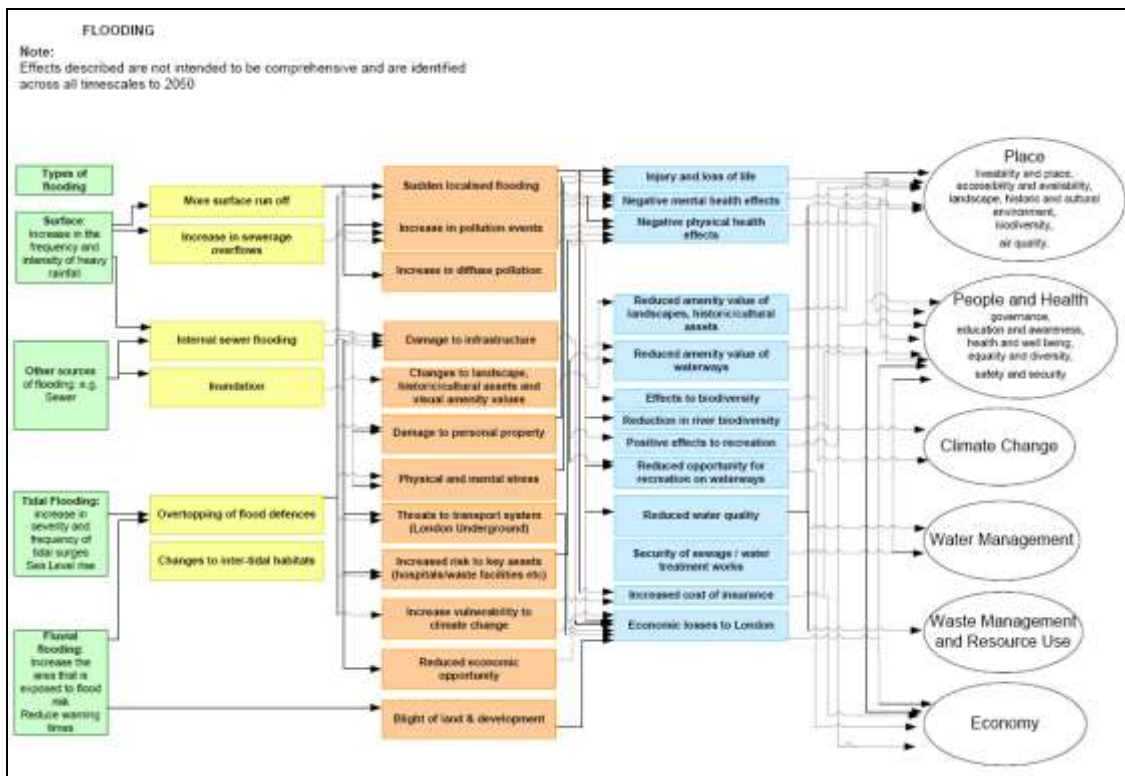
Figure 2: Diagram of Sustainability Appraisal of the draft Climate Change Adaptation Strategy



Identification of effects

- 2.33 To identify the potential effects of climate change on flooding, drought and overheating in London, and which receptors could be affected, network or causal chain analysis was used to trace the links and identify the cause and effect pathways. These casual chain analyses were also valuable in understanding the potential effects of the visions, policies and actions included in the draft CCAS. This was considered to be a particularly appropriate approach given the strategic nature of the draft CCAS and because all the potential effects of the policies and actions may not be immediately apparent. In addition, causal chain analysis can help the process of identifying potentially significant cumulative effects.
- 2.34 Figure 3 shows an example of a causal chain analysis diagram. The full set of causal chains for the predicted effects on flooding, drought and overheating (corresponding with the key policy areas of the draft CCAS) in the capital are included in Section 4. These were intended to be working illustrations to capture the potentially key pathways and receptors. The causal chains have benefited from inputs from the SA Advisory Group, other stakeholders (e.g. at the Health Workshop) and other experts to ensure the key significant effects, receptors and relationships have been identified. The causal chains also draw on the evidence and data collected for Section 3 (Sustainability Context).
- 2.35 Note that only the effects that were considered to be the most significant are shown in the diagrams. In some instances where a likely effect is not considered to be significant, the causal chain was not followed through to subsequent effects / the relevant receptor(s).

Figure 3: Example of Causal Chain Analysis Diagram



Evaluation of effects

- 2.36 As noted above, the potential sustainability effects of climate change on flooding, drought and overheating in London were initially identified by using causal chain analysis diagrams. The

causal chains analysis allowed the identification of potential effects, pathways and receptors. The effects identified were then appraised against the SA objectives and criteria (see Appendix 4). This approach was also used (drawing on the results of the causal chain analysis) for the appraisal of the draft CCAS at the strategic level.

- 2.37 In order to assess the significance of the effects predicted, a set of significance criteria tailored specifically to the SA of the draft CCAS was used (see Appendix 5).
- 2.38 The significance of the effects was rated against each SA objective and criteria using a qualitative 5-point scale: major positive (++), minor positive (+), neutral (0), minor negative (-) and major negative (--). The methodology also allowed uncertain (?) and mixed scores (e.g. +/-) to be used. The identification and evaluation of effects was informed by the baseline and evidence (see Section 3), the review of plans and policies (see Section 3 and Appendix 5), stakeholder engagement and expert judgement. CEP's approach to evaluating the significance of effects was agreed with the SA Advisory Group of 16 January 2007.
- 2.39 The prediction and evaluation of effects was recorded in matrices using the SA objectives and criteria with a scoring and commentary to describe the potential effects of a single preferred alternative or a series of alternatives for comparison. This has the advantage of allowing large amounts of information to be structured in a relatively clear and transparent way. The commentary seeks to explain how each of the scores has been arrived at, with for example reference to baseline data and criteria to explain significance.

Cumulative effects

- 2.40 There are different types of cumulative effects, but a primary concern of the SA of the draft CCAS was the total effect of multiple actions on a single 'receptor' (e.g. certain groups within the population, people living in a particular locality, the elderly or long-term ill, or flora and fauna) as well as cumulative effects over time. However, given the strategic level of the draft CCAS there was limited spatial differentiation that can be predicted between effects, in particular, so inevitably the potential cumulative effects identified were relatively generic.
- 2.41 Certain impacts likely to arise from the draft CCAS have cumulative effects (e.g. impacts on the flood risk reduction, impacts on certain vulnerable groups etc). Some of the effects that have been identified by the appraisal (see Part B) could be cumulative. Causal chain analysis helped understanding of how specific actions were predicted to impact upon the same sustainability objective and / or receptor in relation to particular policy areas (e.g. flooding, drought, overheating). It was not possible to identify an exhaustive list of potential cumulative effects, as predicting the interactions and additive effect of policies is complex and uncertain, however the cumulative effects considered to be most significant have been identified in Section 6 (Part B).

Mitigation, enhancement and recommendations for change

- 2.42 Comments on the overall effects of the draft Strategy and recommendations for 'mitigation and enhancement' have been included in Section 6 (Part B). Recommendations to mitigate significant adverse effects and improve positive effects were identified.
- 2.43 The types of enhancement and mitigation identified take a wide range of forms, including:
- Proposed additional policies and actions to address a key priority sustainability effects.
 - Changes to the wording of the specific policies, actions or supporting text, e.g. to strengthen the requirements or make them clearer.
 - Proposed conditions, or specific mitigation measures that could be associated with the actions. This could involve for example the inclusion of reference to other policies or the conditions included in other plans or strategies.

- Providing more detail on how a policy or action will be implemented, in order to enhance the positive effects of the draft CCAS.
- Having particular regards to vulnerable groups or other sensitive receptors, e.g. biodiversity.
- Other general comments and observations.

Difficulties encountered in compiling information or carrying out the appraisal

Level of detail and scope

- 2.44 As a relatively strategic appraisal, the SA of the draft CCAS cannot provide a very detailed and quantified assessment of the sustainability effects of the strategy and the policies and actions it contains. However, the SA has attempted to provide a largely qualitative assessment of the broad implications of the draft CCAS against the sustainability appraisal objectives and criteria. The SA has also sought to ensure that all the dimensions of sustainability were considered throughout the development of the draft CCAS. In turn, more detailed proposals and implementation plans will need to be subject to detailed appraisal as appropriate.
- 2.45 At the strategic level, in particular, there are inevitable uncertainties associated with undertaking an appraisal of the sustainability implications of a CCAS. There are limitations, including data availability and the need to rely on qualitative as well as quantitative data and appraisal. The SA Report seeks to be transparent about any assumptions that have been made and clearly states the uncertainties associated with any predictions.
- 2.46 In addition the SA methodology had to consider very carefully what effects it was appropriate and possible to predict. As a strategic level plan, seeking to “influence” and encourage more than to “require” specific actions, the draft CCAS might not be predicted to have many clear direct sustainability effects. However, the CCAS when adopted is intended to contribute to the adaptation response in London and encourage considerable planning and preparatory actions in relation to projected climate change.

Timescales of effects and projected climate change

- 2.47 The appraisal of the draft CCAS presented particular methodological complexities in relation to the appropriate time frame (or time frames) to consider. Climate change is happening now, and changes are projected to continue throughout this century and beyond. It was important, therefore, during the appraisal, to consider both the likely effects of climate change in the short and medium term, and also the long-term, and to consider the appraisal of the draft CCAS in this long-term and evolving context.

Baseline data

- 2.48 There were some gaps identified in the baseline information that ideally would have been collected to inform the appraisal. In some instances, only regional or national level data was available rather than data specifically relating to London. Lack of historical/trend data was another key issue as, in many cases, it was difficult to assess whether the situation is improving or worsening. Lack of trend data also makes predicting the future baseline more difficult.

Project timescales

- 2.49 As described above, the draft CCAS was prepared over an extended period. There were several delays in the CCAS preparation process. This meant that the SA had to be undertaken intermittently over an extended period and it was not possible to interlink the SAs of the CCAS and the Water Strategy as closely as originally planned. As a result, the baseline data and review of policies, plans and programmes also had to be updated several times. There were several versions of the draft Strategy prepared for the SA to comment upon and therefore the appraisal had to be revised to reflect changes made to the proposals and supporting text.

Legal Provisions

- 2.50 The Greater London Authority (GLA) Act 2007 entrusts the Mayor with the responsibility to reduce London's contribution to climate change, and to ensure that London is prepared to cope with its effects. Under the Act the Assembly is also subject to a duty to address climate change.

3. SUSTAINABILITY POLICY CONTEXT, BASELINE AND KEY ISSUES

Introduction

- 3.1 This section presents background information relating to London's environmental, social and economic context relevant to the SA of the draft CCAS²⁰. It corresponds to Tasks A1 – A3 of the SA process (see Table 2) and provides background information and the evidence base to inform and assist the appraisal process.
- 3.2 The information has been structured into six broad topics, by grouping the 14 sustainability appraisal objectives (see Table 4 and Appendix 4.), together with a section on cross-cutting issues. These topics were specifically selected for the purposes of the SA of the draft CCAS, as they provide a simplified structure for presenting the relevant contextual information. The information included in this section has been selected to inform the appraisal of the potential sustainability effects of the draft CCAS, and therefore some topics contain more information than others. Interactions between the topics are also considered.
- 3.3 The topics, and how they relate to the SA objectives, are set out in Box 1 below. The SA objectives correspond to those detailed in Table 4 and Appendix 4. Each topic includes information on the:
- **Policy context, relevant baseline and key trends:**
 - key findings of a review of relevant policies, plans, programmes and strategies, see Table 5 and Appendix 6 for further detail;
 - key research and data related to the topic;
 - information on future trends, where available.
 - **Existing sustainability problems and opportunities:**
 - drawing on the review of other policies, plans, programmes and strategies, and the baseline data, the key issues for the SA and the draft CCAS to consider. Including problems which the draft CCAS should seek to address and opportunities which the draft CCAS can encourage or take advantage of.
 - **Evolution of the sustainability baseline in the absence of the CCAS:**
 - an assessment of the likely future trends relating to each topic, based on reviewing the baseline information and existing trends, and the likely influence of existing external plans, strategies and processes. It should be noted that due to the 50 year proposed timeframe of the draft CCAS, there is a high level of uncertainty in these assessments of future evolution of the sustainability baseline.
- 3.4 Table 5 below lists policies, plans, programmes and strategies which are relevant to the SA of the draft CCAS and were reviewed (see also Appendix 6)²¹. This sought to draw out:
- Areas where there is policy overlap between the draft CCAS and other plans or policies;
 - Targets, guidelines and parameters set out in other relevant strategies and plans, particularly those at a higher level (e.g. UK Government or EU level);
 - Key issues for the draft CCAS and the SA to consider.

²⁰ Note that the baseline information and references / web-links included in Section 3 were compiled in November and December 2009.

²¹ Note that this review was completed in December 2009. It is possible therefore that additional policies, plans, programmes and strategies have been adopted or developed since this date.

Box 1: Coverage of SA objectives under topics within context section

<p>1. People and Health</p> <ul style="list-style-type: none"> • Governance • Education and Awareness • Health and Well Being • Equality and Diversity • Safety and Security <p>2. Place</p> <ul style="list-style-type: none"> • Liveability and Place • Accessibility and Availability • Landscape, Historic and Cultural Environment • Biodiversity • Air Quality 	<p>3. Climate Change</p> <ul style="list-style-type: none"> • Climate Change <p>4. Water management</p> <ul style="list-style-type: none"> • Water Quality and Water Resources <p>5. Waste and Resources</p> <ul style="list-style-type: none"> • Waste Management and Resource Use <p>6. Economy</p> <ul style="list-style-type: none"> • Economy <p>7. Cross-cutting</p>
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- 3.5 The review focused on London level policies, plans and programmes, as well as those at a national level which are particularly relevant to the SA of the draft CCAS or are relatively recent and therefore may not yet be reflected in London level policies, plans and programmes. No European Directives or other international documents have been reviewed as any targets and legislation they contain should have already been included in National and London plans and programmes.
- 3.6 This information was used to inform the appraisal of the draft CCAS. It builds on and updates the SA Scoping Report completed in 2006 (CCAS SA Scoping Report, July 2006).

Table 5: Policies, plans and programmes reviewed

Government	
<ul style="list-style-type: none"> • Air Quality Expert Group (2007) Air Quality and climate change: a UK perspective • DCLG (2001) PPG13: Transportation • DCLG (2004) PPS23: Planning and Pollution Control and Annex 1: Pollution Control, Air and Water Quality • DCLG (2006) Code for sustainable homes, DCLG (2008) Code for Sustainable Homes – Technical Guidance Defra (2002) Directing the flow: Priorities for future water policy • DCLG (2006) PPS25: Development and Flood Risk, and DCLG (2008) Development and Flood Risk: A Practice Guide Companion to PPS25 • DCLG (2007) Planning Policy Statement: Planning and Climate Change: Supplement to PPS1 • DCLG (2007) Water Efficiency in New Buildings: a joint Defra and DCLG policy statement • Defra (2002) Directing the flow: Priorities for future water policy • Defra (2003) The Water Environment (Water Framework Directive) (England and Wales) Regulations • Defra (2004) Making space for water • Defra (2005) Drought orders and drought permits • Defra (2005) Taking forward a new Government strategy for flood and coastal erosion risk management in England. First Government response to the autumn 2004 Making space for water consultation exercise • Defra (2006) Climate Change. The UK Programme 2006 and DEFRA (2008) Annual Report to Parliament 	<ul style="list-style-type: none"> • Department of Health (2009) Heatwave Plan for England • DTI (2003) Energy white paper. Our energy future: creating a low carbon economy • EEA (2006) Vulnerability and Adaptation to Climate Change in Europe • Environment Agency (2008) The Pitt review: learning lessons from the 2007 flood. Final Report, and DEFRA (2008) The Government's Response to Sir Michael Pitt's Review of the Summer 2007 Floods • Environment Agency (2009) Water for Life and Livelihoods – A consultation on the Draft River Basin Management Plan Thames River Basin District • HM Government (2005) Securing the future – the UK Government Sustainable Development Strategy • HM Government (2006) Climate Change and Sustainable Energy Act • HM Government (2008) Climate Change Act • HM Government (2008) The Planning Act • House of Commons (2004): Environment, Food and Rural Affairs Committee 16th Report Climate change, water security and flooding • IPCC (2007) Climate Change: Impacts Adaptation and Vulnerability • Met office / Defra (2004) Uncertainty, risk and dangerous climate change • ODPM (2003) Planning Policy Statement 22: Renewable Energy

<ul style="list-style-type: none"> Defra (2006) River basin planning guidance Defra (2007) Consultation on proposed changes to powers to restrict non-essential uses of water Defra (2008) Adapting to Climate Change in England – A framework for action Defra (2008) Future Water – The Government's Water Strategy for England Defra (2009) Draft Flood and Water Management Bill (Consultation Draft) Department of Health (2008) Health effects of climate change in the UK 2008: an update of the Department of Health report 2001/2002 	<ul style="list-style-type: none"> ODPM (2004) The planning response to climate change. Advice on better practice ODPM (2005) Diversity and Equality in Planning, a good practice guide ODPM (2005) Planning Policy Statement 1: Delivering Sustainable Development Office of Science and Technology (2004) Foresight: Future Flooding WHO (2003) Climate Change and Human Health: Risk and Responses Summary
London	
<ul style="list-style-type: none"> City of London Corporation & Acclimatise (2007) Rising to the Challenge - The City of London Corporation's Climate Adaptation Strategy GLA (2002) Cleaning London's Air; The Mayor's Air Quality Strategy GLA (2002) Connecting with London's Nature. The Mayor's Biodiversity Action Plan (BAP) GLA (2003) The Mayor's Municipal Waste Management Strategy GLA (2004) Green Light to Clean Power. The Mayor's Energy Strategy GLA (2004) London: Cultural Capital – realising the potential of a world-class city, the Mayor's Culture Strategy GLA (2004) Sounder City: the Mayor's Ambient Noise Strategy GLA (2004) The Mayor's Transport Strategy Revision (2004) and Transport Strategy Implementation Targets GLA (2005) Adapting to Climate Change: A Checklist for Development. Guidance on Designing Developments in a Changing Climate GLA (2005) London Housing Board London Housing Strategy 2005 - 2016 GLA (2005) Sustaining Success – the Mayor's Economic Development Strategy GLA (2006) Adaptation to Climate Change: Business as Usual? GLA (2006) Sustainable Design and Construction: London Plan SPG GLA (2007) Action Today to Protect Tomorrow. The Mayor's Climate Change Action Plan GLA (2007) Planning for Equality and Diversity in London. London Plan Draft Supplementary Planning Guidance (SPG) GLA (2008) Equality in our Lifetimes – The Mayor's Annual Equalities Report 2007/08 GLA (2008) Living Well in London: the Mayor's draft Health Inequalities Strategy GLA (2008) London Plan SPG: East London Green Grid Network 	<ul style="list-style-type: none"> GLA (2008) The Mayor's London Plan: Spatial Development Strategy for Greater London (consolidated with alterations since 2004) GLA (2009) Clearing the Air. The Mayor's draft Air Quality Strategy for consultation with the London Assembly and functional bodies. GLA (2009) London Housing Design Guide, consultation draft GLA (2009) London's Great Outdoors – A Manifesto for Public Space GLA (2009) Rising to the Challenge – the Mayor's Economic Development Strategy for Greater London. Public consultation draft. GLA (2009) The London Housing Strategy, consultation draft and GLA (2008) Housing in London: the evidence base for the London Housing Strategy GLA (2009) The London Plan: Spatial Development Strategy for Great London. Consultation draft replacement plan GLA (2009) The Mayor's Transport Strategy, draft published for public consultation London Assembly (2005) London under threat? Flooding risk in Thames Gateway London Assembly (2006) The Blue Ribbon Network, The Heart of London London Borough of Havering (2007) Climate Change Strategy 2007-2010 London Climate Change Partnership (2002) London's Warming, the impacts of climate change on London. London Climate Change Partnership (2005) Climate change and London's transport systems London Climate Change Partnership (2006) Lessons for London London Resilience (2008) London Mass Evacuation Plan London Sustainable Development Commission (2003) A Sustainable Development Framework for London NHS Executive London Regional Office (2000) London Health Strategy and London Health Commission (2004) Health in London. Review of the London Health Strategy and High Level Indicators UKCIP (2004) Living with Climate Change in the East of England
Regulators and Public Bodies	
Thames/London	National/other
<ul style="list-style-type: none"> Environment Agency (2001) Water resources for the future: A strategy for Thames Region Environment Agency (2004 and annual updates) The 	<ul style="list-style-type: none"> Association of British Insurers (2005) Financial Risk of Climate Change Defra (2007): Conserving biodiversity in a changing

Thames Corridor catchment abstraction management strategy (CAMS)	climate: guidance on building capacity to adapt
<ul style="list-style-type: none"> • Environment Agency (2006) The London CAMS Final Strategy • Environment Agency (2007) Drought Plan for Thames region 	<ul style="list-style-type: none"> • Environment Agency (2005) The climate is changing: Time to get ready • Environment Agency (2006) The water framework directive and planning: Initial advice to planning authorities in England and Wales
<ul style="list-style-type: none"> • Environment Agency (2009) Thames Estuary 2100 – consultation draft • Environment Agency (2009) Thames Region catchment flood management plan • Environment Agency (2009) Water for Life and Livelihoods – A consultation on the Draft River Basin Management Plan Thames River Basin District 	<ul style="list-style-type: none"> • Environment Agency (2007) Consultation on Identifying Areas of Water Stress • Environment Agency (2009) Water Resources Strategy for England and Wales • HM Treasury (2007) Stern Review on the economics of climate change
<ul style="list-style-type: none"> • Thames Estuary 2100 (1999), Management Guidance for the Thames Estuary (Strategy) 	<ul style="list-style-type: none"> • Ipsos/MORI (2007) Tipping point or turning point – climate change survey • Office of Water Services (2008) Service and delivery – performance of the water companies in England and Wales 2007 – 2008 report • UKCIP (2005) Beating the heat: keeping UK buildings cool in a warming climate, Hacker, JN, Belcher, SE and Connel, RK, UKCIP Briefing Report • UKCIP (2007) Identifying Adaptation Options, Guidance Note

People and Health

3.7 This topic includes information on a number of social and health issues. The people of London make it the city it is: diverse, vibrant, dynamic, colourful and exciting. However there remains considerable inequity in many aspects of life in London. Many determinants of health and quality of life, such as access to open space and overcrowding in the home, affect particular groups and areas more than others. Equally, certain socio-economic groups can have a greater voice in local decision making or be at lower risk from negative issues such as crime or road accidents. Such issues all relate to the people of London and their health. The SA objectives relevant to this context topic are: **Governance; Education and Awareness; Health and Well Being; Equality and Diversity; and Safety and Security**



Policy context, relevant baseline and key trends

3.8 Box 2 presents the key messages from the review of policies, plans, programmes and strategies included in Appendix 6.

Box 2: Key messages from the review of policies, plans, programmes and strategies – people and health

Relevance to the Strategy:

- While there are few specific health related targets and objectives which directly relate to climate change adaptation, the plans and programmes reviewed contain a large amount of information relating to people and health. UK and International level studies are a useful resource in the development of policy relating to social and health aspects of adaptation. For example the World Health Organisation (WHO) report: Climate Change and Human Health, sets out climate change health impacts as well as proposals and data needs for monitoring health effects.
- The Foresight: Future Flooding report analyses predicted flood risks with climate change impacts and sets out recommended “responses”. These include social and community impacts and responses.
- The Air Quality Expert Group report into air quality and climate change provides useful information in understanding the interactions between climate change and air quality and may be very useful in the development of health related policy.
- The Heatwave Plan for England sets out responsibilities and policy for responding to heatwave incidences in the UK. It contains information related to the urban heat island effect, a particular concern in London, but does not contain any specific policy recommendations.
- The Department of Health’s report on the health effects of climate change indicates that there are likely to be significant health implications associated with climate change, particularly for the old and the young. These effects are likely to be heightened in urban areas.
- The Code for Sustainable Homes includes several standards for new homes some of which will be important in adaptation: materials use; water efficiency; run-off and drainage; health and wellbeing. While the detailed standards may be too specific for the CCAS to consider explicitly, these standards and the need to build homes to Code standards in London should be highlighted.
- Development and Flood Risk includes standards aimed at ensuring flood risks are accounted for at all stages in the planning process. Flood events have significant health effects and it is important therefore that the CCAS reflects and supports these standards.
- The Pitt Review (and the Government’s Response) includes key recommendations about how flood risks should be managed and communicated, and recommendations to ensure that flood resilience measures are adequately funded. The Government’s response to the Pitt Review gave the Environment Agency a new strategic responsibility for all forms of flood risk, and charged local authorities with leading and co-ordinating local flood management activity.
- Future Water the Government’s water strategy for England (2008) and the Environment Agency (2009) Water Resources Strategy for England and Wales set the policy context for how water resources should be managed in the long-term. Key to future water management is reducing demand for water and managing the predicted impacts of population increase and climate change on water quantity and quality. These strategies are closely linked to the outcome of the Pitt Review, and reflect a change in how water resources will be managed in England and Wales.
- The Making Space for Water process sets out a “wide ranging” programme (including timeline) of actions relating to all aspects of managing flood risk, which is an important aspect of adaptation. This includes issues such as integrated urban drainage management and living with flood risk.
- There is specific guidance on diversity and equality such as ODPM (now DCLG) guidance on Diversity and Equality in Planning which sets out good practice and includes case studies on how equality and diversity issues can be addressed through planning.
- The London Plan contains several policies which are relevant to the Strategy and are listed in Appendix 6. The London Plan Supplementary Planning Guidance (SPGs) and other Mayoral Strategies contain other relevant priorities and targets. The Mayor has recently (October 2009) published a public consultation draft replacement London Plan. It is intended that this replacement Plan will formally be adopted in 2011.
- There are several relevant social and health related strategies for London, particularly the London Housing Strategy (consultation draft) and draft Health Inequalities Strategy. In particular, the (consultation draft) London Housing Strategy contains housing development projections which need to be considered in the context of the adaptation policy.
- Key Environment Agency plans in the London area, such as the Drought Plan and Catchment Abstraction Management Strategy for the Thames Region set out frameworks for the management of drought and abstraction in the Thames region. The draft River Basin Management Plan Thames River Basin District contains information related to likely future pressures on the region’s water bodies, including climate change effects, and describes the actions necessary over the next 20 years to improve the water environment, of which adaptation to climate change may be a key aspect.

Relevance to the SA:

- Specific targets relating to adaptation and people and health have not been identified during the review. However, conformity with the goals of Government and Regional strategy has been reflected in the SA objectives and criteria.

- The policies, plans and programmes contain relevant baseline and key issues which have been drawn on in this context chapter. These are referred to, as appropriate in the context text below.

3.9 Baseline and key trends for the SA objectives relevant to People and Health are presented below.

Governance

3.10 Involving citizens in decisions that affect them is a priority for government. In 2005 the Government launched the 'Together We Can' action plan²², which set a clear agenda to increase the opportunities for people to influence public policy decisions that affect their lives and their communities. However, the involvement of residents at a local level needs to be balanced against the need to make decisions in London at a strategic level that will benefit London as a whole, and this is particularly the case in the management of issues such as flood risk.

3.11 The GLA Act 2007 gained Royal Assent on 23 October 2007, bringing into law a host of additional powers for the Mayor of London and the London Assembly. The Act gives the Mayor lead roles in tackling climate change, as well as influence over planning and waste. Under the provisions of the GLA Act the Mayor will, amongst others, be required to address climate change, and publish a climate change mitigation and energy strategy and an adaptation to climate change strategy for London. The Assembly will also be subject to a duty to address climate change.

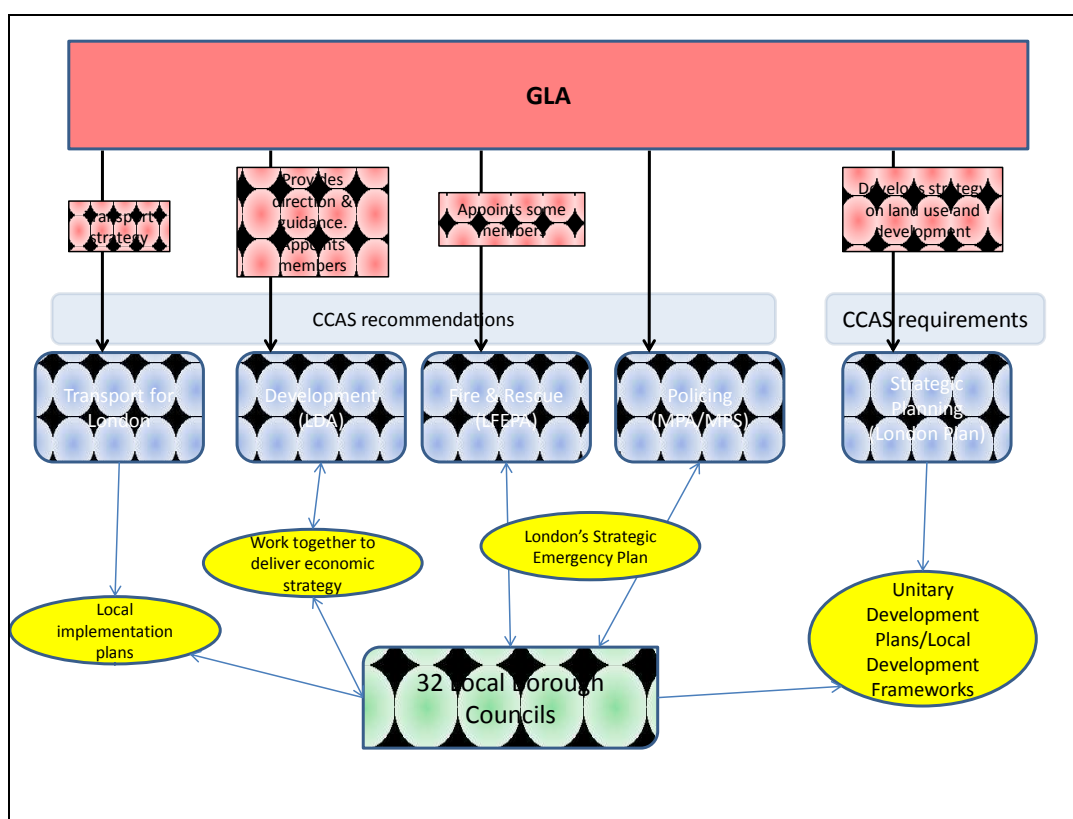
3.12 The aim of the adaptation to climate change strategy required by the GLA Act is to help identify impacts from climate change and possible ways to overcome them. However, the Mayor only has limited powers to prepare London for the impacts and opportunities presented by climate change, and many of the actions required are beyond the remit of the Mayor. As many of the impacts / opportunities have strategic implications for London, the strategy recommends partnership working to achieve these actions, and sets the agenda of what should be aimed for. Partnership bodies involved in London's adaptation but not under control of the Mayor include:

- Transport for London (TfL);
- Metropolitan Police Authority (MPA) (including the Metropolitan Police Service (MPS));
- London Fire and Emergency Planning Authority (LFEPA); and,
- London Development Agency (LDA).

The GLA is also responsible for co-ordinating land use planning in Greater London. London Borough Councils are legally bound to consider the London Plan, as the spatial planning document for London, in planning decisions, and borough level local development documents must be in 'general conformity with' the London Plan.

3.13 Figure 4 sets out the organisational structure of the GLA and its interaction with other organisations and bodies.

²² <http://togetherwecan.direct.gov.uk/>

Figure 4: Structure of the GLA and its interaction with other bodies²³

- 3.14 The Government Office for London (GOL) represents central government in the capital, delivering policies and programmes for 11 central government departments. GOL also presents London's case within Government, playing a key role in liaising between the GLA, the Mayor, the Assembly and Whitehall departments. It takes the lead in co-ordinating the Government response to the Mayor's strategies on economic development, transport, air quality, waste, biodiversity, noise, energy and spatial development, all of which are included in the draft CCAS.
- 3.15 London is composed of 32 boroughs, plus the City of London, which run most of the day-to-day services across the capital. There are usually about 60 elected councillors on each council, representing wards within the borough. The councils set the level of Council Tax which, along with additional funding from central government, facilitates the provision of services such as education, housing, social services, street cleaning, waste disposal, roads, local planning and many arts and leisure services. London Councils is the name of the collective voice of London's 33 councils; it runs a range of services aimed at making life better for Londoners, developing policy, lobbying government and others and attempting to secure more resources for the Capital and the 33 Councils. London is represented at the European Parliament by nine Members of European Parliament (MEPs).
- 3.16 The Mayor appoints Assembly Members to the boards of the LFEPA and the MPA, both of which fall under the GLA group. The LFEPA runs the London Fire Brigade, which deals with fires and other emergencies. There are 17 members of LFEPA appointed annually by the Mayor: nine for the GLA and eight nominated by the London boroughs via the Association of London Government. The MPA oversees and works with the Metropolitan Police Service.

²³ <http://www.london.gov.uk/>

The MPA consults with local communities about their crime concerns, scrutinises police behaviour and uses these findings to inform policing targets. Two other police services work in London, the British Transport Police and the City of London Police, neither of which are under the remit of the MPA.

- 3.17 The London Resilience partnership is a coalition of key agencies that form a pan-London organisation concerned with planning and preparing for potential emergencies. The partnership includes London's emergency services, transport, NHS, central and local government, GLA, utilities, the military, the business community and the voluntary sector. The partnership is currently preparing London's response to pandemic flu, large scale evacuation and severe weather conditions. The Resilience Forum is the body that oversees the work of London Resilience, and is composed of senior officials representing the main emergency organisations and key sectors within the partnership. There is a Heatwave Plan for England, setting out responsibilities and policy for responding to heatwave incidences in the UK. Although it does not include specific policy relating to urban heat island effects, the Strategic Emergency Plan (London Resilience 2007) does contain details of appropriate responses.
- 3.18 Water supply is the responsibility of four companies in London (Thames Water, Three Valleys Water, Essex and Suffolk Water and Sutton and East Surrey Water). Thames Water is the largest supplier in London, and has sole responsibility for sewerage in Greater London.
- 3.19 The water industry was privatised in 1989. Environmental improvements, such as river water quality, due to reduced point source pollution, are seen as a key successful outcome of privatisation. However, there has also been criticism that a privatised water industry lacks the incentive to address issues such as efficiency of use in households and businesses²⁴.
- 3.20 The Environment Agency has responsibility for the quality of water bodies (monitoring, enforcement) and flood protection from main rivers and watercourses. London is at risk of flooding from several sources (tidal, fluvial, surface-run-off) and any planning which may impact on this flooding (such as building in the Thames Gateway) will require consideration by the Environment Agency. The GLA has to work closely with the Environment Agency when formulating its spatial planning documents, such as the London Plan. The Code for Sustainable Homes includes standards that will be important in adaptation. In addition, the London Housing Strategy contains housing development projections which need to be considered in the context of adaptation policy.
- 3.21 The Port of London Authority (PLA) is responsible for maintaining navigational safety along the Tidal Thames, promoting use of the River and safeguarding the environment. The Authority's operations cover 95 miles of the River Thames, with an active presence on the River 24 hours a day, 365 days a year, with harbour launches patrolling between Southend and Putney. The Authority is also responsible for 11 sites of Special Scientific Interest (SSSIs), three of which are also European marine sites. In order to protect the environment of the tidal Thames, all new developments on or in the River have to be fully licensed by the PLA.
- 3.22 The Mayor has published Rail 2025²⁵ which sets out his strategy for developing London's railways to ensure that they are able to cope with projected demand to 2025. Under this strategy, the importance of Network Rail is acknowledged in delivering the majority of the Rail 2025 proposals. Network Rail run, maintain and develop Britain's tracks, signalling system, rail bridges, tunnels, level crossings, viaducts and 17 key stations (43% of all trips to central London involve Network Rail). Rail is vital to London's economy, transporting large numbers of people from the suburbs and the wider South East of England into central London. Any

²⁴ Mayor's draft Water Strategy for Public Consultation, GLA August 2009

²⁵ A rail strategy for London's future: Statement of Case : <http://www.tfl.gov.uk/assets/downloads/Rail2025.pdf>

disruption to its operation, caused by climate change impacts, could cause significant problems for London's economy.

- 3.23 London obtains its energy from gas, oil, coal and uranium (and to a lesser extent hydro, photovoltaics, wind, biomass and waste). Per capita usage of energy is rising²⁶, which, coupled with an increasing population will result in more resource use by London. Increasing the load on infrastructure that is already operating at close to capacity levels could increase the likelihood of blackouts in the future. Climate change has the potential to exacerbate this by increasing demand during extreme heat events (e.g. due to increased air conditioning use), and impacts of climate change such as subsidence and heave and storms / heavy rainfall can cause damage to infrastructure.

Education and Awareness

- 3.24 In 2007, 60.5% of 15 year olds achieved five or more GCSEs with grades A* - C compared to 59.8% in England as a whole. However the level varies significantly between income groups, with pupils in families earning low amounts (c.£18,000/year) achieving results of 39.5%, and those from families earning higher amounts (c.£54,000/year) obtaining results of 70.5%. In addition, the level also varies between boroughs, with results ranging from 34% in Greenwich to 65% in Sutton²⁷. There are also large variations in achievement between different ethnic groups, for example Black, Asian and minority ethnic groups achieved an average of 14.3% difference, compared to white ethnic groups²⁸.
- 3.25 In terms of higher education, London has the highest percentage of degree level qualifications among the adult population of all the regions, with 28.4% compared to 23.7% for England as a whole. However the level of other higher qualifications is lower in London. For example 15.3% of Londoners on average hold two General Certificate of Education A Level or equivalent compared to 19.7% for England as a whole. This suggests a high number of university graduates moving to London for work, but this may mask relatively low levels of attainment among certain groups within the stable London population.
- 3.26 The Learning and Skills Council (LSC) in London identifies the need to increase progression to higher education and improve the skill levels of young Londoners to meet employer needs as a key priority. Around 13% of London employers (representing in the region of 219,000 workers²⁹) report having skill gaps. A further key priority for the LSC is to integrate skills within economic development and local and regional regeneration.

Adapting to a changing climate in London

- 3.27 The information given to the public in relation to everyday activities related to a changing climate may affect significantly the success of responses to these, and the ability of stakeholders to communicate effectively. The London Assembly Health and Public Services Committee report into drought in London³⁰ identified that during recent droughts customers have been "*confused about what water restrictions are in place*" and what these restrictions mean for them. Improving information given to customers was among their key recommendations.

²⁶ The Mayor's Energy Strategy 2003: <http://www.london.gov.uk/mayor/strategies/energy/docs/strategy2.pdf>

²⁷ GLA, 2008, Focus on London 2008: <http://www.london.gov.uk/gla/publications/factsandfigures/fol2008/>

²⁸ Ibid.

²⁹ LSC, 2007, *The London Learning and Skills Plan*: http://readingroom.lsc.gov.uk/lsc/London/The_London_Learning_and_Skills_Plan_-_Our_regional_commissioning_plan_for_London_2007-08.pdf

³⁰ London Assembly Health and Public Services Committee, 2006 – *Drought in London*: <http://www.london.gov.uk/assembly/reports/health/londons-drought.pdf>

- 3.28 Changing people's behaviour and attitudes is integral to promoting sustainable behaviour but achieving these changes is far from straightforward. Jackson (2005)³¹ provides a comprehensive review of evidence on consumer behaviour and behavioural change and highlights that *"for much of the time people find themselves 'locked in' to unsustainable consumption patterns. Consumer 'lock-in' occurs in part through the architecture of incentive structures, institutional barriers, inequalities in access, and restricted choice. But it also flows from habits, routines, social norms and expectations and dominant cultural values"*.
- 3.29 A 2006 Environment Agency report³² makes a series of recommendations to promote retrofitting behaviour to achieve energy and water efficiency and minimise waste in households which will facilitate London's adaptation:
- *"The best way to change behaviour is through communities and special interest groups, where positive behaviour can be encouraged by social pressure and conversations and unsustainable behaviour is discouraged."*
 - *Providing practical 'on-the-ground' support for behaviour change, tailored to specific audiences and localities is more effective than raising awareness. Here support and information are crucial to enable the behaviour change and develop it sustainably within the community.*
 - *Providing a combination of prolonged support, coupled to a convenient system and community participation, a significant and sustainable behaviour change can be influenced.*
 - *Convenient infrastructure should be in place before engaging to encourage action. However, there may be a need to "warm up" the audience as infrastructure is coming on line.*
 - *Incentives can reflect the shared social responsibility of householders and others and are important where behaviour is not a social norm and convenience is compromised. They are considered essential to encourage early adopters and to build presence of pro-environmental behaviour in the community"*.

Health and Well Being

- 3.30 The WHO defines health as
- "a state of complete physical, mental and social wellbeing and not merely the absence of disease or infirmity"*.
- A healthy city is one that *"is continually creating and improving the physical and social environments and expanding the community resources that enable people to mutually support each other in performing all the functions of life and in developing their maximum potential"*³³.
- 3.31 The London Health Commission reports³⁴ that overall Londoners' health is improving, life expectancy is increasing for both males and females, and infant mortality is decreasing. Londoner's self-reported health in 2001 was slightly better than the national average for England, with 70.8% compared to 68.7% reporting that they were in good health. However the same report identifies significant inequalities within London in relation to health. Life expectancy for males for example varies from 80.8 years in Kensington and Chelsea to 73.9 years in Islington. In general the levels of life expectancy are lower in central London and higher in outer London. Ethnic groups also show considerable health inequalities, with people

³¹ Tim Jackson, 'Motivating Sustainable Consumption, a review of evidence on consumer behaviour and behavioural change', 2005, University of Surrey

³² Environment Agency 'Marketing Strategies to Promote Retrofitting Behaviour', 2006, p.3

³³ *Delivering Healthier Communities in London*, NHS London Healthy Urban Development Unit, 2007

³⁴ London Health Commission, 2007, *Health in London Looking back looking forward report: 2006/07 review of trends, progress and opportunities*: <http://www.londonhealth.gov.uk/hinl2006.htm>

- from Bangladeshi and Pakistani ethnic groups much more likely to assess their own health as “not good” than those from other groups, with those from white British, mixed white, Asian, black African and Chinese groups the least likely to report their health as “not good”³⁵.
- 3.32 Climate change can impact on health in a number of ways. For example water rationing during periods of drought could have a “*major impact on Londoner’s health and safety*” particularly on vulnerable people³⁶. Equally flooding can have significant physical and mental health effects from the immediate (e.g. drowning, illness) to the after effects (e.g. exposure to flood waters causing respiratory symptoms, stress, anxiety). These effects are discussed in more detail below.
- 3.33 Climate change will result in an increase in temperature, with more extreme hot weather events in summer and milder winters. This might mean that greater numbers of vulnerable people will die during the summer months, and fewer vulnerable people will die during (warmer) winter months^{37,38,39}. The extreme hot weather events will be compounded in London by the Urban Heat Island (UHI) effect, complicating measures which may seek to reduce energy consumption, especially due to energy use for air conditioning.
- 3.34 During the heatwave of 2003, the centre of London was up to 10°C warmer than the surrounding greenbelt⁴⁰, resulting in the widespread use of mechanical air cooling. A 2003 study⁴¹ on the impacts of green infrastructure, particularly green roofs, in the Greater Manchester area found that adding green roofs helps keep temperatures down in urban areas. The report states that “*adding green roofs to all buildings can have a dramatic effect on maximum surface temperatures, keeping temperatures below the 1961-1990 current form case for all time periods and emissions scenarios. Roof greening makes the biggest difference...where the building proportion is high and the evaporative fraction is low. Thus, the largest difference was made in the town centres*”.
- 3.35 A reduction in local air quality as a result of increased temperatures may lead to an increased number of summer air pollution episodes. Higher outdoor pollution may have negative health effects for Londoners^{42 43 44}. Climate change could increase the frequency of exceedances of short-term air quality standards, as well as the magnitude of the exceedances. Short-term exceedances are particularly important to those with pre-existing heart or lung disease. Adaptation measures that depend on a pleasant external environment, such as encouraging a modal shift to cycling, could be undermined by lower local air quality. In addition, increased outdoor air pollution may lead to poorer indoor air quality, either due to people opening their windows less, thus increasing exposure to internal sources of air pollution and maintaining a high ambient temperature, or, conversely, particularly close to main roads, in hot weather open windows can lead to traffic related air pollution (e.g. Nitrogen Dioxide and particulate matter) affecting indoor air quality.

³⁵ Ibid.

³⁶ London Assembly Health and Public Services Committee, 2006 – *Drought in London*:

<http://www.london.gov.uk/assembly/reports/health/londons-drought.pdf>

³⁷ UK Health Impacts of Climate Change <http://www.parliament.uk/documents/upload/POSTpn232.pdf>

³⁸ Rooney C, McMichael AJ, Kovats RS, Coleman MP. Excess mortality in Greater London during the 1995 heatwave. *J Epidemiol Community Health* 1998; 52:482-486

³⁹ McMichael AJ, Kovats RS. Assessment of the impact on mortality in England and Wales of the heatwave and associated air pollution episode of 1976. Report to the Department of Health. London: London School of Hygiene and Tropical Medicine, 1998.

⁴⁰ GLA (2009) Climate Change Adaptation Strategy

⁴¹ Gill, S.E., J.F. Handley, A.R. Ennos and S. Pauleit. “Adapting Cities for climate Change: The Role of the Green Infrastructure.” *Built Environment* Vol 33 No. 1, page 122-123

⁴² Hajat S, Haines A, Goubet SA, Atkinson RW, Anderson HR. The association of air pollution with daily GP consultations for asthma and other lower respiratory conditions in London. *Thorax* 1999; 54:597-605

⁴³ Stedman JR, Anderson HR, Atkinson RW, Maynard RL. Emergency hospital admissions for respiratory disorders attributable to summertime ozone episodes in Great Britain. *Thorax* 1997; 52:958-963

⁴⁴ Scarlett JF, Abbott KJ, Peacock JL, Strachan DP, Anderson HR. Acute effects of summer air pollution on respiratory function in primary school children. *Thorax* 1996; 51:1109-1114

- 3.36 The quality of life in London is closely correlated with the quality of green spaces available in the Capital⁴⁵. Climate change has the potential to negatively impact on the quality of London's green spaces. This is important when policies are being designed to encourage people to exercise more to improve their health⁴⁶. Warmer summers, an increased number of heatwaves, and possibly wetter winters may lead to people walking outdoors less, although warmer winters may have the opposite effect, so it is difficult to predict an overall effect. Recreational walking or cycling have positive impacts on cardio vascular disease and diabetes risk by reducing obesity^{47,48,49}.
- 3.37 The population of the UK is projected to become increasingly overweight towards 2050, with over 60% of the population predicted to be classed as obese by this date⁵⁰. This may have specific implications for the design of policies to help London adapt to climate change. For example, the Mayor's aim of increasing cycling in London by 400% by 2020⁵¹, to improve transport and tackle poor physical health in the city, may be more difficult to achieve if an increasing proportion of the population is obese. Similarly, if the majority of people are bigger, and heavier, this may challenge the underground's ability to cope with the projected capacity demand increase of 30% to 40% over the next 20 years⁵².
- 3.38 Flooding can cause injury and death by drowning, and an increased incidence of mental health disorders⁵³. Some flood victims suffer long-term mental health effects as a result of their experience of flooding⁵⁴.
- "The long term effects of flooding on psychological health may perhaps be even more important than illness or injury. For most people the emotional trauma continues long after the water has receded. Making repairs, cleaning up, and dealing with insurance claims can be stressful. If there is a lack of support during the recovery process, stress levels may increase further"*⁵⁵.
- 3.39 A recent review of literature on disasters and hazards suggests that certain groups within populations are more exposed to disasters, suffer a higher impact from those disasters and have a reduced capacity to recover. These groups include women, the elderly, ethnic groups, lower socio-economic groups and those new to an area⁵⁶.
- 3.40 Deprived communities may be particularly hard hit by flood incidences. A report commissioned by the Environment Agency emphasises that while *"not all vulnerable individuals and households are deprived, it is nonetheless true that deprived neighbourhoods contain concentrations of vulnerable individuals"*. Some characteristics which increase the impact of flooding on certain individuals and households are more prevalent in deprived

⁴⁵ Choosing Health: Making Healthy Choices Easier <http://www.smokefreeengland.co.uk/files/choosing-health.pdf>

⁴⁶ Local Exercise Action Plans are being developed by Government to encourage more physical activity to promote healthier lifestyles

⁴⁷ National Institute of Diabetes and Digestive and Kidney Disease (2002). Diet and exercise dramatically delay Type 2 diabetes: diabetes medication metformin also effective. Available: <http://www.nlm.nih.gov/databases/alerts/diabetes01.html>

⁴⁸ Paffenbarger RS Jr, Hyde RT, Wing AL, Lee IM, Jung DL, Kampert JB. Association of changes in physical activity level and other lifestyle characteristics with mortality among men. *N Engl J Med* 1993;328:538-45

⁴⁹ US Department of Health and Human Services. Physical activity and health: a report of the Surgeon General. Atlanta, GA: US Department of Health and Human Services, CDC, National Centre for Chronic Disease Prevention and Health Promotion, 1996.

⁵⁰ Foresight: Tackling Obesity – Future Choices :

<http://www.foresight.gov.uk/OurWork/ActiveProjects/Obesity/KeyInfo/Index.asp> Accessed: 06 07 09

⁵¹ Transport 2025 – Transport Vision for a Growing World City <http://www.london.gov.uk/mayor/transport/t2025.jsp>

⁵² Transport for London: A rail strategy for London's future – Statement of Case

<http://www.tfl.gov.uk/assets/downloads/Rail2025.pdf>

⁵³ Hajat S, Ebi KL, Kovats S, Menne B, Edwards S, Haines A (2003) The human health consequences of flooding in Europe and the implications for public health: a review of the evidence. *Applied Environmental Science and Public Health* 1(1): 13-21.

⁵⁴ Tunstall S, Tapsell S, Green C, Floyd P, George C (2006) 'The health effects of flooding: social research results from England and Wales' *Journal of Water and Health* 4(3): 365-380

⁵⁵ Ohl C, Tapsell S (2000) Flooding and human health. *British Medical Journal* 321: 1167-1168.

⁵⁶ Tapsell, S, Burton, R, Oakes, S and Parker, D (2005) The Social Performance of Flood Warning Communications Technologies. Technical Report. The Environment Agency, Bristol, UK.

areas, including: poor health, which increases the health effects, lower levels of flood risk awareness, lower incomes and higher unemployment which reduces the likelihood of having insurance and savings that may act as a buffer against some of the impacts⁵⁷.

Equality and Diversity

3.41 Over 40% of Londoners are from black and minority ethnic (BME) communities and significant growth in black and minority ethnic communities is projected over the next 20 years⁵⁸. There is specific guidance on diversity and equality, such as DCLG guidance on Diversity and Equality in Planning.

Some key 'headlines' in relation to equality in London include:

- Women from all ethnic groups and men from BME groups are under-represented among elected representatives, and among opinion leaders in business.
- London's BME population has a younger age profile than the white population.
- More than 300 languages are spoken in schools in London.
- Unemployment rates are higher for most BME groups than for the white population.
- More than a million disabled people live in London.
- 26.3% of London households with dependent children are headed by a lone parent.
- Recent polls suggest that Londoners welcome diversity – in January 2004, 30% of people cited the mix of people as one of their top six reasons for living in London.

3.42 The Mayor's target minorities groups⁵⁹ are:

- Children
- Ethnic minorities
- Lesbian, gay, bisexual and transgender people,
- Older people
- Disabled and deaf Londoners
- People with mental health needs
- Refugees, asylum seekers and immigrant workers
- Women

3.43 41% of all children in London, and more than 50% in inner London are classified as living in poverty (within households whose income is below 60% of median income), with child poverty strongly correlated to non-employment in households with dependent children⁶⁰. The highest proportions of children in workless households were within the mixed White / Black Caribbean group, the Bangladeshi group (both at 40%) and the Black African group (39%)⁶¹.

3.44 The London Assembly Health and Public Services Committee reports on drought in London. Possible reductions in water pressure (a measure adopted to reduce leakage in London's water supply network) will potentially impact disproportionately on certain groups.

3.45 Hotter, drier summers due to climate change will make the need to reduce water demand and promote efficiency increasingly important. A key means of reducing demand is the metering of use, such that household water bills reflect the amount of water used. However this may increase costs for some households. The Vulnerable Groups Regulations aim to protect certain metered low-income households from paying large bills. The Regulations were introduced to help people who might reduce their water consumption to a level that might compromise their health because of concerns about their ability to pay the bills. Eligible

⁵⁷ Walker, G, Burningham, K, Fielding, J, Smith, G, Thrush, D, and Fay, H (2006) Addressing environmental inequalities: flood risk. Science Report. The Environment Agency, Bristol, UK.

⁵⁸ Draft Further Alterations to the London Plan, GLA 2006: <http://www.london.gov.uk/mayor/strategies/sds/further-alts/docs.jsp>

⁵⁹ Who's vulnerable? Mayor of London's website: <http://www.london.gov.uk/london-life/community-and-people/vulnerable/index.jsp>

⁶⁰ London Health Commission: Health in London. Review of the London Health Strategy high level indicators, October, 2005 - <http://www.londonhealth.gov.uk/PDF/hin/2005/Hil2005Chap4.pdf>

⁶¹ Ibid.

customers pay no more than the average household bill for their region even if they use more than the average amount of water⁶².

- 3.46 In order to qualify for assistance, the household has to be metered and someone in the home must be in receipt of benefits. In addition, they will have to be responsible for three or more children under the age of 19 and in full-time education or have (or someone living in the property must have) a medical condition which requires significant additional use of water.⁶³

Table 6: Number of households applying for help under the Vulnerable Groups Regulations: 2006-07 and 2007-08⁶⁴

Water Company	Total number of applications		Total number of successful applications	
	2006-07	2007-08	2006-07	2007-08
Northumbrian (inc. Essex & Suffolk)	1,023	1,232	898	1,077
Thames	2,522	2,741	2,053	2,333
Sutton & East Surrey	94	113	91	110
Three Valleys	332	537	316	504

- 3.47 However, only a minority of homes have meters in London (for example only 17% of Thames Water served homes⁶⁵), so the majority of vulnerable households are not protected by the Regulations. In addition, there are other 'vulnerable' people not covered by the regulations, e.g. lower income working households, pensioner households, etc.
- 3.48 Water bills may also increase following 2010 when new prices will be set for the 2010 – 2015 period⁶⁶ (although Ofwat's draft price determinations for the same period⁶⁷ will seek to minimise these rises) and the penetration of metering is also set to increase^{68 69}. Lower income households spend a higher percentage of their disposable income on water bills. The percentage of income spent on water and sewerage bills is set to increase for the two lowest income quintiles. Non-working households without children currently pay and will continue to pay the highest proportion of their income. The details and implications of water metering in London are discussed in more detail in the SA Report for the draft Water Strategy (GLA, 2009).
- 3.49 Warmer winters will reduce the demand for winter space heating, whilst hotter summers, amplified by the urban heat island effect, will increase energy demand for summertime cooling in London. UKCP09 predictions state that the average temperature will increase in London by the 2050's. The climate models produced through UKCP09 cannot model urban land cover and therefore assume a rural land cover for the whole of the UK. This means that urban feedbacks, such as the urban heat island effect are not represented in the model, and therefore the models may under-predict future urban temperatures⁷⁰. The increase in average temperature, combined with a higher frequency of heatwaves, is a significant issue as higher temperatures may encourage more mechanical cooling. Mechanical cooling is a

⁶² Ofwat 'Customers applying for help under the Vulnerable Groups' Regulations – 2006-07 and 2007-08', http://www.ofwat.gov.uk/consumerissues/problemspayingbill/gud_pro_watersure2008.pdf

⁶³ Ibid

⁶⁴ This is company wide data for the Water Companies that serve London; no data for London has been identified

⁶⁵ London Assembly Health and Public Services Committee Report 'Drought in London', 2006

⁶⁶ GLA draft Water Strategy for public consultation, August 2009

⁶⁷ Ofwat (2009) Future water and sewerage charges 2010-15: draft determinations

⁶⁸ CEP (2009) Draft Water Strategy SA report

⁶⁹ Source: 1992-93 to 2004-5, Actual June Return metering numbers from Ofwat; 2009-10, PR04 final determination metering assumption; 2014-15 to 2029-30, Water Resource Plan 2004 Projections, in Institute for Public Policy Research (IPPR) 'Every drop counts, Achieving Greater Water Efficiency', 2006, p. 28

⁷⁰ GLA (2009) draft Climate Change Adaptation Strategy (draft dated 10th September 2009)

more energy inefficient and carbon intensive process than heating. This will increase energy consumption and associated emissions, and could mean higher electricity bills for Londoners, affecting those on low incomes more than the average. To date there is no scheme in place to ensure that these vulnerable groups are not adversely affected by spending a disproportionate amount of their wages on electricity bills.

- 3.50 London consumes a large amount of resources, producing 18 million tonnes of waste annually, and this is projected to increase to 23.6 million tonnes annually by 2020. The majority of this waste is currently sent to landfill, a practice which will have to change in the near future. The Landfill Directive⁷¹, applied under the Landfill Regulations (England and Wales) 2002 and must be fully implemented by 2009. To comply with the directive London's waste will increasingly need to be diverted from landfill to alternative, more sustainable disposal means. A waste charge may be introduced to pay for alternative disposal, as with increasing water and electricity bills, this may have particularly adverse effects on vulnerable and low-income groups.

Safety and Security

- 3.51 Community safety is a key social issue for London. Safety in London and crime rates were rated as being among the worst things about living in London by 45% of Londoner's in the Annual London Survey⁷², 2007. This rated higher than concerns about transport, health services and schools, with the only issues considered worse being the cost of living, traffic congestion and the cost of housing. 33% of respondents said that they felt a bit, or very, unsafe walking in their neighbourhood in the evening.
- 3.52 London has a significantly higher crime rate than the average for England and Wales. The Home Office crime statistics⁷³ for the period 2007/08 show that for "total recorded crime" the London region saw 116 offences per 1000 people, compared to 91 offences per 1000 people average in England and Wales. For the same period for "burglary" there were 13 offences per 1000 people in London compared to 11 offences per 1000 people in England and Wales, and for "other theft offences" in London there were 28 offences per 1000 people compared to 20 offences per 1000 people in England and Wales.
- 3.53 Although the predicted effects of climate change on crime are not well understood, studies from around the world have shown a correlation between the weather and the amount and type of crime^{74,75,76}. More days / periods of extreme heat, compounded by the UHI, could mean an increase in the amount of violent crime experienced by the residents of London, and, due to certain environmental characteristics, this increase has the potential to be focused in areas where vulnerable groups reside. Section 17 of the Crime and Disorder Act (1996) promotes the practice of partnership working to reduce crime and disorder, and places a statutory duty on police and local authorities to develop and implement a strategy to tackle problems in their area. The Mayor has voluntarily adopted the duty to reduce crime and disorder, and has committed to work with key stakeholders to investigate the relationship between climate and crime in London, and to promote community safety.
- 3.54 The Mayor's SPG *Providing for children and young people's play and informal recreation*⁷⁷ notes that safety fears, largely a result of traffic growth and road danger, but also a

⁷¹Council Directive 1999/31/EC

⁷² MORI, 2007. *Annual London Survey 2007*: http://www.london.gov.uk/mayor/annual_survey/2007/als-2007-toplines.pdf

⁷³ Home Office crime statistics for England and Wales <http://www.crimestatistics.org.uk/output/page1.asp>

⁷⁴ Ouimet, M. and Blais, E. (2001): *Rhythms of crimes: how weather and social factors affected the daily volume of crimes in greater Montréal from 1995 to 1998*; report prepared for the Climate Change Action

⁷⁵ Anderson, C.A. (2001): *Heat and violence*; Current Directions in Psychological Science

⁷⁶ Field, S. (1992), *The effect of temperature on crime* Br J Criminol.

⁷⁷ GLA, 2008, Final SPG, *Providing for children and young people's play and informal recreation*: <http://www.london.gov.uk/mayor/strategies/sds/spg-children-recreation.jsp>

consequence of fear of crime and abduction, have left many children and young people with fewer opportunities to walk or cycle independently around their neighbourhoods.

Key existing sustainability problems and opportunities

- 3.55 Drawing on the review of other policies, plans and programmes and the baseline data, the key sustainability problems and opportunities for the SA and the CCAS to consider relating to the people and health topic are summarised in Box 3.

Box 3: Key existing sustainability problems and opportunities – people and health

Problems

- The complex governance structure and legislation controlling the various services impacted by climate change and potential overlaps and relationships of the CCAS with other plans and strategies.
- Potential negative effects of climate change related issues such as flooding, drought, heatwaves and poor air quality. These can impact particularly on certain deprived and other vulnerable households.
- Lack of public awareness regarding the appropriate response to extreme climate related events (heatwaves, droughts, floods) as well as incremental responses, such as retrofitting homes to be more resilient to climate change effects.

Opportunities

- Partnership working between the Mayor and utility companies, regulators and public bodies in preparation and delivery of long term strategic goals, such as improving electricity delivery infrastructure.
- Promoting and protecting the transport, educational, recreation and amenity value of London's green spaces and supporting the Green Grid initiative.
- Provision of new or improved green spaces through, for example, urban wildlife corridors and planting / greening initiatives to tackle UHI effects.
- Potentially increasing public awareness of climate issues including their impact on the risk of flooding and health / quality of life in London's urban environment.

People and Health - evolution of the environment in the absence of the CCAS

- 3.56 In the absence of the CCAS, over the intended timeframe of the Strategy⁷⁸, the baseline under the People and Health theme is likely to evolve in the following ways:

- Positive changes in relation to many of the determinants of health of Londoners are likely to lead to continuing improvements in health, however existing health inequalities related to income and education levels will persist and could increase. Climate change impacts, for example flooding and overheating, may impact more on vulnerable (e.g. the elderly and young) and low income groups and may increase health inequalities in some areas / groups. Warmer winters may, however, reduce the number of deaths due to extreme cold;
- Climate change is likely to have an impact on air quality. Longer, hotter summers could increase the frequency and severity of summer smogs, though wetter winters may reduce pollutant concentrations. These summer conditions may disproportionately affect vulnerable groups such as the elderly or those with existing respiratory and underlying health problems; and
- Behaviour change is very difficult to predict, especially in the long-term. However, existing infrastructure in London has, to a certain extent, locked residents to unsustainable behaviour patterns, and as much of this infrastructure will still be in use to the 2030s, and beyond, it is likely that these unsustainable behaviour patterns will continue. Greater awareness, and possibly increased financial / other incentives to

⁷⁸ The introduction to the draft CCAS notes that it considers the climate over the century (i.e. to 2100), but particularly focuses on the period up to 2031.

modify behaviour in relation to climate change (and other environmental issues) may lead to some positive behaviour changes, for example greater understanding of the risks of, and preparedness for, flooding.

Place and quality of surroundings

- 3.57 This topic focuses on the physical environment in which we live. It encompasses the natural, built and historic environment, the landscape and townscapes of the city, and its “liveability” as a place where communities thrive and individuals can access and enjoy the amenities they need. The SA objectives relevant to this topic are: **Liveability and Place; Accessibility and Availability; Landscape, Historic and Cultural Environment; Biodiversity; and Air Quality.**



Policy context, relevant baseline and key trends

- 3.58 The key messages for this topic context from the review of relevant plans and programmes have been listed in Box 4:

Box 4: Key messages from the review of policies, plans, programmes and strategies – place and quality of surroundings

Relevance to the Strategy:

- The Planning Response to Climate Change sets out “current thinking” on the planning response to climate change. It contains advice and guidance on how planning and development can best meet the challenge of climate change adaptation.
- Plans and programmes related to flooding (such as Making Space for Water, Foresight: Future Flooding and PPS25) seek to reduce the threat to people and their property from flooding and deliver the greatest environmental, social and economic benefit consistent with the Government’s sustainable development principles. Responding to these priorities may influence the CCAS’s approach to aspects of Place, especially biodiversity, landscape and townscape.
- Future Water the Government’s Water Strategy for England (2008) and the Environment Agency (2009) Water Resources Strategy for England and Wales set the policy context for how water resources should be managed in the long-term. Key to future water management is reducing demand for water and managing the predicted impacts of population increase and climate change on water quantity and quality. These strategies are closely linked to the outcome of the Pitt Review, and reflect a change in how water resources will be managed in England and Wales.
- Other national guidance, such as the Code for Sustainable Homes, PPG13: Transportation and PPS1: Planning and Climate Change set specific standards, which may be too detailed for the CCAS to consider including in policy. However as a strategic plan for London, the CCAS can highlight the need to build homes to the standards set out in the Code and other national guidance.
- The Water Framework Directive (WFD) regulations and related river basin management and planning process will be very important in relation to the management of flooding and water issues, both of which are critical to climate change adaptation. The WFD Regulations require the Environment Agency to gather and monitor a large amount of water related information at the river basin scale.
- The Thames River Basin Management Plan is expected to be completed by the Environment Agency by December 2009 which will be an important document in the management of water in the London region.

- The London Plan (2008) and, when adopted, the replacement London Plan, as well as priorities and targets set out in London Plan SPGs and other Mayoral Strategies which relate to “Place”, such as the Mayor’s Transport Strategy and the London Biodiversity Action Plan provide the London level policy context in which the CCAS must fit.
- Specific studies on the impact of climate change in London, such as London’s Warming, Climate Change and London’s Transport Systems and London Under Threat? Flooding risk in the Thames Gateway provide key information in understanding issues which the CCAS should seek to address.
- Other London strategic plans as set out in Appendix 6, including The Blue Ribbon Network, and the draft London Housing Strategy.

Relevance to the SA:

- Specific targets relating to Place were not identified during our review, however conformity with the goals of Government and Regional strategy has been reflected in the SA objectives and criteria.
- The policies, plans and programmes contain relevant baseline data and key issues which have been drawn on in this context chapter. These are referred to as appropriate in the context text below.

Liveability and Place

- 3.59 Liveability and place encompasses the provision of streets, spaces and urban environments which create and enhance social cohesion, encourage active lifestyles and actively contribute to the wellbeing of residents. The Living Streets⁷⁹ organisation defines a number of variables which contribute to the “liveability” of a street. These include: walkability; balance of uses; well designed, well maintained spaces; safe, both day and night; attractive and interesting; well connected; space to relax; legible and informative signs where needed. The ODPM (now DCLG) Liveability Action Fund pilot schemes included Ealing Borough Council in London, where it sought to “*make places – towns and neighbourhoods – more vital, attractive, inclusive, safer, cleaner, greener, accessible and sustainable*”⁸⁰. The Planning Response to Climate Change contains advice and guidance on how planning and development can best meet the challenge of climate change adaptation.
- 3.60 Noise is an aspect of the liveability of a place which the draft CCAS may influence. The 2002 GLA London Household Survey asked people which noises caused a ‘serious problem’. 4% said road works, compared to 13% citing road traffic and 6% aircraft. Flood defence and improvements to drainage infrastructure might increase the number of roadworks in London. In addition warmer summers may increase domestic noise disturbance, especially combined with higher population densities, as more people may chose to keep windows open and socialise outdoors and in public spaces.
- 3.61 The projected increase in the number of extreme heat events caused by climate change, and the elevated temperatures in London from the UHI effect, may impact negatively on quality of life and the liveability of certain places / spaces in London (such as un-shaded squares). Higher temperatures may result in outdoor and green spaces becoming more important to quality of life in London. Higher temperatures, and the resulting increase in people using the public realm, will mean that design which maximises potential benefits will be important.
- 3.62 Increased temperatures due to climate change are also predicted to adversely affect air quality in London. This is discussed in the People and Health section above, and in a separate air quality sub-section below.
- 3.63 The projected increase in flooding, both fluvial and tidal, will mean more incidents of serious disruption to life in the capital. Major infrastructure will be under threat, with the potential for

⁷⁹ http://www.livingstreets.org.uk/what_you_can_do/assess_livability.php

⁸⁰ ODPM Liveability Action Fund, London Borough of Ealing: final update: <http://www.idea.gov.uk/idk/core/page.do?pagelId=270369>

significant loss of life. Making Space for Water⁸¹ (Defra 2005), Foresight: Future Flooding⁸² (Office for Science and Technology 2004), PPS25⁸³, Future Water⁸⁴ (Defra 2008) and the draft Flood and Water Management Bill⁸⁵ seek to reduce the threat to people and their property from flooding.

Accessibility and Availability

- 3.64 Enhancing access to jobs, services and social networks, including for the most disadvantaged is one of the Department for Transport's four strategic objectives. Improving⁸⁶ access to public transport and services may be particularly important for certain groups – with socially and economically disadvantaged people often being most isolated and unable to access the services and amenities they need.
- 3.65 Accessibility is about creating facilities for walking, cycling and public transport, but it is also about making the services and amenities which people need available locally and conveniently. Obviating the need to travel (through provision of what people need close to where they live or work) is a more sustainable way of improving accessibility than by facilitating mobility and access to services further away. The more routine activities people can do without travelling, the more London's finite infrastructure can be freed up to enable people to enjoy the special recreational, cultural and economic activities that a world city can offer.
- 3.66 While the public transport network is also vulnerable to extreme events, a transport system and economy which does not rely so heavily on private transport might also have greater resilience to the projected consequences of climate change, such as flooding and extreme weather events, as restrictions on vehicle movements would be easier to enforce, and potentially less disruptive.
- 3.67 The Department for Transport policies actively encourage the transferral of freight from road to water⁸⁷, and water transport can be an important contributing factor in improving access. Transport for London's Freight Unit is also supportive of transfer of freight to water. For example the London Freight Plan sees greater water based transportation of freight as a "significant opportunity to relieve congested roads and reduce emissions"⁸⁸. About three million people a year travel on the Thames by boat, and considerably more use the Thames-side paths and other waterways extensively for leisure purposes such as walking and cycling⁸⁹.
- 3.68 The Mayor's Transport Strategy identifies a number of options for increasing the use of the Thames, including: developing further piers; extending services and improving regularity and frequency. A lack of integration between water transport and other modes is also noted as a barrier to increased use of the Thames and other waterways for transport. The Transport Strategy was published in July 2001. Since this time work has been ongoing to improve the integration of river transport services with the wider transport network, such as through better

⁸¹ Defra Making Space for Water 2005: <http://www.defra.gov.uk/environ/fcd/policy/strategy.htm>

⁸² Office for Science and Technology, Foresight Future Flooding, 2004: <http://www.foresight.gov.uk/OurWork/CompletedProjects/Flood/KeyInformation/Outputs.asp>

⁸³ DCLG Planning Policy Statement 25; Development and Flood Risk, 2006: <http://www.communities.gov.uk/planningandbuilding/planning/planningpolicyguidance/planningpolicystatements/planningpolicystatements/pps25/>

⁸⁴ Defra (2008) Future Water – The Government's Water Strategy for England <http://www.defra.gov.uk/Environment/water/strategy/>

⁸⁵ Defra (2009) Draft Flood and Water Management Bill <http://www.defra.gov.uk/environment/water/flooding/flow/index.htm>

⁸⁶ Department of Transport aim and objectives: <http://www.dft.gov.uk/about/aimandobjectives>

⁸⁷ DfT Future of Transport White Paper, 2004: <http://www.dft.gov.uk/about/strategy/whitepapers/previous/fot/>

⁸⁸ TfL, 2006, *The London Freight Plan* (draft for consultation): http://www.tfl.gov.uk/assets/downloads/businessandpartners/The-London-Freight-Plan-web_3_30-6-06.pdf

⁸⁹ GLA, 2001, *Mayor's Transport Strategy, Chapter 4M River Thames and Other Waterways*: http://www.london.gov.uk/mayor/strategies/transport/pdf/final_ch04m.pdf

signage and more visible maps⁹⁰. The 2001 Mayor's Transport Strategy is to be replaced in 2010 by a new Transport Strategy, for which a public consultation draft is currently being consulted upon (November 2009)⁹¹. This new draft Transport Strategy also supports the transferral of freight from road to water, and increased use of the Thames and other waterways for transport.

- 3.69 The Mayor's Transport Strategy and TfL's "*Transport 2025 Transport Vision for a Growing World City*" both include modal shift as a viable way of improving transport services in the Capital. A transport hierarchy is proposed: with private car use a last resort and primacy given to walking or cycling, with public transport in between. The effectiveness of policies to encourage modal shift away from private car use may be influenced by climate change impacts in relation to each transport mode. Increasing summer temperatures may, for example, make conditions even more uncomfortable on some underground lines, even if limited forms of cooling might be possible. Equally waiting areas for buses and trains may be increasingly uncomfortable (either due to heat, or excessive rain) which might discourage people from using these modes. London Underground has a 'hot weather' programme which is triggered when temperatures exceed 24°C. UKCP09 projections suggest that by the 2030s there is a 24% – 27% probability of temperatures being warmer than 24°C. By the 2050s, this rises to a 62% – 75% probability and 70% - 91% by the 2080s. There are particular constraints to cooling the underground network, and, in the long-term delivering improvements to overland public transport networks may be a more viable means of providing a transport system adapted to higher average temperatures and heatwave conditions.

Landscape, Historic and Cultural Environment

- 3.70 London is a city with a very rich history, and culture. With over 40,000 listed buildings and structures, and four of England's 16 World Heritage Sites it is one of the most important historic cities in the World.

- 3.71 English Heritage notes that:

*"London has flourished by striking a successful balance between the old and the new. It is not a question of choosing one or the other. We must have both. The challenge is to reuse the legacy of historic buildings and areas we have inherited from past generations to regenerate failing parts of the city – to get the right buildings in the right places. Looking after the historic environment is intrinsically linked to making London a truly sustainable city"*⁹²

- 3.72 As well as the River Thames and other historic waterways, London also has approximately 80km of canal network running through contrasting city landscapes. Green corridors and the Blue Ribbon Network run through built up areas and provide important habitat and open space, and also contribute to landscape. The London Plan and its Further Alterations recognises their importance for landscape quality, as well as biodiversity. The Blue Ribbon Network should also be "*respected as the location of a rich variety of heritage that contributes to the vitality and distinctiveness of many parts of London*"⁹³.

- 3.73 While there is no single register of landscapes at risk, the national Heritage Counts in 2005 reported that nearly half of all parkland recorded in 1918 in England had been lost by 1995. Borough data is available for London, and shows that between 1918 and 1995, some boroughs have lost as much as 95% (Ealing) of parkland and the overall loss to be 30%

⁹⁰ Personal communication from Helen Woolston, TfL, commenting on draft of this report.

⁹¹ The Mayor's Transport Strategy Public Consultation Draft, October 2009

⁹² Heritage Counts – The State of London's Historic Environment 2005, English Heritage (2005): <http://www.english-heritage.org.uk/>

⁹³ GLA 2008, The London Plan (consolidated with alterations since 2004) London Plan, September 2006: <http://www.london.gov.uk/thelondonplan/thelondonplan.jsp>

across all London boroughs, although this very long time period covers significant social and economic transition so such losses are perhaps to be expected⁹⁴. During the period from April 2002 to April 2008 there were eight additional registered parks in London, increasing from 140 to 148. Of these 148 registered parks in the capital, 5% are at high risk, 17% are at medium risk and 78% are at low risk.⁹⁵

- 3.74 The 2007 GLA's London State of the Environment Report⁹⁶ notes that historically, London's growth has put pressure on the river environment, modifying rivers by straightening, encasement in concrete straitjackets or being buried underground. "*River restoration seeks to recreate a more natural structure in rivers and so creating a more attractive landscape providing the opportunity to experience the sights and sounds of a living river*". River restoration can thus play an important role in urban regeneration and the creation of sustainable urban communities through delivery of a range of social and environmental benefits⁹⁷.
- 3.75 A headline indicator for the London State of the Environment reporting is the length of non-tidal river restored per year. For 2003 – 2007 "*full river restoration or significant improvement*" has been achieved in greater than 6km of watercourse:
- Restored: 1.97km;
 - Partially restored: 0.15km;
 - Significantly improved e.g. toe boarding⁹⁸ removal: 4.3 km;
 - Total 6.42km.⁹⁹

Biodiversity

- 3.76 The London State of the Environment Report defines biodiversity as the variety of life on earth – all the species of plants and animals and their habitats¹⁰⁰. The necessity of preserving biodiversity is recognised at an international level, for example through the Natura 2000 network¹⁰¹ and the EC Habitats Directive¹⁰², to a local level with borough level Biodiversity Action Plans. Biodiversity has intrinsic importance and is increasingly valued for its positive effects on standards of living together with associated economic benefits¹⁰³. Two thirds of London's 1,600 square kilometres is occupied by green spaces or water. Around one third of this is private gardens, another third is parks or sports-use, and the remaining third is wildlife habitat¹⁰⁴.
- 3.77 In 2002 the Mayor published the first statutory Biodiversity Strategy for London¹⁰⁵. The strategy sets two targets to measure the success of strategic objectives for biodiversity in London:

⁹⁴ Heritage Counts – The State of London's Historic Environment 2006 Indicators and data report, English Heritage:

http://www.english-heritage.org.uk/hc2006/upload/pdf/HC_2006_LondonDATA.pdf

⁹⁵ Heritage Counts – The State of London's Historic Environment 2008, English Heritage : http://www.english-heritage.org.uk/hc/upload/pdf/HC08_London_Acc.pdf?1238419383

⁹⁶ GLA (2007)_ Greener London – The Mayor's State of the Environment Report for London

<http://www.london.gov.uk/mayor/environment/soereport.jsp>

⁹⁷ London State of the Environment Report 2007, Chapter 6: Land Use.

<http://www.london.gov.uk/mayor/environment/soereport.jsp>

⁹⁸ Toe boarding is a low wall built in the river channel to prevent erosion of the riverbank, usually made of timber.

⁹⁹ London State of the Environment Report 2007, Chapter 6: Land Use.

<http://www.london.gov.uk/mayor/environment/soereport.jsp>

¹⁰⁰ London State of the Environment Report 2007, Chapter 7: Biodiversity.

<http://www.london.gov.uk/mayor/environment/soereport.jsp>

¹⁰¹ <http://www.natura.org/>

¹⁰² <http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=CELEX:31992L0043:EN:HTML>

¹⁰³ Water Strategy SA Scoping Report, ENTEC July 2006.

¹⁰⁴ London State of the Environment Report 2007, Chapter 7: Biodiversity.

<http://www.london.gov.uk/mayor/environment/soereport.jsp>

¹⁰⁵ Connecting with Nature, the Mayor's Biodiversity Strategy, GLA 2002,

http://www.london.gov.uk/mayor/strategies/biodiversity/biodiversity_strategy.jsp

- No net loss of important wildlife habitat
 - Reduction of areas which are deficient in accessible wildlife sites.
- 3.78 The Mayor's Biodiversity Strategy notes that climate change is likely to have a significant effect on biodiversity. For example, in London's rivers, increased flooding in winter and low-flows in summer could exacerbate existing problems for biodiversity from varying river flows, but could also encourage the development of wetland habitats in flood storage areas. The Biodiversity Strategy indicates that the Thames supports 118 species of fish and more than 450 invertebrate species (in tidal Thames) and is an important nursery for North Sea species. Many birds also feed in the Thames' rich feeding grounds and *"the greater Thames Estuary is probably the most important in the United Kingdom for birds"*¹⁰⁶.
- 3.79 A recent report¹⁰⁷ from the London Climate Change Partnership identified that different habitats and species will experience different impacts due to climate change in London, with some proving more resilient than others. For example, standing water habitats could experience a loss of some species of amphibians and fish due to reduced water availability, while acid grassland is likely to be moderately resilient, particularly to summer drought. In relation to species, those dependent on water-based habitats could be particularly adversely affected by drought, while other species such as the grey heron and peregrine falcon are likely to be relatively well equipped to respond to climate change.
- 3.80 Before the expansion of suburban London, there was a wealth of farm ponds in London, however more than 80% of these have been lost over the last 150 years due to built development and neglect. This in turn is threatening the survival of species such as newts¹⁰⁸. Larger lakes in London cover an area of more than 1500 hectares and are all artificial in nature, but are still important habitats for wildlife and plants.
- 3.81 The London State of the Environment Report 2007¹⁰⁹ notes that having access to nature has beneficial effects on human well being, both in terms of physical exercise and mental health. Protecting biodiversity maintains the health of the local environment and provides a pleasant place for people to relax and spend time.
- 3.82 Both the biodiversity and quality of life value of London's river and water habitats is thus of great importance. The London State of the Environment Report states that London's rivers are valuable wildlife habitats, and river restoration and water quality have significant impacts on wildlife. River restoration is discussed briefly under Landscape, Historic and Cultural Environment above, and water quality is assessed in detail in the Water Management context topic below.
- Headlines relating to biodiversity in London during 2007 include:

 - Wildlife sites covered 17.1% (28,874 hectares) of total land in London 2003. This exceeds the 10% targets set out in the 1980 World Conservation Strategy.
 - There are two Special Protection Areas (SPAs) which lie partially within Greater London. There are three Special Areas of Conservation (SAC) (Richmond Park, Wimbledon Common and Epping Forest) with a combined total of 2800 hectares. There are two Ramsar sites (the Lea Valley and South West London Waterbodies) with a combined area of 1276 hectares.
 - There are 38 Sites of Special Scientific Interest (SSSIs) in Greater London, including Epping Forest and Hainault Forest, with a combined area of over 3800 hectares.
- 3.83 Flood management works and the inclusion of sustainable urban drainage systems (SUDS) in developments can also provide an opportunity to create and enhance habitats, with works at Sutcliffe Park in Greenwich recognised as a "wildlife gain" in the London State of the

¹⁰⁶ Ibid.

¹⁰⁷ London Climate Change Partnership (2009) Adapting to Climate Change – Creating natural resilience
<http://www.london.gov.uk/lccp/publications/londons-changing-climate-oct09.jsp>

¹⁰⁸ Ibid.

¹⁰⁹ London State of the Environment Report 2007, Chapter 7: Biodiversity.
<http://www.london.gov.uk/mayor/environment/soereport.jsp>

Environment Report for 2007. The Mayor's Biodiversity Strategy also recognises that allowing rivers to flood in places where this will do the least harm is both a more sustainable means of controlling flood risk, but also has secondary benefits for biodiversity in providing opportunities for the re-creation of riverside habitats.

- 3.84 London has over 5000 acres of historic parkland providing a diverse range of habitats and supporting a wide range of species. The parks occupy large tracts of central London and attract millions of visitors each year.
- 3.85 The predicted changes to the city's climate have the potential to alter the species composition in the park lands, and may lead to difficulties for the species that are historically associated with the parks. Increased drought stress, or conditions that favour more disease and pest species, both have the potential to affect the parks and streetscapes of London.
- 3.86 Around one third of London's green space, and one-fifth of London's total land area, is made up of private gardens, with an estimated two-thirds of London's trees in domestic gardens¹¹⁰. The large land area covered by private gardens makes them a crucial component of London's ecosystem, perhaps most significantly in the city's ability to absorb rainfall. It has been estimated that an area equivalent to 32 square kilometres of space which was previously made up of private front gardens has been paved over¹¹¹, reducing the capacity of London to absorb rainfall and increasing pressure on the drainage system during heavy rainfall. London gardens provide biodiversity corridors that will enable species to adapt to climate change, and as such they deserve protection from development.

Air Quality

- 3.87 London's air quality is among the worst in the UK, frequently exceeding national and European Union air quality objectives for monitored air quality pollutants. The Mayor published "Cleaning London's air: The Mayor's Air Quality Strategy" in 2002. The Strategy is concerned with all of the air pollutants contained in the National Air Quality Strategy¹¹², but focuses on particulate matter (PM10) and Nitrogen Dioxide (NO₂). Local air quality in London is influenced by the ambient temperature, with higher temperatures resulting in increased incidences of local air pollution. This is compounded in some areas where urban canyons exist, which decrease air flow and prevent pollutants from dissipating.
- 3.88 The London Air Quality Network monitors the quality of London's air at a large number of sites around the city, based on objectives related to the number of days an agreed average acceptable mean levels of particular pollutants are exceeded or not. In 2005 and the months to June 2006 the annual mean NO₂ objective was exceeded at all kerbside and roadside monitoring sites in London, a deterioration on the 2004 position. PM10 annual mean objectives were also exceeded over the same period at sites in Brent, Greenwich, Marylebone Road and Bexley¹¹³.
- 3.89 The importance of improving London's air quality is further highlighted by the European Commission's announcement in January 2009 that it is to commence legal proceedings against the UK for breaches in PM10 targets in London¹¹⁴.

¹¹⁰ Crazy Paving – The environmental importance of London's front gardens

<http://www.london.gov.uk/assembly/reports/environment/frontgardens.pdf>

¹¹¹ Ibid, paragraph 1.4.

¹¹² Department for Environment Food and Rural Affairs in partnership with Scottish Executive, Welsh Assembly Government and Department of the Environment Northern Ireland. (July 2007), The Air Quality Strategy for England, Scotland, Wales and Northern Ireland,

¹¹³ London Air, 2006, *Air Quality in London 2005 and mid 2006 Briefing*.

<http://www.londonair.org.uk/london/reports/AirQualityInLondon2005andmid2006.pdf>

¹¹⁴ <http://europa.eu/rapid/pressReleasesAction.do?reference=IP/09/174&type=H> and http://ec.europa.eu/environment/air/quality/legislation/pdf/pm10_exceedances_2005_07.pdf

- 3.90 All of London's 33 Boroughs have declared themselves Air Quality Management Areas (AQMA). Most AQMAs are related to emissions of NO_x (nitrogen oxides) and particulates, largely associated with the volume of traffic on London's roads. Climate change is predicted to increase summer and reduce winter air pollution levels¹¹⁵. The higher temperatures and decreased cloud cover will increase the formation of ground level ozone, while more frequent and longer duration anti-cyclonic weather systems will increase air stagnation and reduce pollutant dispersal. The wetter winters predicted as a consequence of climate change will, however, help remove pollutants from the atmosphere and prevent their re-suspension.
- 3.91 Clean air is an important contributing factor to good quality of life. Air pollution has negative health impacts, and these particularly affect the most vulnerable¹¹⁶ (e.g. the young, old and those suffering from respiratory diseases) and the impacts of poor air quality tend to be disproportionately felt in deprived areas¹¹⁷. It was estimated in 2005 that PM10 pollution in London alone caused 1031 premature deaths and another 1088 hospital admissions¹¹⁸. In addition poor air quality may also have an indirect effect on health, as the perception of poor air quality may discourage people from spending time outdoors – although poor outdoor air quality is also likely to affect air quality indoors. This could have a negative impact on levels of physical activity and social cohesion¹¹⁹. For example, any rise in indoor humidity will increase house dust mite allergen and moulds. Approximately 50% of asthmatics are sensitised to one or other of these and their increase will exacerbate asthma. Asthma is a major public health problem.
- 3.92 The impacts of climate change on average temperatures may exacerbate current air quality issues, both directly and indirectly, as warmer temperatures may encourage people to spend more time outside, or have their windows open, thus increasing exposure to air pollution. Indoor air quality is also likely to decrease for reasons other than the quality of local outdoor air. Improved building insulation which is designed to increase energy efficiency will reduce air flow, which will lead to more stagnant indoor air conditions and higher concentrations of air pollutants.
- 3.93 Indoor air quality is a policy responsibility that currently straddles a number of government departments. Current indoor air quality recommendations are set by the Health and Safety Executive (HSE), but provide guidance for occupational use only. The Committee on the Medical Effects of Air Pollution (COMEAP) advises that the standards set by the HSE are not appropriate for residential development.

Key existing sustainability problems and opportunities

- 3.94 Drawing on the review of other policies, plans and programmes and the baseline data, the key sustainability problems and opportunities for the SA and the CCAS to consider relating to the place and quality of surroundings topic are summarised in Box 5.

¹¹⁵ GLA (2008) The London Climate Change Adaptation Strategy, Draft report for Assembly consultation <http://www.london.gov.uk/mayor/publications/2008/docs/climate-change-adapt-strat.pdf>

¹¹⁶ GLA, 2002, *Cleaning London's Air, the Mayor's Air Quality Strategy*: http://www.london.gov.uk/mayor/strategies/air_quality/air_quality_strategy.jsp

¹¹⁷ *The London State of the Environment Report 2007*, Chapter 4: Pollution, GLA 2007 <http://www.london.gov.uk/mayor/environment/soereport.jsp>

¹¹⁸ Ibid.

¹¹⁹ Ibid.

Box 5: Key existing sustainability problems and opportunities – place and quality of surroundings

Problems

- Transport modal share might be affected by significant climatic effects, potentially reducing accessibility and reducing local air quality.
- Existing transport infrastructure and public realm may be unsuited to future climate conditions, particularly increased rainfall, temperature and extreme weather events.
- Climate change may impact negatively upon biodiversity and green spaces.
- Poor air quality is likely to be exacerbated by increasing average temperatures, and exposure to air pollutants may increase as people modify behaviour in warmer weather.

Opportunities

- Maximising opportunities arising from climate change to encourage walking and cycling in parks and other green spaces, and as a transport choice for commuting / other non-leisure trips.
- Re-invigoration of London's public realm through adaptation initiatives, e.g. to provide shading, cooling (e.g. fountains), improved drainage and create new open spaces.
- Protecting established London parks and promoting the establishment of new ones.
- Maximising biodiversity and habitat creation, landscape and access to nature / open space opportunities that climate risk management might provide. Opportunities for new plant and animal species to thrive in London.

Place and quality of surroundings - evolution of the environment in the absence of the CCAS

3.95 In the absence of the CCAS, over the intended timeframe of the Strategy¹²⁰, the environment under the Place and Quality of Surroundings theme is likely to evolve in the following ways:

- An increase in the number of heatwaves, and elevated average temperatures (further exacerbated by the UHI effect), together with other extreme weather events have the potential to affect the liveability of London. This may make some existing open spaces and squares less useable (e.g. due to lack of shading), and may make the use of public transport less attractive (e.g. due to excessive heat, or inappropriate waiting areas exposed to sun / rain). The success of the policy to encourage a modal shift from private car use and onto public transport / cycling will depend on the interaction of the various transport modes with climate change over the long term. It is likely that with the projected expansion in the population, there will be more daily passenger journeys in London;
- Other climate change impacts, such as flooding and extreme weather (storminess) may also disrupt life in London, for example through damage to essential infrastructure;
- Efforts to improve air quality in line with National and EU targets may be frustrated by the effects of climate change. Higher average temperatures are likely to exacerbate existing air pollution problems, and changes in behaviour (e.g. more use of outdoor spaces and more people choosing to keep windows open) may increase exposure to air pollutants;
- The projected increase in overall population and population density may exacerbate noise disturbance and pollution through an increase in road traffic, and people living in closer proximity. As noted, climate change may lead to more people choosing to keep windows open, which will increase the likelihood of noise disturbance and disruption; and,
- Climate change, together with existing development pressures are likely to both challenge and provide opportunities in relation to biodiversity. Flora and fauna will be influenced directly by changes in the climate, and it is likely that some habitats will change. However there will be opportunities too, for example flood control strategies may require the setting aside of low-lying areas of land to for flood storage, which could become new wetlands.

¹²⁰ The introduction to the draft CCAS notes that it considers the climate over the century (i.e. to 2100), but particularly focuses on the period up to 2031.

Climate Change

3.96 This topic relates to the changing baseline climatic conditions which the draft CCAS is seeking to address. Climate change is predicted to lead to significant challenges for London, both in terms of direct impacts on infrastructure and services, and indirect effects such as the availability of water, extreme weather events and flooding. The causes of climate change will need to be mitigated (reducing CO₂ emissions etc.) and adaptations



will need to be made to the aspects of climate change which are already inevitable. There may, however, be potential synergies or even conflicts between mitigation measures and adaptation measures which the adaptation strategy needs to address. This topic is relevant in particular to SA objectives relating to **Climate Change Adaptation and Mitigation**, but is indirectly relevant to all SA objectives.

3.97 Many of the impacts and issues relating to climate change which may be important for other topic areas (such as Liveability and Place, People and Health etc.) are discussed in more detail within these topic areas.

Policy context, relevant baseline and key trends

3.98 The key messages for this topic context from the review of relevant policies, plans and programmes have been listed in the Box 6:

Box 6: Key messages from the review of policies, plans, programmes and strategies – climate change

Relevance to the strategy:

- International and national plans and programmes reviewed include a high level of strategic information and analysis of the impacts of climate change, and the challenges, opportunities and options for adaptation. Some focus on specific issues (such as air quality, health, energy or flooding). These are all important sources of information for the development of strategic policy for London.
- The Climate Change Act details national policy priorities and targets in relation to Climate Change. The Stern Review on the Economics of Climate Change, includes a chapter on adaptation. This may be a very useful resource for the CCAS in terms of communicating the benefits of adaptive action.
- The UK Climate Change Programme includes a chapter on climate change adaptation, in which the Government's commitment to develop adaptation policy is set out.
- National guidance, including The Planning Response to Climate Change the Planning and Climate Change supplement to PPS1 and others such as Making Space for Water and the Code for Sustainable Homes provide clear direction for climate change related policy.
- Future Water and the Water Resources Strategy for England outlines the direction the Government and Environment Agency plan to take in managing water resources in a changing climate.
- The London Plan (2008) and the Mayor's Climate Change Action Plan, which sets targets for the reduction of CO₂ emissions (60% below 1990 levels by 2025). Emerging strategies are also relevant, notably the Mayor's Water Strategy which is currently being developed. The Mayor has also published a directly relevant SPG: Adapting to Climate Change – a Checklist for Development. London Plan (2008) policies considered directly relevant to the CCAS are:

4A.1 – Tackling Climate Change

4A.2 – Mitigating Climate Change
 4A.3 – Sustainable design and construction
 4A.9 – Adaptation to climate change
 4A.10 – Overheating
 4A.11 – Living Roofs and Walls
 4A.12 – Flooding
 4A.13 – Flood risk management
 4A.14 – Sustainable drainage
 4A.15 – Rising groundwater
 4A.16 – Water supplies and resources
 4A.18 – Water and sewerage infrastructure
 4A.19 – Improving air quality
 4B.7 – London Resilience and emergency planning

- The Mayor has recently (October 2009) published a public consultation draft replacement London Plan. It is intended that this replacement Plan will formally be adopted in 2011. This new London Plan will set out new policies and priorities for London. Appendix 6 includes details on the new policies proposed in this draft replacement London Plan.
- Other London climate related plans and programmes include Local Authority plans, such as the City of London Corporation's Climate Adaptation Strategy. These are a useful source of information and direction on appropriate policy options in the London context.
- Studies by the London Climate Change Partnership provide a high level of information, data and analysis on the impacts, and possible responses, to climate change in London.
- There is also considerable climate change related research and guidance produced by regulators and public bodies. The Environment Agency reports, as reviewed in Appendix 5 in particular provide key direction in climate change related issues, such as catchment flood management, drought and river basin management planning (RBMPs).

Relevance to the SA:

- Key targets and information on key issues are presented in the baseline context information, below. For example targets from the Mayor's Climate Change Action Plan are included below.
- The policies, plans and programmes contain relevant baseline and key issues which have been drawn on in this context chapter. These are referred to as appropriate in the context text below.

3.99 The London State of the Environment Report stated in 2007 that "*climate change is the most pressing environmental, social and economic problem facing the planet today*"¹²¹. The United Kingdom taken as a whole is the world's eighth largest emitter of carbon dioxide. The Climate Change Act (2008) intends to provide a clear, credible and long-term framework for tackling climate change. The Act includes a series of legally binding targets: Greenhouse gas emission reductions of at least 80% by 2050, and reductions in CO₂ emissions of at least 26% by 2020 (both against a 1990 baseline). London is responsible for 8% of all of UK emissions, producing 44 million tonnes of CO₂ each year. Figure 5 below shows a breakdown of London's CO₂ emissions by sector in 2006.

3.100 Looking into these SA data, energy use in existing homes is the largest single source of CO₂ in London, with 38% of the total. Hot water heating accounts for 18% of this figure for the domestic sector¹²². The commercial and industrial sectors combined contributed 40% of London's CO₂ emissions in 2006. 7% of this was for water heating. Ground based transport is responsible for 22% of London CO₂ emissions. This is relatively low for a city the size of London, and is attributed to the investment in and use of public transport in London, and policies to combat congestion and manage road traffic, such as the congestion charge¹²³.

3.101 Between 1965 and 1999, energy consumption in Greater London increased overall by around 16%, in spite of a net fall in population of 7%. Thus, the per capita rate of energy

¹²¹ London State of the Environment Report 2007, Chapter 1: Climate Change:

<http://www.london.gov.uk/mayor/environment/soereport.jsp>

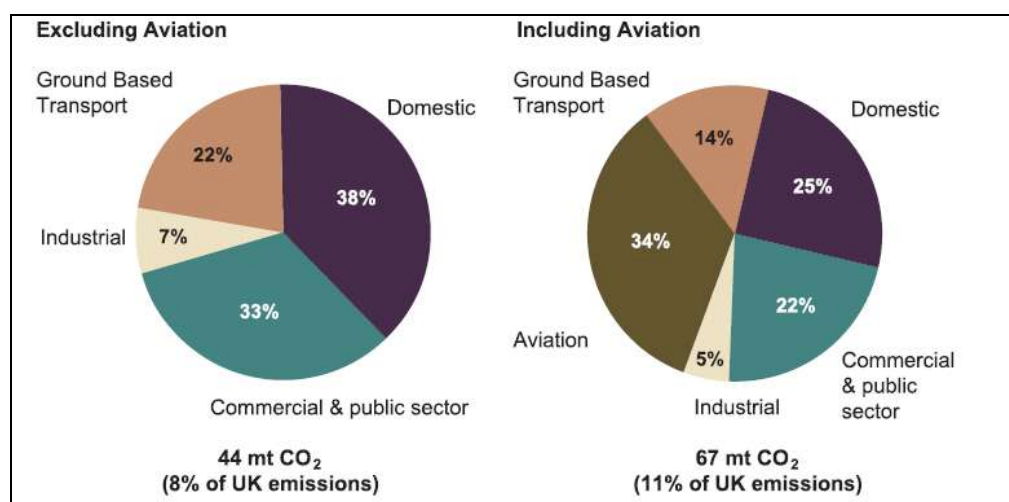
¹²² GLA, 2007, Action Today to Protect Tomorrow, the Mayor's Climate Change Action Plan.

¹²³ Ibid.

consumption has risen significantly¹²⁴. However the Mayor's Climate Change Action Plan shows that since 1990, London's overall CO₂ emissions have gone down, from just over 45 million tonnes per year to approximately 44 million tonnes in 2006. The Action Plan identifies that this change is largely due to a halving of industrial emissions, due to the relocation of industrial activity to other parts of the UK or abroad, along with a significant shift in the UK's electricity generating mix, with a reduced contribution from coal and an increase from natural gas¹²⁵.

3.102 However, London's population is growing, with the London Plan projecting an increase from 7.57 million in 2006 to 7.94 – 8.19 million in 2016, an increase of between 370,000 – 620,000 people, which is the equivalent of a city bigger than Leeds. This will impact on energy use, greenhouse gas emissions and could lead to more people and property being at risk from the effects of climate change, such as flooding. Without concerted action to curb emissions, the Mayor's Climate Change Action Plan predicts that London's emissions of CO₂ could increase by 15% to 51 million tonnes by 2025¹²⁶. The Mayor's action plan seeks to reduce these emissions by 7.7 million tonnes by 2025, and the plan asserts that *"half of this reduction can be delivered if just two thirds of Londoners make simple behavioural changes and put some basic energy efficiency measures in place"*, such as using energy efficient light bulbs and appliances.

Figure 5: 2006 CO₂ emissions from London¹²⁷



3.103 The draft CCAS itself has identified a number of issues related to London being a dynamic, growing city which, taken with the effects of a changing climate, is predicted to bring about:

- Increased pressure on water resources due to reduced rainfall;
- Higher incidence of wind storms;
- Increase in the number of significant subsidence and heave events;
- Increase in the regularity and severity of heatwaves;
- Increase in the number of poor air quality incidents;
- Increased flow to, and discharges from, sewage treatment works;

¹²⁴ GLA, 2004, A Green Light to Clean Power – the Mayor's Energy Strategy.

¹²⁵ London State of the Environment Report 2007, Chapter 1: Climate Change: <http://www.london.gov.uk/mayor/environment/soereport.jsp>

¹²⁶ GLA, 2007, Action Today to Protect Tomorrow, the Mayor's Climate Change Action Plan.

¹²⁷ Ibid.

- A greater risk of surface flooding as rainwater runs off new houses, driveways and roads; and,
 - An increase in storm and tidal surges.
- 3.104 Even if all CO₂ emissions ceased immediately the projected temperature increases worldwide would continue until the middle of the century. UKCP09 predicts that, under the medium emissions scenario, climate change will lead to¹²⁸:
- winters that are 1-2°C warmer by the 2020s and 3–4 °C warmer by the 2080s;
 - summers that will be 1-2°C hotter in the 2020s, and as much as 4-6°C hotter by the 2080s;
 - more frequent high summer temperatures, which will be exacerbated in central London due to the urban heat island effect;
 - winters that are 6% wetter by the 2020s and up to 20% wetter by the 2080s;
 - summers that are 6% drier by the 2020s and 22% drier by the 2080s;
 - potentially more / stronger wind storms¹²⁹;
 - less cloud cover; and,
 - relative sea level rise of 96cm and 2 metres by the end of the century¹³⁰
- 3.105 The UKCP09 projections, together with other information collated in the development of this context section were used to construct a table setting out current and future climatic conditions in London, both in the medium term (to the 2020s) and the long-term (2050 and beyond). Given the importance of understanding these projections to undertaking the SA of the draft CCAS, and to avoid repetition, this table is not included within this context section, but can be found in Section 4 (Part B), which sets out in detail the likely evolution of the baseline in the absence of the CCAS, which forms a key part of the SA process.
- 3.106 While London currently has a very high standard of protection from tidal flooding, climate change will increase the probability of all forms of flood risk, and the city is already exposed to far greater potential damage from flooding than any other urban area in the UK¹³¹. A number of parts of London are within the tidal flood plain with over 150 square kilometres of London below high tide level¹³². The Mayor's Climate Change Action Plan estimates that 1.25 million people and over £80 billion of property is located in flood plain¹³³. The Environment Agency is currently consulting on the strategic flood risk management plan for the Thames, Thames Estuary 2100 (TE2100), which sets out the how flood risk is likely to change in response to future changes in climate. TE2100 considers the effects on people and property, and makes recommendations and actions needed to manage flood risk through this century¹³⁴.
- 3.107 London's exposure to potential damage from flooding is high because it is home to a large and dense population, and has relatively vulnerable infrastructure, such as the underground network. The flood risk situation in London is further exacerbated by the fact that flooding potential comes from upstream (fluvial flooding) and downstream from the tidal Thames (tidal flooding / sea surge).
- 3.108 A lack of surface permeability in public spaces is also exacerbating flood risks, as it minimises natural drainage opportunities. For example, the loss of front gardens to parking and other hard surfacing (as discussed in the Liveability and Place topic above) is cited as a key

¹²⁸ UKCIP (2009) Key Findings for London <http://ukclimateprojections.defra.gov.uk/content/view/2148/528/>

¹²⁹ GLA (2009) draft Climate Change Adaptation Strategy

¹³⁰ Ibid.

¹³¹ London's Warming – the impacts of climate change on London, summary report, UKCIP and GLA 2002

¹³² Action Today to Protect Tomorrow, the Mayor's climate change action plan, GLA 2007

¹³³ Ibid.

¹³⁴ Environment Agency (2009) Thames Estuary 2100 – consultation draft <http://www.environment-agency.gov.uk/research/library/consultations/106100.aspx>

component in London losing its ability to absorb rainfall naturally, thus leading to an increase in run-off, and pressure on the city's underground drainage system¹³⁵. More than 70% of Thames tributaries are contained in culverts or concrete channels; and the replacement of green space by roads and buildings has reduced the city's ability to absorb rainfall has decreased¹³⁶. By the end of the century, climate change is projected to increase peak flows in the tributaries by 40%¹³⁷.

- 3.109 The Mayor's Climate Change Action Plan seeks for London to become an exemplar in the reduction of CO₂ from buildings, industries and transport. It includes an ambitious target of stabilising London's CO₂ emissions by 2025 at 60% below 1990 levels, with steady progress towards this over the intervening years. This compares to the UK government's current aspiration, for a 60% reduction from 2000 levels by 2050.
- 3.110 The London Plan and its Further Alterations requires developments to reduce CO₂ generation by 20% through the use of on site renewable energy generation, wherever feasible. The Mayor's Energy Strategy¹³⁸ encourages wind-power schemes, and recognises industrial areas, and particularly riverside locations in industrial and commercial use as being potential sites. The Strategy also advocates small scale hydro schemes in London, such as St Josephs RC School in Wandsworth, which receives power from a micro-hydro scheme on the River Wandle.

Key existing sustainability problems and opportunities

- 3.111 Drawing on the review of other policies, plans and programmes and the baseline data, the key sustainability problems and opportunities for the SA and the CCAS to consider relating to the climate change topic are summarised in Box 7.

¹³⁵ London Assembly, 2005, *Crazy Paving – the Environmental Importance of London's Front Gardens*: <http://www.london.gov.uk/assembly/reports/environment/frontgardens.pdf>

¹³⁶ "Warmer, Wetter, Hotter Drier" essay by Alex Nickson (GLA) and Dave Wardle (Environment Agency) for the East London Green Grid Primer, GLA 2006

¹³⁷ GLA (2009) draft Climate Change Adaptation Strategy

¹³⁸ GLA (2004) A Green Light to Clean Power – the Mayor's Energy Strategy.

Box 7: Key problems and opportunities – climate change**Problems**

- The implications of increased population, economic growth and development in London are likely cause an overall increase in energy use and emissions of greenhouse gases, even if per-capita energy use and emissions fall.
- Population growth will require new development, for housing, infrastructure, businesses and services. The pressure on land for development could mean that more people and property are at risk of flooding.
- More frequent droughts, floods and extreme weather events are predicted.
- There are potential “mal-adaptation” solutions to climate change effects, such as energy use and CO₂ emission implications of coping with higher temperatures e.g. increased installation and use of air conditioning.

Opportunities

- Potential for London to set an example to other cities around the world if appropriate adaptation measures are introduced.
- While climate change will present a significant challenge to many sectors, and impact upon wildlife and biodiversity as well as quality of life in the capital, there will also be opportunities. For example new businesses could emerge around adaptation solutions / products, some species could thrive in warmer weather, and certain adaptation options (e.g. creating flood storage) could provide opportunities to create habitats.
- “Mode shift to lower carbon forms of transport” is expected to contribute 20% of the planned reduction in CO₂ emissions by 2025 from ground-based transport – cycling could play an important part in this.
- Reducing energy use / improving efficiency will reduce CO₂ emissions.
- Improving contingency planning and increasing preventative measures to reduce the risks of dangerous climate change.

Climate change – evolution of the environment in the absence of the CCAS

3.112 In the absence of the CCAS, over the intended timeframe of the Strategy¹³⁹, the environment under the Climate Change theme is likely to evolve in the following way:

- National and London policy is seeking to reduce CO₂ emissions dramatically in the coming decades, with a national target of an 80% reduction in emissions compared to the 1990 baseline by 2050¹⁴⁰. Energy efficiency in new development, new technologies and raised awareness of climate change as an issue may lead to a decline in per-capita energy use and CO₂ emissions over the next 10 years. Although there has been a modest fall in emissions between 2002 and 2009 due in part to a decline in manufacturing in London¹⁴¹, based on existing trends of increasing energy consumption per capita, overall energy consumption and emissions could in fact rise in the capital due to projected increases in population and economic development¹⁴²;
- Climate change is likely to increase the risk of tidal, fluvial, and surface water flooding in the capital through a combination of rising sea level and increasing frequency of storm and extreme rainfall events;
- Climate change is also likely to impact on life and infrastructure in the capital in a number of other ways, including: increased pressure on water resources due to reduced amounts of summer rainfall and higher average temperatures; declining river flows leading to impacts on water quality and biodiversity; higher risk of subsidence and heave; increased incidence and intensity of heatwaves; and, declining air quality.

¹³⁹ The introduction to the draft CCAS notes that it considers the climate over the century (i.e. to 2100), but particularly focuses on the period up to 2031.

¹⁴⁰ The Climate Change Act 2008: http://www.decc.gov.uk/en/content/cms/legislation/cc_act_08/cc_act_08.aspx

¹⁴¹ LSDC (2009) London's quality of life indicators 2008 – 09 report.

http://www.londonsdc.org/documents/qol_reports/QoL_indicators.pdf

¹⁴² The London Climate Change Action Plan (GLA 2007) indicates that electricity and gas consumption in London accounts for 75% of London's emissions and is set to increase by 15% by 2025, if nothing is done to reduce emissions.

- Overheating is likely to become a more significant issue, as the urban heat island effect is exacerbated by increased development in London, and climate change leads to an increased incidence and intensity of heatwaves, and higher average temperatures. This is particularly likely to be the case where action is not taken to increase green spaces and vegetation cover. Mechanical cooling in response to overheating could increase greenhouse gas emissions, further contributing to climate change.

Water Management

- 3.113 This context topic seeks to cover all aspects of the management of water in London. It provides information on the water management situation in London, and seeks to identify key issues and opportunities arising from these. The SA objectives relevant to this topic are: **Water Quality and Water Resources**; and the flood risk aspects of **Safety and Security**.



Policy context, relevant baseline and key trends

- 3.114 The key messages for this topic context from the review of relevant policies, plans and programmes have been listed in Box 8:

Box 8: Key messages from the review of policies, plans, programmes and strategies – water management

Relevance to the Strategy:

- The Water Strategy (Defra 2008) and the Water Resources Strategy for England and Wales (Environment Agency 2009) set the national policy framework for water resources and quality.
- The draft Flood and Water Management bill should improve the effectiveness of managing the risk of flood and coastal erosion, improve the sustainability of water resources and protect against potential droughts.
- Assessment of water management issues related to climate change adaptation are included in international and national plans and programmes, such as the EEA study into vulnerability and adaptation to climate change in Europe.
- A number of studies have analysed in some detail the flood risk implications of climate change, such as the Foresight report into Future Flooding. These will provide useful information on priorities and policy for the CCAS.
- The Water Framework Directive Regulations and related River Basin Planning guidance set out the regulatory requirements expected of the Environment Agency in relation to the WFD. For example emerging River Basin Management Plans, which the Environment Agency is due to complete by the end of 2009. Large quantities of information and data are being collated by the Environment Agency in relation to its River Basin Planning responsibilities. This information could provide very useful inputs to monitoring the CCAS, particularly in relation to water management issues.
- Emerging, and currently draft, policy and legislation, such as that relating to restricting non-essential water uses, and water metering, both of which are actively being consulted upon.
- National and London policy, for example the Code for Sustainable Homes includes standards for potable water usage per-capita in the home.
- Adapting to Climate Change: A Checklist for Development and the Mayor's SPG on Sustainable Design and Construction provide standards and guidance aimed at ensuring climate change is factored into all new development – a number of these guidance standards relate to efficiency of water use and drainage.
- Other Mayoral strategies, in particular the London Plan which includes policies directly related to

climate change (see Appendix 6), a number of these also relate to water management issues.

- The Housing Strategy for London sets out how London will meet targets for housing set in the Sustainable Communities Plan. The provision of new housing is an important issue relating to water management which will be exacerbated by climate change impacts.
- Water management related reports and policy developed by the Environment Agency, in particular catchment flood management planning, drought plans, catchment abstraction management plans and in future, the River Basin Management Plan for the Thames Region.

Relevance to the SA:

- Specific targets relating to Water Management and adaptation have not been identified during our review, however conformity with the goals of Government and Regional strategy has been reflected in the SA objectives and criteria.
- The policies, plans and programmes contain relevant baseline and key issues which have been drawn on in this context chapter. These are referred to as appropriate in the context text below.

Water Quality

3.115 Defra reported that, in 2004:

- 27% of the total river lengths in London were of good biological quality (England average 70%) and 32% were of good chemical quality (England average 62%).
- London was ranked ninth (last) of the regions in terms of both biological and chemical water quality.
- However, the total river lengths classed as having good biological quality in London increased by 16 percentage points between 1990 and 2004, and lengths with good chemical water quality increased by 18 percentage points.

3.116 Drinking water quality in London is exceptionally high. In relation to drinking water in the Thames Region, the Drinking Water Inspectorates 2008 report on drinking water quality (in 2007)¹⁴³ concludes that:

“Drinking water quality across the region was maintained at the same level of compliance achieved in 2006, with compliance at 99.98% (based on 40 parameters).”

Despite remaining the same overall, underlying this figure were a number of changes with fewer failures for 10 parameters (colour, taste and odour, sodium, nitrate, iron, nickel, lead, E coli and enterococci) which were offset by more failures for 3 parameters (antimony, pesticides and bromates) and first time failures for two further parameters (benzo(a)pyrene, and tetrachloromethanes).”

3.117 Although bottled water has to meet the 2003 EU Regulations¹⁴⁴ related to water quality, there are no labelling requirements to help people to determine if a product is suitable for their nutritional needs, nor compare it to similar products and to tap water. Thus bottled water is not required to reflect its chemical and bacteriological content¹⁴⁵.

Water Supply

3.118 Four companies supply London with water: Thames Water, which supplies 76% of London's population, Three Valleys Water, 14%, Essex & Suffolk Water, 6.5% and Sutton & East Surrey, 3.5%¹⁴⁶.

3.119 Each company has a duty to ensure the security of its water supplies. The security of supply index allows Ofwat to monitor compliance of the water companies with this duty. Thames

¹⁴³ Drinking Water Inspectorate (2008) Drinking Water 2007 Thames Region, <http://www.dwi.gov.uk/pubs/annrep07/CIR07%20Thames%20Region.pdf>

¹⁴⁴ Council Directive 80/777/EEC of 15 July 1980 on the approximation of the laws of the Member States relating to the exploitation and marketing of natural mineral waters

¹⁴⁵ http://www.ciwem.org/policy/policies/bottled_water.asp

¹⁴⁶ London Assembly Health and Public Services Committee Report (2006) 'Drought in London',

Water currently ranks 20 out of 23 water companies in terms of their security of supply index and their security of supply index is C which indicates a 'significant deficit'¹⁴⁷.

- 3.120 In a dry year, London has a deficit of 200 million litres a day, equivalent to the daily demand of 1.2 million Londoners¹⁴⁸. London is among the driest capital cities in the world, with available water resources per head similar to that of Israel¹⁴⁹, and climate change is likely to make droughts like that of 2005/6 increasingly common. 80% of the capital's water is abstracted from the Rivers Thames and Lee and stored in reservoirs; the remaining 20% comes from local groundwater in the chalk aquifer under London¹⁵⁰. In relation to water management issues, the Environment Agency is collating much of the relevant information under the requirements of the Water Framework Directive Regulations¹⁵¹ and related River Basin Planning guidance¹⁵².
- 3.121 Population growth is also increasing pressure on water supply. In 2004, there were 600,000 more people living in London than in 1991. The population is predicted to rise by up to 810,000 additional people by 2026. Domestic water use in London has increased throughout the century, with each person in London consuming an average of 161 litres per day, compared to the national average of 150 litres per person per day. Based on current water use, water companies will need to provide approximately an extra 130 million litres of water a day to meet the additional needs implied by projected population growth¹⁵³. As identified in the Integrated Impact Assessment for the Mayor's Housing Strategy¹⁵⁴, the additional housing planned for London over the next ten years will increase the consumption of water resources, and the quantity of sewage produced.
- 3.122 The Environment Agency has estimated that, without any further action to manage water demand, under some models new strategic water resources may be required for London by 2020.

Leakage management

- 3.123 Leakage is defined by Ofwat¹⁵⁵ as '*the loss of water from the supply network, which escapes other than through a controlled action*'.
- 3.124 Supplying water requires energy and consequently produces carbon emissions. The national average of energy use and CO₂ emissions in 1998/99 for the supply of water were 468 kWh per million litres of water supplied, producing 209 kg of CO₂¹⁵⁶. The total greenhouse gas emissions (from energy use only, as per Carbon Reduction Commitment guidelines) for the water and sewerage sectors is 3.5 million tonnes CO₂ equivalent, and if transport and process greenhouse gas emissions are included (as per Defra guidelines) the total is 4.5 million tonnes CO₂ equivalent¹⁵⁷.

¹⁴⁷ Ofwat (2008) Service and Delivery – Performance of the water companies in England and Wales 2007 – 08, http://www.ofwat.gov.uk/regulating/reporting/rpt_los_2007-08.pdf

¹⁴⁸ Environment Agency (2006) 'Planning for a better London'

¹⁴⁹ UKCIP and GLA (2002) London's Warming – the impacts of climate change on London, summary report,

¹⁵⁰ GLA (2006) "*Warmer, Wetter, Hotter Drier*" essay by Alex Nickson (GLA) and Dave Wardle (Environment Agency) for the East London Green Grid Primer

¹⁵¹ The Water Environment (Water Framework Directive) (England and Wales) Regulations, Defra 2003

¹⁵² River Basin Planning Guidance, Defra (2006)

¹⁵³ Ibid.

¹⁵⁴ GLA (2009) The London Housing Strategy – Draft for Public Consultation: Integrated Impact Assessment

¹⁵⁵ Ofwat (2008) Service and Delivery – Performance of the water companies in England and Wales report 2007 - 08

http://www.ofwat.gov.uk/regulating/reporting/rpt_los_2007-08.pdf

¹⁵⁶ BRE (2004) 'Energy use and CO₂ emissions in the Water Industry' Newsletter, Issue 4

¹⁵⁷ Ofwat (2008) Service and Delivery – Performance of the water companies in England and Wales report 2007 - 08

http://www.ofwat.gov.uk/regulating/reporting/rpt_los_2007-08.pdf

- 3.125 Leakage by Thames Water in 2007-08 was 715 ml/d (million litres per day) compared to a target of 755 ml/d¹⁵⁸. The leakage targets set by Ofwat for Thames Water for the remainder of the 2005-10 price review period (to 2009-10) is 685 Ml/d¹⁵⁹.
- 3.126 However, fixing leaks and replacing mains is not only expensive but can cause considerable disruption especially to road transport, air-pollution (dust) and noise if it is not adequately managed. Thames Water currently applies for nearly one million permits for street works every year. Work is being carried out in 23 areas of London and in one of those areas 60 bus routes have been disrupted. Thames Water claims that there is a limit to the amount of leakage repair work that can be done in London at any one time and that it needs to be carried out by highly skilled workers¹⁶⁰.
- 3.127 In addition leakage itself can cause disruption, for example a mains water leakage in Brentford (London Borough of Hounslow) in May 2006 caused severe 'traffic disruption and the closure of a mental health care day centre' as well as damage to the fabric of the road¹⁶¹. However, a recent initiative to encourage utility companies to reduce their disruptive impacts on road traffic may help reduce the negative impact of leakage repair works¹⁶².
- 3.128 Supply pipes losses are also significant. It has been estimated that around 30% of leakage in the UK comes from customer-owned supply pipes¹⁶³. During 2007-08, as in previous years, the bulk of leakage savings reported was the result of companies' activity in repairing and replacing consumers' supply pipes. In 2007-08 this delivered 46 million litres/day, an increase of 4 million litres/day on the year before, and representing 69% of the total water efficiency savings. Water suppliers have policies to assist customers with repairs. Thames Water has a policy for fixing only first leak and only external leaks and for owner-occupiers only¹⁶⁴. Supply pipe losses can go undetected unless a property is metered.

Water abstractions

- 3.129 Catchment Abstraction Management Strategies (CAMS) are strategies prepared by the Environment Agency for managing water resources, abstractions and licences at a local level. There are two CAMS that affect London:
- i) The London CAMS which includes a number of tributaries that join the Thames between Kingston and Erith, but not the Thames. The main rivers are the Brent, Crane and Lower Lee (downstream from Feildes Weir) in the North and Hogsmill, Beverley Brook, Wandle and Ravensbourne in the South¹⁶⁵.
 - ii) The Thames Corridor CAMS which covers water resources and licensing in the River Thames¹⁶⁶.

¹⁵⁸ Ofwat (2008) Service and Delivery – Performance of the water companies in England and Wales report 2007 -08

http://www.ofwat.gov.uk/regulating/reporting/rpt_los_2007-08.pdf

¹⁵⁹ Ibid.

¹⁶⁰ Richard Aylard, External Affairs and Environment Director, Thames Water in the 16 May 2006 meeting of the Health and Public Services Committee on 'Drought in London'

¹⁶¹ Disruption in Brentford due to flooding, London Borough of Hounslow news archive, May 2006:

http://www.hounslow.gov.uk/text/25_may_brentford_flood

<http://www.tfl.gov.uk/corporate/media/newscentre/archive/11511.aspx>

¹⁶² Water UK, 'Towards Sustainability, 2005-2006, Highlights'

¹⁶⁴ There are two options in the policy– a (1) free repair or (2) subsidised relay. (1) Free repair option available to domestic customers who are owner-occupiers experiencing their first leak on their external supply pipe. Repairs are covered by a one-year warranty (subsequent repairs charged at £350). (2) The subsidised relay option is broken down into two choices: (a) replacement of the supply pipe from the boundary to the point of entry of the building covered by five-year warranty or (b) a full relay, replacement of supply pipe from the boundary to the inside stop valve covered by a ten year warranty. Service and Delivery – Performance of the water companies in England and Wales supporting information report 2007-08, , Ofwat 2008 p. 55

¹⁶⁵ Environment Agency (2006) 'The London CAMS, Final Strategy Document'

¹⁶⁶ Environment Agency (2004) 'Thames Corridor CAMS'

- 3.130 A classification system has been developed to provide information on the availability of water resources within a catchment. The 'resource availability status' indicates the relative balance between committed and available resources, showing whether licences are likely to be available and highlighting areas where abstraction needs to be reduced¹⁶⁷. There are four categories of resource availability status (see Table 7).
- 3.131 There are five Water Resources Management Units (WRMUs) in the London CAMS that include both surface and groundwaters. Of these, one WRMU is over-abstracted, one is over-licensed, two have a 'no water available' status and only one has a 'water available' status¹⁶⁸.

Table 7: Resource availability status categories¹⁶⁹

Indicative resource availability status	Definition
Water available	Water likely to be available at all flows including low flows. Restrictions may apply.
No water available	No water available for further licensing at low flows although water may be available at higher flows with appropriate restrictions.
Over-licensed	Current actual abstraction is resulting in no water available at low flows. If existing licences were used to their full allocation, they would have the potential to cause unacceptable environmental impact at low flows. Water may be available at high flows with appropriate restrictions.
Over-abstracted	Existing abstraction is causing unacceptable environmental impact at low flows. Water may still be available at high flows with appropriate restrictions

- 3.132 Additionally, there are three WRMUs in the Thames Corridor CAMS. Two of those are over-abstracted and the third has a 'no water available' status¹⁷⁰.
- 3.133 Current abstraction levels in the Thames region are 10% higher than ideal from an environmental perspective¹⁷¹.

New resource development

- 3.134 There are a number of possible new water resource options ranging from desalination to effluent re-use. None of these options is without environmental, and / or public health impacts and economic costs.

Desalination

- 3.135 Ofwat believes that Thames Water cannot achieve 'security of supply' by 2009-10 without developing new resources, particularly its planned desalination plant in Newham (East London)¹⁷². The Government approved the construction of the plant on 15 June 2007¹⁷³. The project is currently underway¹⁷⁴ and will deliver 148 million litres/day when complete (during 2009 – 10)¹⁷⁵.
- 3.136 Desalination is a very energy intensive process; for every day that the desalination plant is in full use, the emissions would exceed of 150 tonnes of carbon dioxide. Thames Water's

¹⁶⁷ Ibid.¹⁶⁸ Environment Agency (2006) 'The London CAMS, Final Strategy Document'¹⁶⁹ Ibid.¹⁷⁰ Environment Agency (2005) 'Thames Corridor CAMS, Annual Update'¹⁷¹ Environment Agency officer cited in London Assembly Environment Committee 'Down the Drain, London's Water Usage and Supply', 2005¹⁷² Ofwat (2006) 'Security of Supply, Leakage and Water Efficiency Report 2005-6'¹⁷³ Thames Water, 15 June 2007, 'Thames desalination plant to be powered by green energy'¹⁷⁴ Thames Water <http://www.thameswater.co.uk/cps/rde/xchg/corp/hs.xsl/2802.htm>

predicted use pattern for the plant would lead to the emission of 22,600 tonnes of carbon dioxide per year¹⁷⁶. However, Thames Water has stated that the desalination plant will run on biodiesel, and that they are investigating other sources of renewable fuels¹⁷⁷. There are other concerns associated with desalination, such as the need to dispose of the highly saline effluent which could affect river / estuary water quality, the impact of intake pipes on aquatic organisms, and the visual impact of the plant¹⁷⁸.

- 3.137 Desalination might be justified in some circumstances, for instance as a way of dealing with peaks in demand where there is a high seasonal tourist population¹⁷⁹.

Reservoirs

- 3.138 Reservoirs which store water when it is more plentiful (i.e. in the winter), for use when there is higher demand (i.e. the summer), are another potential new water resource option. There are several new reservoirs being considered in south east England. Thames Water, for example, has proposed a major new reservoir near Abingdon in Oxfordshire to help cope with the projected future increase in demand for water from London, Swindon and Oxfordshire. The reservoir is expected to cost around £1 billion and would cover an area of approximately 10 square kilometres and hold up to 150 million cubic metres of water. Thames Water had intended to apply for planning permission for this development in May 2008, however it was decided to include consideration of the reservoir in Thames Water's updated Water Resources Management Plan¹⁸⁰. The Environment Agency, in its response to the draft Plan, has said that it is yet to be satisfied that the proposed reservoir is the best solution for the company's customers, the environment and the wider South East¹⁸¹. Thames Water responded that the scheme would be delayed by five years and has reduced the proposed size of the reservoir by a third (from 150 million cubic metres to 100 million cubic metres)¹⁸².

- 3.139 Reservoir developments tend to be unpopular in the area where the development is proposed. As a consequence of the development, people may have to be relocated and there can be a loss of agricultural land and associated employment. Reservoir construction can use significant natural resources, can be disruptive and cause increases in traffic and noise over several years. Another serious issue is planning blight; people may not be able to sell their homes until the impact of the development becomes clear. Once built, reservoirs often become tourist attractions¹⁸³, with the associated potential for recreational and economic benefits but also some negative impacts such as traffic generation.

Water transfers/water grid

- 3.140 Another option to increase supply would be to build a 'water grid' which would consist of large pipelines to move water to south east England. The Environment Agency consider that, although this is a feasible option, it would only be justifiable if:

- The demand for water in south east England exceeds the available supply; and
- There are no better, cheaper options locally¹⁸⁴.

¹⁷⁵ Thames Water (2009) Draft Water Resources Management Plan

¹⁷⁶ Appeal by Thames Water Utilities Limited Site at Beckton Sewage Treatment Works Opening Submission on Behalf of the Mayor of London

¹⁷⁷ Thames Water <http://www.thameswater.co.uk/cps/rde/xchg/corp/hs.xsl/2807.htm>

¹⁷⁸ CIWEM Information Resources: Desalination, www.ciwem.org

¹⁷⁹ Do we need large-scale water transfers for south east England?, Environment Agency, 2006

¹⁸⁰ Thames Water (2008) Draft Water Resources Management Plan

¹⁸¹ The Environment Agency's representation on Thames Water Draft Water Resources Management Plan, Environment Agency 2008 <http://publications.environment-agency.gov.uk/pdf/GEHO0808BOOB-e-e.pdf?lang= w>

¹⁸² Thames Water (2009) Statement of Response – Draft Water Resources Management Plan

<http://www.thameswater.co.uk/cps/rde/xbcr/corp/statement-of-response.pdf>

¹⁸³ Do we need large-scale water transfers for south east England?, Environment Agency, 2006

¹⁸⁴ *ibid.*

- 3.141 The cost of developing and transferring water from Wales to London, for example, has been estimated to be at least four times the cost of developing new reservoirs and pipelines in the South East to bring water to London. Additionally, using the River Severn as part of a transfer network would have significant environmental impacts¹⁸⁵.

Effluent re-use

- 3.142 Sewage treatment plant effluents are normally discharged to a river or the sea. This option takes treated effluent from a sewage treatment plant and uses it to further the public water supply. The main advantage of effluent re-use is that it can provide a reliable source of water. Public health is obviously the main concern¹⁸⁶.
- 3.143 This is a particularly good option when the effluent is discharged to sea as the removal of discharges inland would affect river flows, particularly in summer¹⁸⁷.

New boreholes

- 3.144 There is little scope in south east England for new groundwater abstraction¹⁸⁸, so this is not likely to be a feasible option in most cases.

Water use data

- 3.145 Averaged over the past five years, the daily household water use in London is 161 litres per person¹⁸⁹. This is slightly higher than the average for England and Wales, which was estimated to be 150 litres per person per day¹⁹⁰. Water use in London has risen steadily during the twentieth century¹⁹¹ and there is a dry year deficit of 170 mega litres per day, equivalent to 1.1 million Londoners' daily demand¹⁹². The Environment Agency predicts that per capita consumption is expected to rise in London in the long term, but that average overall should fall until 2020 as more people have water meters installed¹⁹³.
- 3.146 Water companies currently forecast an increase in the per capita use of water, mostly based on predictions for a reduction in the average household occupancy¹⁹⁴. The average per capita consumption of a one person household is 78 litres per person per day more than a household with four people¹⁹⁵.

Water efficiency

- 3.147 Water companies have a duty to promote water efficiency but do not have targets to improve household water efficiency, which could contribute significantly to achieving security of supply¹⁹⁶.
- 3.148 Metering can reduce water use by 10-15%¹⁹⁷. Water companies must install meters in all new homes and there are plans for a phased approach to installing new meters on change of occupancy. Customers can ask to have a meter installed¹⁹⁸. Thames Water plans to bring

¹⁸⁵ Ibid.

¹⁸⁶ Ibid.

¹⁸⁷ Ibid.

¹⁸⁸ Ibid.

¹⁸⁹ Draft Water Strategy, May 2009

¹⁹⁰ Ibid.

¹⁹¹ Ibid.

¹⁹² Environment Agency State of the Environment (London) <http://www.environment-agency.gov.uk/research/library/publications/34083.aspx>

¹⁹³ Ibid

¹⁹⁴ Institute for Public Policy Research (IPPR) (2006) 'Every drop counts, Achieving Greater Water Efficiency'

¹⁹⁵ Environment Agency State of the Environment (London) <http://www.environment-agency.gov.uk/research/library/publications/34083.aspx>

¹⁹⁶ Institute for Public Policy Research (IPPR) (2006) 'Every drop counts, Achieving Greater Water Efficiency'

¹⁹⁷ <http://www.environment-agency.gov.uk/research/library/position/41229.aspx>

¹⁹⁸ London Assembly Health and Public Services Committee Report (2006) 'Drought in London'

the level of metering in London to 77% within 15 years¹⁹⁹, and has proposed beginning a 10-year programme of compulsory metering of households in 2010²⁰⁰.

- 3.149 It is important to have appropriate tariffs so that lower income and other vulnerable groups are not disadvantaged by the increase in metering (see People and Health context topic above).
- 3.150 Reducing water use would result in energy savings and a reduction in CO₂ emissions: IPPR's calculations suggest that 10% reduction in total household water demand could result in carbon savings of 126 tonnes per day or 45,990 tonnes per year. This does not include energy savings from a reduction in hot water use within the home. As noted under the climate change context topic above, water heating contributes 18% of CO₂ emissions from homes in London. This level of saving could contribute to the UK's domestic target to cut carbon emissions by 26% by 2020²⁰¹.
- 3.151 However, energy usage in the water industry is expected to increase in the future as a result of more strict water quality treatments and rising demand leading to increased pumping of water between resource zones and the development of energy intensive desalination plants²⁰².

Domestic water efficiency

- 3.152 Recent studies show that potential water savings in the existing housing stock are estimated to range from 12% to 30%. The variation reflects the influence of individual behaviour²⁰³.
- 3.153 The Housing Strategy for London sets out how London will meet housing targets, which has the potential to put more pressure on water resources in the Capital.
- 3.154 Water companies have a duty to promote water efficiency in the household, but expenditure in this area has declined since 1997. The current regulatory system rewards supply expansion and profits are made by selling more water and treating more wastewater. There are no such incentives for investing in demand management and other efficiency measures²⁰⁴.
- 3.155 There is no financial incentive for most individual households to retrofit their homes. A study in 2005²⁰⁵ highlighted that *"for householders to take the lead in improving their homes they must be able to do it at a low cost, with minimal disruption and maximal financial and environmental benefits"*.

Use of reclaimed water (greywater and rainwater) for non-potable needs

- 3.156 Rainwater can be collected using adapted roof guttering and water storage systems, and has potential end uses such as toilet flushing, car washing and plant watering. Greywater is water that has been previously used, such as in wash basins, baths and showers and has the potential end uses such as toilet flushing and car washing. Greywater is not suitable for use in plant watering due to potential contamination with cleaning products etc.
- 3.157 Reclaimed water systems require adequate maintenance including suitable water treatment, i.e. depending on the source of the water and the levels of bacteria, the duration of storage and the potential level of contact with humans which can be very low, e.g. toilet flushing or

¹⁹⁹ Thames Water (2009) Draft Water Resources Management Plan – Statement of Response

²⁰⁰ Thames Water (2008) Draft Water Resources Management Plan

²⁰¹ Ibid.

²⁰² Yorkshire Water, 2005 cited in Institute for Public Policy Research (IPPR) 'Every drop counts, Achieving Greater Water Efficiency', 2006

²⁰³ Institute for Public Policy Research (IPPR) 'Every drop counts, Achieving Greater Water Efficiency', 2006

²⁰⁴ Ibid.

²⁰⁵ AEA Technology (2005) cited in Environment Agency (2006) 'Marketing Strategies to Promote Retrofitting Behaviour'

- higher, e.g. car washing²⁰⁶. Currently, there are no required standards for reclaimed water, although Defra intends to produce appropriate standards for non-potable water²⁰⁷.
- 3.158 Health risks associated with rainwater harvesting are very low and considerably less than the level considered tolerable for drinking water supplies²⁰⁸. Greywater contains lower levels of organic matter and nutrients than wastewater; however heavy metals are in the same concentration range²⁰⁹ so it would have to be adequately treated prior to use.
- 3.159 A potential additional risk of greywater, or dual systems are misconnections with the drinking water system. The Water Supply Regulations (1999) impose legal requirements to avoid cross-connections and backflow of greywater into the drinking water system by placing an obligation on installers not to allow such cross-connections and to mark clearly the different pipes and fittings to distinguish between recycled and mains water²¹⁰.
- 3.160 Rainwater harvesting systems can be installed in both new and existing buildings. Rainwater can be used for all non-potable uses, i.e. all purposes except drinking. These systems can be expensive: a basic system has an approximate cost of £1,500 and plumbing and fitting costs can exceed £1,000²¹¹ per dwelling.
- 3.161 The Environment Agency estimates that using greywater for toilet flushing can save up to 18,000 litres of water a year for each person. Toilet flushing accounts approximately for one third of domestic water usage²¹². However, *“in practice most domestic roof areas are too small to satisfy all this potential demand regardless of storage cistern size, so it important to evaluate the potential savings before investing in an expensive installation”*²¹³.
- 3.162 When running costs are included, rainwater harvesting systems have been found to be less cost effective than efficiency measures such as reduced flush toilets²¹⁴. The same study found that the environmental impact of rainwater harvesting, including energy use for pumping is higher than for efficiency measures even when taking into account the potential reduction in combined sewer overflows²¹⁵.
- 3.163 The Environment Agency points out that *“in existing housing, it is generally more economic to employ water-saving measures than to reuse rainwater or greywater. However, with new developments, rainwater reuse becomes a more attractive option”*²¹⁶ due to economies of scale and ease of fitting.
- 3.164 Rainwater harvesting has the additional benefit that it can contribute to reducing the risk from surface and sewer flooding and also reducing volumes to combined sewers and consequently sewage pollution in water courses. In residential areas, sewer flooding presents considerable risk as both local residents and emergency services may be exposed to the many chemical and microbiological agents present in sewage²¹⁷.

²⁰⁶ Reclaimed Water Systems, Information about Installing, Modifying or Maintaining Reclaimed Water Systems, Water Regulations Advisory Scheme 1999 http://www.wras.co.uk/pdf_files/IGN%209-02-04%20Reclaimed.pdf

²⁰⁷ Draft Water Strategy, May 2009

²⁰⁸ Fewtrell L and Kay D. (2007) A desk-top health impact assessment of rainwater harvesting in the UK. Centre for Research into Environment and Health. Submitted to Water Research

²⁰⁹ Eriksson E, Auffarth K, Henze M, Ledin A. (2002) 'Characteristics of grey wastewater' Urban Water 4, 85-104

²¹⁰ Environment Agency, Conserving water in buildings: A Practical Guide, available: http://www.environment-agency.gov.uk/static/documents/Leisure/geho1107bnjree_1934318.pdf

²¹¹ Environment Agency 'Rainwater Harvesting', www.environment-agency.gov.uk

²¹² Environment Agency, Conserving water in buildings: A Practical Guide, available: http://www.environment-agency.gov.uk/static/documents/Leisure/geho1107bnjree_1934318.pdf

²¹³ Environment Agency, Conserving water in buildings: A Practical Guide, available: http://www.environment-agency.gov.uk/static/documents/Leisure/geho1107bnjree_1934318.pdf

²¹⁴ Nick Grant (2002) 'Water Conservation Products. A Preliminary Review', Elemental Solutions

²¹⁵ Ibid.

²¹⁶ Environment Agency, Conserving water in buildings: A Practical Guide, available: http://www.environment-agency.gov.uk/static/documents/Leisure/geho1107bnjree_1934318.pdf

²¹⁷ Bridges O. (2003) 'Double trouble: health risks of accidental sewage release' Chemosphere 52 1373-1379

- 3.165 Water butts are a lower cost option to provide storage for rainwater which can be used for watering gardens. Water butts offer storage capacity between 100 and 700 litres and can cost as little as £35²¹⁸.

Drainage

Traditional rainwater drainage

- 3.166 Traditional rainwater drainage aims to remove run-off from built up areas as quickly as possible usually by collecting it in pipes and thus minimising the risk of flooding in the immediate area²¹⁹.

- 3.167 Traditional drainage systems fall into two categories²²⁰:

- Combined sewer systems, where a single pipe is used to convey foul sewage and surface run-off. Sewage is carried to a treatment works of limited capacity requiring stormwater overflows that may allow sewage to spill into watercourses during heavy rains.
- Separate sewer systems, where foul sewage and run-off are conveyed in separate pipes that carry the sewage to a treatment works and the run-off to a watercourse. Although better than the combined system, this system also causes water pollution: run-off is contaminated as it flows through an urban area with pollutants such as heavy metals, oils and petrol, organic debris, silt, dust, pesticides and detergents which are discharged into a water course.

Rainwater drainage in London

- 3.168 Most of central London's drainage system was constructed by the Victorians in the 1850s. London's sewers are designed to carry a combination of sewage and rainfall. Increased development in London means that more ground is covered by impermeable surfaces and less rainfall is absorbed into the ground and consequently more is going into the drains²²¹.
- 3.169 During heavy rains, drainage pipes overflow and the contents of the sewers are discharged into receiving watercourses. This has not only an impact on the water environment but can also result in localised flooding when rivers burst their banks. West London suffered flash flooding in August 2004, with significant damage to streets and homes, loss of water supply and overflow of raw sewage in the Thames²²².
- 3.170 The increase in hard impermeable surfaces due to development and paving of front gardens in London is another factor. These surfaces do not allow water to be absorbed by the ground and reduce the time it takes for the water to reach the drains²²³.
- 3.171 More than a third of London's green spaces and one fifth of the total land area is made up of private gardens. London's private gardens cover an area slightly smaller than the combined size of London's inner boroughs, 319 square kilometres. As well as a key component of London's ecosystem, they are crucial in the city's ability to absorb rainfall²²⁴.
- 3.172 Front gardens are considerably smaller than back gardens, a conservative estimate would be that they cover 3% of the total area of London or around 48 square kilometres. Two thirds of London's front gardens are already at least partially covered by surfaces other than

²¹⁸ Price based on water butt available from Thames Water's recommended supplier of water butts: Thames 2 u (http://www.thames2u.com/Shop/Water_Butts.html)

²¹⁹ CIRIA Report 523 (2000) 'Sustainable Urban Drainage Systems, Best Practice Manual'

²²⁰ Ibid.

²²¹ London Assembly Environment Committee (2005) 'Crazy paving. The environmental importance of London's front gardens'

²²² Ibid.

²²³ 'London under threat? Flooding risk in the Thames Gateway' London Assembly Environment Committee, 2005

²²⁴ London Assembly Environment Committee (2005) 'Crazy paving. The environmental importance of London's front gardens'

vegetation, with paving, bricks, concrete, or gravel being the most usual. The gradual loss of London's front gardens and their capacity to absorb rainfall is increasing the city's vulnerability to flash flooding and increasing the burden of run-off on the drainage system²²⁵. The London Assembly Environmental Committee estimates that the total area of parking bays in London's former front gardens now adds up to a total area of around 32 square kilometres²²⁶.

- 3.173 The lack of capacity of the drain system to deal with the increase in run-off and sometimes the inadequate maintenance of those drains add to the problem²²⁷. London's urban drainage system could take a rainstorm event with a probability of once every three years but a rainstorm of the kind which took place once every fifty years would be a major flooding problem and due to the number of basement flats in London may even cause loss of life²²⁸. Assessment of London's drainage system concludes that even a small increase in rainfall could require the significant modification of the drainage system to maintain current service levels²²⁹.
- 3.174 One of the issues in managing drainage is that different aspects of street drainage are the responsibility of different authorities including the boroughs, Transport for London, Thames Water and private landowners in some cases²³⁰. The confusion over responsibilities around drainage maintenance led the Mayor to create the Drain London Forum. This is a partnership involving all the organisations with responsibility for and information on surface water management in London. The Forum has undertaken a scoping study to assess available data on the location and ownership of London's drainage network, and to propose a process by which information can be shared and maintained to develop a regional Surface Water Management Plan for London²³¹.

Urban run-off

- 3.175 Rainwater run-off from developments increases the risk of flooding, is an important source of diffuse pollution and reduces the amount of water soaking into the ground. Rain falling on urban areas is normally drained through surface water drains and discharged into watercourses via surface water outfalls²³².
- 3.176 Traditional urban drainage can have several effects on²³³:
- Water quality: rainwater falling on impermeable surfaces picks up dust, oil, litter, organic matter, etc, which ends up in watercourses. These pollutants have serious impacts on receiving water bodies and as a consequence of repeated discharges, life can be severely restricted and fish can suffocate in the event of a storm. The quality of groundwater can also be affected where discharges soak into the ground. Also many people are unaware that surface drains discharge directly into watercourses so liquid waste such as oil, garden chemicals or car washing waste are often poured into the drains adding to the pollution.
 - Flooding: traditional drainage systems are designed to remove rainwater as quickly as possible from developed areas which causes higher flow rates and can result in flooding downstream. Storage measures such as balancing ponds or underground storage tanks are often required to compensate these higher flows.

²²⁵ London Assembly Environment Committee (2005) 'Crazy paving. The environmental importance of London's front gardens'

²²⁶ Ibid.

²²⁷ London Assembly Environment Committee (2005) London under threat? Flooding risk in the Thames Gateway'

²²⁸ Edmund Penning-Rowsell cited in 'Flooding in London' A London Assembly Scrutiny Report, 2002

²²⁹ GLA (2009) Climate Change Adaptation Strategy

²³⁰ London Assembly Environment Committee (2005) London under threat? Flooding risk in the Thames Gateway'

²³¹ GLA (2009) Draft Water Strategy

²³² Environment Agency, SEPA & Environmental and Heritage Service of Northern Ireland (2003) 'Sustainable Drainage Systems' (SUDS), an introduction

²³³ Ibid.

- Water resources: impermeable surfaces reduce the amount of water that infiltrates into the ground, reducing groundwater levels and low flows in streams.
- Biodiversity: altered flow patterns with higher peak flows and reduced low flows can alter river habitats dramatically. Increased flow rates cause river bank erosion and because of this many streams have been confined to concrete channels, with the consequent loss of river side habitats. Another effect of traditional drainage systems is the trapping of amphibians in road gullies.

Sustainable Drainage Systems

- 3.177 Sustainable Drainage Systems or Sustainable Urban Drainage Systems (SUDS) are a series of techniques that have been developed in order to reduce the adverse effects of urban drainage²³⁴.
- 3.178 SUDS include both measures to prevent pollution and run-off at source and a range of physical structures to receive the surface run-off. Source control measures include permeable surfaces and rainwater harvesting systems, including water butts. Physical structures include swales, ponds and wetlands. These types of structures can provide natural 'treatment' of water prior to discharge to a water course. As noted in the Liveability and Place context topic above, as well as reducing the risk of flooding, pollution and helping maintain natural flows, these physical structures can also be designed to improve amenity and biodiversity in built up areas²³⁵.
- 3.179 The 'surface water management train' addresses run-off quantity and quality at all the stages of the drainage system²³⁶:
- Minimising the quantity of run-off should be considered first as this determines the size of the downstream systems and provides scope for the greatest savings. The use of rainwater for watering gardens and flushing toilets may be possible. Another desirable option at this stage is infiltration if the soil and groundwater conditions permit it.
 - Collected run-off should be removed from the site in a way that minimises pollution and allows further volume reduction and infiltration.
 - Finally, if necessary, further flow attenuation and passive treatment can be installed to reduce flood risk and improve water quality before discharge to a watercourse.
- 3.180 The cost of SUDS does not only include the cost of installation but also maintenance and operation costs. Certain features such as wetlands and ponds can be expensive to install and maintain. However, it is increasingly being accepted that the cost of maintaining well-designed systems is no higher than the cost of a conventional drainage system or open landscaped area²³⁷.
- 3.181 The benefits of SUDS also includes environmental and amenity benefits and indirect benefits such as a reduction in flooding, costs of wastewater treatment in combined systems and cost of pollution remediation in watercourses²³⁸.
- 3.182 HR Wallingford have carried out research and reporting for the DTI to determine good practice in whole-life cost assessment for SUDS development and management²³⁹.

²³⁴ Ibid.

²³⁵ Ibid.

²³⁶ Ibid.

²³⁷ CIRIA Report 523 (2000) cited in Berry, C.W. 'Sustainable Urban Drainage- UK Experience and practical application in New Zealand' 2002

²³⁸ Berry, C.W.(2002) 'Sustainable Urban Drainage- UK Experience and practical application in New Zealand'

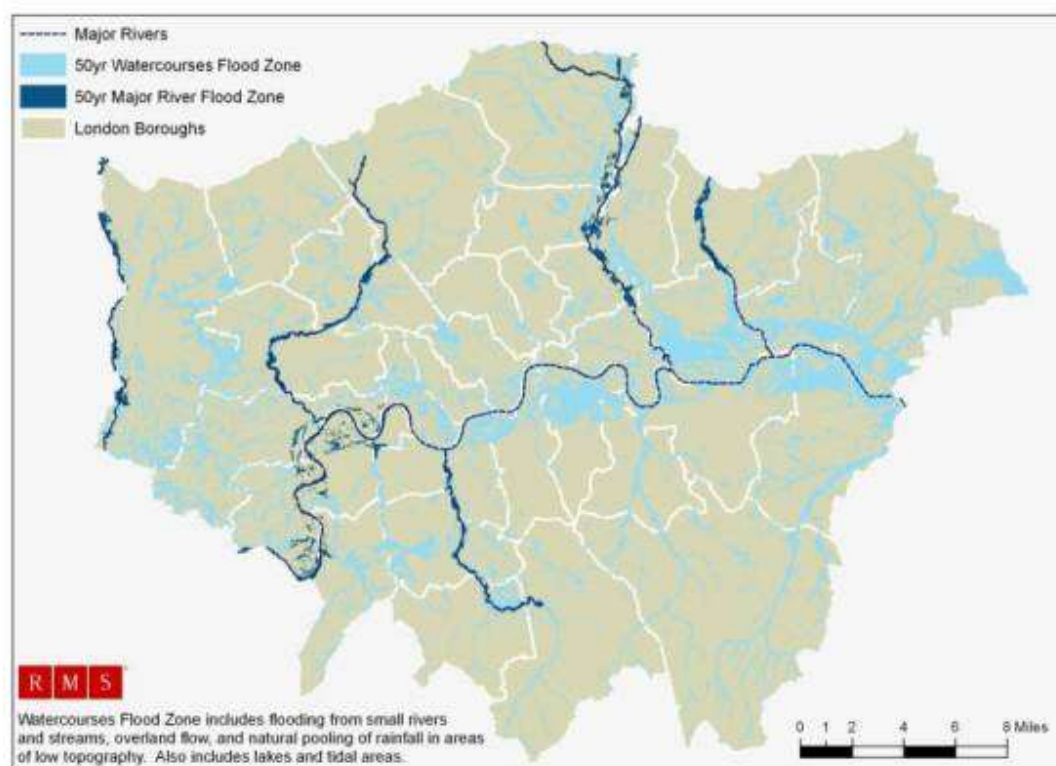
²³⁹ See <http://www.ciria.com/suds/index.html> for further information

Flood Risk

Flooding in London

- 3.183 Flooding can occur from one of several sources or a combination of sources: coastal flooding, river flooding, localised or fluvial flooding, groundwater and sewer flooding²⁴⁰.
- 3.184 The draft Regional Flood Risk Appraisal of London stresses that *'flood risk is a serious consideration for London'* and that 15% of Greater London has some extent of known flood risk. Tidal and river flooding are a major risk for London. Around 45 square miles of London is at risk of tidal flooding, an area containing 400,000 properties and home to 1.25 million people²⁴¹, 16 hospitals, 30 overland railway stations, 68 underground stations and eight power stations²⁴².
- 3.185 The draft CCAS notes that currently 82% of the 400,000 properties are at 'low risk' of flooding, but that 100,000 are at 'moderate' or 'significant' risk. These properties would be particularly susceptible to a change in the probabilities of a flood event. For the properties at risk of surface water flooding, 1 in 7 would be affected by a 1 in 50 year rainfall event, rising to 1 in 5 for a 100 year event²⁴³. Figure 6 shows the areas of London at risk of surface water flooding from a 1 in 50 year rainfall event.

Figure 6: Areas at risk of surface water flooding from a 1 in 50 yr rainfall event



Source: Assembly consultation draft CCAS (August 2008)

²⁴⁰ See Draft Regional Flood Risk Appraisal (June 2007) Chapter 2 'Overview of flood risk to London' Available: <http://www.london.gov.uk/mayor/strategies/sds/docs/regional-flood-risk.rtf>

²⁴¹ City of London (2007) Rising to the challenge – The City of London Corporation's Climate Change Adaptation Strategy http://217.154.230.218/NR/rdoonlyres/7347D392-3CF3-4344-8B2D-9AF9315E8801/0/SUS_climateadapt.pdf

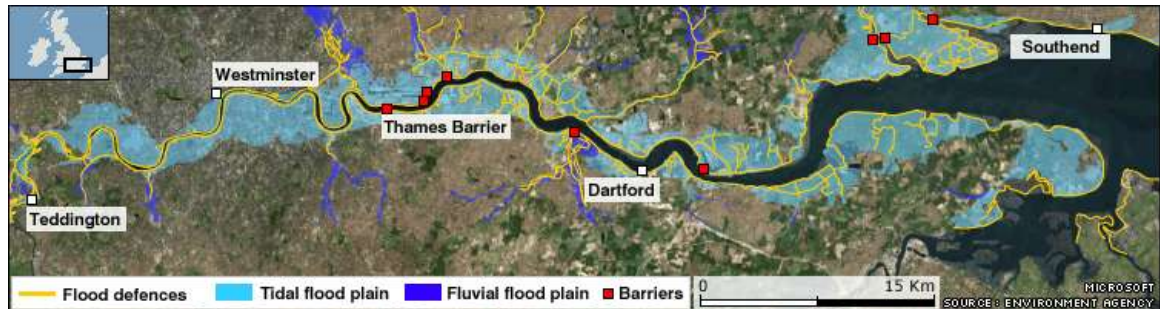
²⁴² Environment Agency (2006) 'Planning for a better London'

²⁴³ GLA (2009) draft Climate Change Adaptation Strategy

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- 3.186 Figure 7 below shows the extent of the floodplain in London, extending as far as the Thames Estuary in Essex.

Figure 7: Flood plain extent in London



Source: Environment Agency²⁴⁴

- 3.187 The London Flood Response Strategic Flood Plan highlights that as well as those who live in the flood plain in London there are:

“many more people work in, visit or travel through potentially vulnerable areas and could be unfamiliar with the risk. The cultural mix in London and the high mobility of the population serve to make incident and emergency response more complex. Because it is a densely developed urban area, there is a rapid response to rainfall in both the natural and constructed drainage systems with the result that there may be no forewarning of fluvial and surface water flooding”²⁴⁵.

- 3.188 Climate change will cause an increase in the risk of flooding:

“sea level rise, more frequent and higher storm surges and increased winter rainfall and more intense summer rainfall will add to existing risk and it may not prove possible to improve fixed defences sufficiently to maintain or raise protection standards”²⁴⁶.

Flood Risk Management

- 3.189 As the risk of flooding cannot be completely eliminated the term ‘flood risk management’ is preferred to ‘flood defence’. Broadly, the main options to reduce flood risk to people, property and the environment are flood defences, flood forecasting and warning systems, increasing flood resilience of properties, changes in land management and discouraging inappropriate development in areas at risk of flooding²⁴⁷. These options for management have to be combined, for example, using flood warnings to reduce the consequences of a flood defence breaching or being overtopped.
- 3.190 Defra is responsible for flood and coastal erosion risk management in England. The Environment Agency and local authorities are responsible for delivery on the ground. The Environment Agency is the main operating authority and has ‘permissive powers’ i.e. is empowered, but does not have a legal obligation, to manage flood risk from main rivers and the sea. The Environment Agency is also responsible for forecasting and flood warning and for raising awareness of flood risk. Local authorities have similar powers for ‘ordinary watercourses’ i.e. those which have not been designated as main rivers²⁴⁸.

²⁴⁴ Image downloaded from BBC: http://news.bbc.co.uk/nol/shared/spl/hi/pop_ups/07/sci_nat_enl_1187112433/img/1.jpg

²⁴⁵ London Resilience (2007) ‘London flood resilience strategic plan’

²⁴⁶ Ibid.

²⁴⁷ Defra (n.d.) <http://www.defra.gov.uk/enviro/fcd/default.htm>

²⁴⁸ Defra (2007) Flood and coastal erosion risk management, Available: <http://www.defra.gov.uk/enviro/fcd/defrafrm.pdf>

Flood defences in London

- 3.191 London is protected by a combination of tidal and fluvial flood defences.
- 3.192 As a result of the 1953 flood, a system of tidal flood defences was constructed in London. The Thames Barrier, which has been operational since 1982, is a key part of this system. There are also around 400 smaller barriers and movable flood gates downstream of the Thames Barrier and over 300 km of river walls and embankments stretching into Essex and Kent that have been raised by 2 metres to give additional protection from storm surges. Upstream of the Thames Barrier river walls prevent the normal range of high tides from flooding parts of inner and central London²⁴⁹.
- 3.193 Since its completion in 1982, the Thames Barrier has been closed 101 times (up to March 2007) to prevent flooding. The general trend shows an increase in the number of closures per year. Closure of the Thames Barrier is also accompanied of closure of other barriers and flood gates, which causes disruption to navigation and mooring. The Environment Agency has indicated that closing the Thames Barrier more than 70 times in a year is not likely to be sustainable²⁵⁰.
- 3.194 Most of the Thames tributaries have flood defences to reduce the risk of fluvial flooding. Most of these consist of river walls and widened channels. Although these structures protect people and property from flooding, they also cause reduction of biodiversity and amenity value of rivers and have increased maintenance requirements²⁵¹. Increases in rainfall due to climate change are projected to increase peak flows in the Thames tributaries by 40% by the end of the century²⁵².

²⁴⁹ See Draft Regional Flood Risk Appraisal (June 2007) Chapter 2 'Overview of flood risk to London' Available: <http://www.london.gov.uk/mayor/strategies/sds/docs/regional-flood-risk.rtf>

²⁵⁰ Ibid.

²⁵¹ Ibid.

²⁵² GLA (2009) Climate Change Adaptation Strategy

Figure 8: Vulnerability to flooding classification

Essential Infrastructure	<ul style="list-style-type: none"> • Essential transport infrastructure (including mass evacuation routes) which has to cross the area at risk, and strategic utility infrastructure, including electricity generating power stations and grid and primary substations.
Highly Vulnerable	<ul style="list-style-type: none"> • Police stations, Ambulance stations and Fire stations and Command Centres and telecommunications installations required to be operational during flooding. • Emergency dispersal points. • Basement dwellings. • Caravans, mobile homes and park homes intended for permanent residential use. • Installations requiring hazardous substances consent.¹⁹
More Vulnerable	<ul style="list-style-type: none"> • Hospitals. • Residential institutions such as residential care homes, children's homes, social services homes, prisons and hostels. • Buildings used for: dwelling houses; student halls of residence; drinking establishments; nightclubs; and hotels. • Non-residential uses for health services, nurseries and educational establishments. • Landfill and sites used for waste management facilities for hazardous waste.²⁰ • Sites used for holiday or short-let caravans and camping, subject to a specific warning and evacuation plan.
Less Vulnerable	<ul style="list-style-type: none"> • Buildings used for: shops; financial, professional and other services; restaurants and cafes; hot food takeaways; offices; general industry; storage and distribution; non-residential institutions not included in 'more vulnerable'; and assembly and leisure. • Land and buildings used for agriculture and forestry. • Waste treatment (except landfill and hazardous waste facilities). • Minerals working and processing (except for sand and gravel working). • Water treatment plants. • Sewage treatment plants (if adequate pollution control measures are in place).

Source: PPS25 (2001)

- 3.195 The Environment Agency is responsible for flood forecasting, warning and undertaking flood awareness campaigns. The Environment Agency does not only provide warnings for the public but also for their professional partners in flood emergencies: primarily the emergency services and local authorities. However, warnings cannot be issued for all flood events. Although the Environment Agency aims to provide at least 2 hour warnings where possible, in many areas little or no warning can be provided for fluvial flooding. For tidal flooding, the Environment Agency can normally provide a warning of up to 12 hours although this does not take into account breaches in existing defences in which case no warning could be provided. Additionally, no warning is generally possible for surface water flooding²⁵³.
- 3.196 A further issue is that many of those living in flood risk areas in London may be particularly vulnerable from the point of view of receiving a flood warning: including elderly people, those with disabilities, those whose first language is not English, etc.
- 3.197 Emergency planning and response is another key component of flood risk management in London, given the large numbers of people living and working on the flood plain²⁵⁴.

²⁵³ London Resilience (2007) 'London flood resilience strategic plan'

²⁵⁴ Ibid.

Key existing sustainability problems and opportunities

- 3.198 Drawing on the review of other policies, plans and programmes and the baseline data, the key sustainability problems and opportunities for the SA and the CCAS to consider relating to the water management topic are summarised in Box 9.

Box 9: Key existing sustainability problems and opportunities – water management

Problems

- London's water deficit in dry years and over abstraction of existing water resources which has knock on effects on the water environment.
- Potential social and environmental effects of developing new resources.
- London's increasing population and decaying water infrastructure including leaky pipes and drainage and sewerage systems unable to cope.
- Higher levels of leakage, challenges and barriers to fixing leaks (e.g. disruption caused) and issues associated with potential reduction in water pressure to reduce leakage.
- Rising per capita water use, exacerbated by increases in single person households and lack of understanding and incentives to change behaviours.
- Poor (but improving) biological and chemical quality of London's water bodies. Diffuse and aesthetic pollution caused by sewer misconnections and combined sewer overflows and effects on biodiversity and amenity value of watercourses.
- Risk of flooding from all sources and potential impacts on health, well being, infrastructure.
- The effects of climate change and increasing population in all the above.

Opportunities

- Increasing financial incentives to save water through the installation of water meters.
- Opportunities for reducing water consumption in new developments, promoting retrofitting and more responsible use of water resources.
- Improving infrastructure and water environment as a result of new development and regeneration, e.g. the Olympics.
- Increasing water available by using reclaimed water.
- Including SUDS in new developments and reducing the risk of flooding by opening up rivers and providing space for water. Consequent increase in the provision amenity, recreation and biodiversity benefits.

Water management - evolution of the environment in the absence of the CCAS

- 3.199 In the absence of the CCAS, over the intended timeframe of the Strategy²⁵⁵, the environment under the Water Management theme is likely to evolve in the following ways:
- The chemical and biological quality of London's rivers are improving. National and EU regulations, especially the implementation of the Water Framework Directive are likely to lead to further improvements in the water quality of London's waterways. However, as noted under the evolution of the baseline in relation to the Climate Change topic, there is the possibility that the effects of climate change may reduce water quality by reducing river flows and increasing the incidence of combined sewer overflows;
 - London's water deficit is likely to increase, due to projected increases in population and changing weather patterns, especially warmer, drier summers. However, the management of demand and increasing water efficiency measures may help to reduce the deficit. Some new water resources may be developed, but major new developments are unlikely to be online within 10 years;
 - Loss of water through leakage is likely to reduce as water companies repair / replace damaged pipes, although overall leakage levels in London are likely to remain high in comparison to other areas given the age of much of the infrastructure;

²⁵⁵ The introduction to the draft CCAS notes that it considers the climate over the century (i.e. to 2100), but particularly focuses on the period up to 2031.

- Changing weather patterns are likely to increase the amount of surface water run-off, flooding and overflow of sewage into water courses;
- The risk and severity of flooding in London is likely to increase, resulting in greater damage and disruption to transport networks and other infrastructure. There are also potential negative health consequences associated with flooding, which are covered in the People and Health section above; and
- If the current schedule for the construction of the Lee Tunnel and the Thames Tunnel are met, they could be completed in approximately 2014 and 2020 respectively. Therefore, within 10 years the level of untreated sewage overflowing from London's sewers into the River Thames and its tributary the River Lee could be substantially reduced. The tunnels should assist compliance with the Urban Waste Water Treatment Directive.

Waste and Resources

- 3.200 This topic provides information relevant to the production and management of waste and the consumption of resources. Particular focus is given to the consumption of non-renewable materials. This topic is relevant to the **Waste Management** SA objective.



Policy context, relevant baseline and key trends

- 3.201 The key messages for this topic context from the review of relevant policies, plans and programmes have been listed in Box 10:

Box 10: Key messages from the review of policies, plans, programmes and strategies – waste and resources

Relevance to the Strategy:

- Sustainable design and construction techniques such as those set out in the Code for Sustainable Homes will influence resource use and waste generation. The CCAS could help promote wider resource use efficiency, perhaps focusing on materials used in construction.
- Climate impact studies such as London's Warming highlight waste related issues – such as heatwaves and milder summers requiring more frequent household waste collection, or modified waste storage facilities. The CCAS should consider these issues.
- Mayoral Strategies and SPGs, particularly the London Plan and the Mayor's Municipal Waste Management Strategy include waste and resource related policy.

Relevance to the SA:

- Targets and priorities relating to waste set out in the National Waste Management Strategy, the Mayor's Municipal Waste Management Strategy, and resource related objectives in (for example) the Code for sustainable homes, and the Government Strategy for Sustainable Development have been reflected in the SA objectives and criteria.
- The policies, plans and programmes contain relevant baseline and key issues which have been drawn on in this context chapter. These are referred to as appropriate in the context text below.

- 3.202 The waste management hierarchy as set out in the National Waste Strategy²⁵⁶ aims to first avoid the production of waste altogether, then re-use materials; then recycle and compost

²⁵⁶ Defra (2007) Waste Strategy for England and Wales 2007:
<http://www.defra.gov.uk/environment/waste/strategy/strategy07/pdf/waste07-strategy.pdf>

them; then recover energy from them; and finally, as a last resort, dispose of them. This hierarchy is reflected in the Mayor's Waste Strategy²⁵⁷.

- 3.203 Total annual municipal waste production for London in 2007/2008 was estimated at 4.14 million tonnes²⁵⁸, of which households produced 3.34 million tonnes and non-household sources produced 0.8 million tonnes²⁵⁹.
- 3.204 53% of this total figure for London was sent to landfill in 2007-08, down from 72% in 2000-01. 22% was incinerated (with energy from waste), up from 20% in 2000-01, and 22% was recycled or composted in 2005-06, an increase from 8% in 2000-01. While this increase in recycling is encouraging, London still lags considerably behind other regions. The East of England achieved 40% recycling/composting over the same period, for example, and all regions exceeded 25%. The England average in 2007-08 was 34% recycled or composted.
- 3.205 London's high rates of waste production and a lack of facilities to deal with waste mean that the capital has severe difficulties in meeting European and UK targets for reducing and recycling waste.
- 3.206 The National Waste Strategy sets ambitious targets:
- A 29% reduction in waste produced (waste prevention) by 2010, and by 45% by 2020.
 - Recycling and composting of household waste: at least 40% by 2010, 45% by 2015 and 50% by 2020.
 - Recovery of municipal waste: 53% by 2010, 67% by 2015 and 75% by 2020.
- 3.207 The treatment of waste water and sewage produces sewage sludge. The predicted increase in the population of London is likely to increase the production of sewage sludge. The Mayor's Waste Strategy seeks to encourage the development of anaerobic digestion plants which could turn sewage sludge into a digestate suitable for agricultural and horticultural use²⁶⁰.
- 3.208 London currently sends the majority of its municipal waste to landfill²⁶¹. Landfill can contaminate water resources, as heavy metals, solvents and other contaminants may leach from the soil. Although there are strict guidelines governing the operation of landfill sites²⁶², it is likely that the projected increase in London's population will result in an increase in the quantity of waste going to landfill. This is likely to increase the risk of leachate contaminating London's water resources.
- 3.209 The Mayor's Municipal Waste Strategy includes proposals to increase the amount of waste incinerated in London. During incineration water is used to cool fly-ash, and during this process the water can be contaminated²⁶³. Thus increasing the amount of waste sent for incineration may adversely affect water resources in the capital.
- 3.210 London currently transports 27% of its municipal waste on the Thames²⁶⁴. The projected increase in waste levels may result in an increase in the amount of traffic on the Thames.

²⁵⁷ GLA (2003) Rethinking Rubbish in London – the Mayor's Municipal Waste Management Strategy.
http://www.london.gov.uk/mayor/strategies/waste/docs/wastestrat_all.pdf

²⁵⁸ Defra National Waste Statistics, November 2008 release
<http://www.defra.gov.uk/environment/statistics/wastats/bulletin08.htm>

²⁵⁹ Ibid

²⁶⁰ GLA (2003) Rethinking Rubbish in London – The Mayor's Municipal Waste Management Strategy

²⁶¹ Ibid

²⁶² The Landfill Directive (Directive 1999/31/EC on the landfill of waste)

²⁶³ GLA (2003) Rethinking Rubbish in London – The Mayor's Municipal Waste Management Strategy

²⁶⁴ Ibid

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- 3.211 Increased average temperatures might necessitate more frequent collection of household waste or modified waste storage facilities. The London Plan and the Mayor's Municipal Waste Management Strategy include waste and resource related policy.
- 3.212 Some adaptation actions could have resource consumption and waste generation implications, for example the consumption of aggregates and other materials in the construction of flood defences and projects such as the Thames and Lee sewage intercept tunnels.

Key existing sustainability problems and opportunities

- 3.213 Drawing on the review of other policies, plans and programmes and the baseline data, the key sustainability problems and opportunities issues for the SA and the CCAS to consider relating to the waste and resources topic are summarised in Box 11.

Box 11: Key existing sustainability problems and opportunities – waste and resources

Problems

- London's low recycling rate, dependence on declining landfill capacity inside and outside of London, and lack of facilities to deal with waste in London means that the capital has numerous challenges to overcome in order to meet European and UK targets for reducing waste to landfill and increasing waste recycled.
- Higher average temperatures and heatwaves may require more frequent waste collection, or modified collection and waste storage facilities.
- Increased frequency and intensity of rainfall may exacerbate problems associated with leachate from landfill sites and other waste facilities.

Opportunities

- Minimising the contribution adaptation actions (e.g. construction of flood defences) make to the amount of waste generated in London.

Waste and resources - evolution of the environment in the absence of the CCAS

- 3.214 In the absence of the CCAS, over the intended timeframe of the Strategy²⁶⁵, the environment under the Waste and Resources theme is likely to evolve as follows:
- While per-capita waste arisings may fall, for example as a result of campaigns to reduce packaging waste and meet statutory recycling targets, if population increases in line with projections, overall waste generation in the Capital is likely to increase, including sewage sludge. Dealing with this waste may pose a threat to the quality of water resources, for example, by increasing the amount of leachate from landfill or other forms of disposal, or the water required in the process of waste incineration;
 - Climate change may lead to specific waste management issues, such as the need for more frequent waste collections in hot weather (or development of improved waste storage).
 - Certain adaptation actions may produce construction waste, such as constructing flood defences, or upgrading water or other infrastructure to cope with predicted climate changes. However this amount may not be significant in comparison to overall waste arising from new development across the city over the next 10 years.

²⁶⁵ The introduction to the draft CCAS notes that it considers the climate over the century (i.e. to 2100), but particularly focuses on the period up to 2031.

Economy

3.215 This topic presents information relevant to the economy. Climate change has the potential to have significant direct and indirect effects on the economy of London, such as due increased incidence of disruptive events such as floods or heatwaves within the capital. Conversely there could be opportunities for some economic innovation, especially if London is able to establish itself as a leader in city-level climate change adaptation. This topic is relevant to the **Economy** SA objective.



Policy context, relevant baseline and key trends

3.216 The key messages for this topic context from the review of relevant policies, plans and programmes have been listed in Box 12:

Box 12: Key messages from the review of policies, plans, programmes and strategies – economy

Relevance to the SA:

- The economic importance of climate change, and the benefits of adaptation are highlighted in the Stern Review, as well as London specific studies, such as Adapting to Climate Change – Business as Usual and Climate Change and London's Transport Systems.
- The Water Environment (Water Framework Directive) Regulations require economic analyses of water issues to be carried out by the Environment Agency, and the impact of climate change will be an important factor in these analyses.
- Mayoral strategies, in particular the London Plan, and the Mayor's Economic Development Strategy, recognise the potential opportunities in a successful transition to a low-carbon economy, but also highlight the costs and negative consequences climate change could have for the economy of London.

Relevance to the SA:

- Specific targets relating to Economy were not identified during the review of policies, plans and programmes. However, conformity with the goals of Government and Regional strategy has been reflected in the SA objectives and criteria.
- The policies, plans and programmes contain relevant baseline and key issues which have been drawn on in this context chapter.

Background

3.217 London is a successful world city with a global outlook. London's economy is highly competitive, its workforce highly skilled. Since 2000 it has consolidated its position as the key driver of national economic success. London's economy contributes around 17% of the UK's total Gross Domestic Product, and its annual rate of employment growth is above that of the rest of the UK. The London Plan (consolidated with alterations since 2004) projected net growth in jobs in London between 2006 and 2026 is 912,000²⁶⁶.

²⁶⁶ GLA (2008) The London Plan, (consolidated with alternations since 2004),

- 3.218 However the benefits of this remarkable economic success have not been felt by all. The Mayor's Economic Development Strategy notes that London has the highest rates of child poverty in Great Britain and only 71% of its working age population is in employment. Specific features of the London economy include a concentration of relatively high skill jobs, meaning those with low qualifications face higher risks of exclusion than elsewhere, and the high levels of earnings mean that housing costs are very high, especially for those on low incomes²⁶⁷. In 1980, the top 10% of full-time male earners in London had weekly earnings just over twice as high as those in the bottom 10%. In 2000 the ratio had grown to nearly four times²⁶⁸. At the same time there is social and economic deprivation in many parts of the capital, over half of London boroughs (19 out of 33) are in the top 30% most deprived in England²⁶⁹.
- 3.219 Equality is discussed fully in the People and Health context topic, above.

Climate change related to economic factors

- 3.220 The Mayor's public consultation new draft Economic Development Strategy²⁷⁰ includes climate change as one of the key "threats and weaknesses" of London's economy, stating the London needs to adapt to the unavoidable impacts of climate change, in particular flooding, overheating and drought. The draft new Economic Development Strategy states that London is "*well placed to develop expertise in sectors that are able to respond to the growing market opportunities in the areas of climate change mitigation and adaptation*".²⁷¹ However, the specific proposals included within the new draft Economic Development Strategy relate only to measures to promote the move to a low-carbon economy.
- 3.221 The draft CCAS²⁷² identifies the global consequences of climate change as posing a risk to the financial services sector of London's economy. As many of the assets held by the financial services companies are located across the world, and will be held for a long period of time, assets could be devalued by the consequences of climate change. This in turn could lead to a slowdown in the economy of London as the companies exposed to the risks feel the effects. As displayed by the recent economic crisis, the interlinked nature of the financial market, and the importance of the financial services sector to London's economy, suggest that such impacts could affect the whole economy rather than being contained to the financial services sector.
- 3.222 Water shortages, transport disruption and flooding are recognised by the London Economic Development Strategy as climate change related risks to the London Economy²⁷³. The economic cost, measured in terms of insurance claims, of the recent severe flooding in the UK was estimated at £2 billion²⁷⁴. Another estimate put the total cost figure in excess of £3 billion²⁷⁵. The disruption to businesses and individuals was enormous.
- 3.223 As discussed in the Water Management context topic, much of London is exposed to a high risk of flooding. Flood risks are likely to increase as development further encroaches on flood-plains, and due to climate change impacts. There are economic implications of the

²⁶⁷ GLA (2005) Sustaining Success, the London Economic Development Strategy, http://www.london.gov.uk/mayor/strategies/economic_development/docs/sustaining_success_full.pdf

²⁶⁸ GLA (2008) The London Plan, (consolidated with alternations since 2004),

²⁶⁹ Data Management and Analysis Group (2007) Deprivation in London

<http://www.londoncouncils.gov.uk/economicdevelopment/briefings/IndexofMultipleDeprivationIMD2007.htm>

²⁷⁰ GLA (2009) Rising to the Challenge. The Mayor's Economic Development Strategy for Greater London, Public Consultation Draft (October 2009)

²⁷¹ Ibid.

²⁷² GLA (2009) draft London Climate Change Adaptation Strategy, version dated 10th September 2009

²⁷³ Data Management and Analysis Group (2007) Deprivation in London

<http://www.londoncouncils.gov.uk/economicdevelopment/briefings/IndexofMultipleDeprivationIMD2007.htm>

²⁷⁴ ABI estimate, reported on BBC: <http://news.bbc.co.uk/1/hi/business/6912827.stm>

²⁷⁵ Global Continuity.com – web portal for business continuity and disaster recovery – reporting Risk Management Solutions estimate: http://www.globalcontinuity.com/current_headlines/cost_of_uk_floods_will_top_3_billion

choice to build greater resilience into developments, invest more heavily in defences, or restrict development altogether in the highest risk areas.

- 3.224 Increased frequency and severity of heatwaves in the Capital has the potential to negatively impact on the economy of the city, for example by reducing the general health of London's population, increasing the number of sick days, lengthening commuting times and exacerbating water shortages and electricity demand. Extended periods of very high temperatures can also damage transport and other infrastructure, which can lead to disruption and increased economic costs.
- 3.225 London's economy is dominated by the financial services sector, a sector that is exposed to the global implications of climate change. Increased frequency of catastrophic weather events has the potential to increase insurance costs and significantly affect asset prices over the long term. This has the potential to change investment conditions, negatively affecting businesses that have not adapted.

Key existing sustainability problems and opportunities

- 3.226 Drawing on the review of other policies, plans and programmes and the baseline data, the key sustainability problems and opportunities for the SA and the CCAS to consider relating to the economy topic are summarised in Box 13.

Box 13: Key existing sustainability problems and opportunities – economy

Problems

- Deprivation, unemployment and economic inequality are all important issues in London.
- Local impacts of climate change may disrupt businesses (either directly or due to infrastructure damage), with a knock on effect on London's economy.
- Due to London's global connectivity and role, climate change impacts elsewhere in the world may have significant impacts on the economy of London.
- The costs of insuring homes, buildings and infrastructure may become a major issue due to increased frequency and severity of storms, floods and other extreme events.
- Flooding and water shortages can have significant economic consequences by disrupting businesses, transport, supply routes etc.

Opportunities

- Reducing deprivation and inequality and facilitating economic development through improved water management and reduction of flood risk.
- London could become an exemplar city in how it plans for and adapts to climate change – and thus build a reputation as a safe, secure location for business.
- London could develop expertise and skills in specific sectors responding to adaptation (new technologies, consulting etc.).

Economy - evolution of the environment in the absence of the CCAS

- 3.227 In the absence of the CCAS, over the intended timeframe of the Strategy²⁷⁶, the environment under the Economy theme is likely to evolve as follows:
- London has a strong and dynamic economy, but there are extensive economic inequalities which are likely to increase over time. Over the coming decades London may develop specific expertise / clusters in the environmental sector, however this may depend on there being active support for these sectors in the capital;
 - Climate change has the potential to cause water shortages, transport disruption, damage to infrastructure and buildings, all of which would have negative consequences for London's economy; and,

²⁷⁶ GLA (The introduction to the draft CCAS notes that it considers the climate over the century (i.e. to 2100), but particularly focuses on the period up to 2031.2008) The London Plan (consolidated with alterations since 2004)

- Flood risk is likely to increase as pressure on land for housing and other development leads to developments encroaching into areas at risk of flooding, and due to the effects of climate change. Flooding can have significant negative economic and social effects, disrupting transport networks and other infrastructure, inundating homes and businesses, and impacting on the physical and mental wellbeing of those affected, which in turn imposes an economic cost on society. Increased risk and incidence of flooding will increase the potential scale and risk of these costs.

Cross-cutting Issues and Policies

- 3.228 This context section highlights key overarching issues and trends which the CCAS will need to be aware of and respond to. Factors such as the projected expansion in London's population over the coming few decades will have significant effects on the supply, use and management of all resources in the Capital. While specific issues are discussed in more detail in the sections which follow, this section seeks to bring together the key overall policy, trends and issues.



Policy context, overarching baseline and key trends

- 3.229 The key messages for this topic context from the review of relevant plans and programmes have been listed in Box 14:

Box 14: Key messages from the review of policies, plans, programmes and strategies – cross-cutting issues and policies

Relevance to the Strategy:

- The UK Sustainable Development Strategy does not provide direct adaptation related policy or direction for the CCAS, but does set out the framework for Sustainable Development which the Government advocates, and which all GLA strategies should seek to reflect and support.
- Other high level strategies and plans, for example, IPPC studies and the EEA report into Vulnerability and Adaptation to Climate Change in Europe, can provide direct guidance and support for adaptation policy options for the CCAS.
- The London Plan is the Mayor's highest level spatial strategy and policy for London. The CCAS will go further than the London Plan in terms of detail, but must be in conformity with policies in the London Plan. The London Plan describes itself as "the integrating framework for all" other Mayoral strategies.
- The Mayor has recently (October 2009) published a public consultation draft replacement London Plan. It is intended that this replacement Plan will formally be adopted in 2011. This new London Plan will set out new policies and priorities for London. Appendix 6 includes details on the new policies proposed in this draft replacement London Plan.

Relevance to the SA:

- These documents provide the high level basis for the appraisal: The SA seeks throughout to ensure that the CCAS is as supportive of sustainable development as is possible, and the SA objectives and criteria draw upon and reflect Government and Regional strategy.
- These high-level policies, plans and programmes also contain relevant baseline and key issues which were drawn on in this context chapter.

- 3.230 The population of London in 2006 was estimated at 7.57 million. The London Plan (2008) provides a "best current estimate" of population in 2016 of between 7.94 and 8.19 million

rising to between 8.26 and 8.71 million in 2026. This equates to an increase of up to 1.14 million people between 2006 and 2026. The London Plan also predicts an increase in the number of households from around 3.2 million (mid-2006) to as high as 3.9 million in 2026, an increase of approximately 540,000 to 728,000 households in 20 years, equivalent to more than 27,000 – 36,000 additional households a year. GLA projections suggest that between 2006 and 2026, by 2025, London will have an additional 912,000 jobs²⁷⁷.

- 3.231 To meet this projected growth, the London Plan has set a minimum target for housing provision of 30,500 additional homes per year. This target will be the basis for monitoring up to 2016, and the figure will be reviewed in 2011, and from time to time thereafter.
- 3.232 This dramatic increase in population and homes will require the provision of associated public and social infrastructure – transport, education, healthcare, green spaces, and will place increasing demand on London's resources, including water.
- 3.233 The London Plan identifies specific development and regeneration areas in the Thames Gateway and the London-Stansted-Cambridge-Peterborough growth area, which includes Opportunity Areas in North East London. These will present locally-specific resource issues due to the focus of large scale development. The Thames Gateway area is also within the Thames tidal flood plain, and thus presents particular flood risk problems. These flood risks will be exacerbated by climate change.
- 3.234 The projected increase in the population of London, together with the projected impacts on water resources due to climate change, will put a serious strain on the water resources, on both the demand and the supply side. Planning and investment will be required to ensure that any new buildings are as water efficient as possible, and that existing buildings are retrofitted to improve existing efficiency.
- 3.235 Drainage in London will be affected by an increasing population and the effects of climate change. Traditional rainwater drainage aims to remove run-off from built up areas as quickly as possible, usually by collecting it in pipes and thus minimising the risk of flooding in the immediate area²⁷⁸. Additionally, the porous ground found in green spaces acts like a sponge, soaking up rainwater that would otherwise enter the drainage system, increasing the chance of a flash flood. The opportunities for water to drain naturally in a controlled manner are reducing in London^{279 280}, and the effects of climate change are set to compound this problem further²⁸¹.
- 3.236 The London Plan identifies a number of driving forces for change in the city. These include:
- Globalisation of the economy together with “dramatic” advances in technology.
 - Increased inter-relationship between major economies, shrinking distance between people, markets and business decision makers.
 - Fundamental and accelerating environmental imperative to use energy and resources more efficiently, to mitigate and adapt to climate change, and to reduce emissions and environmental stress.
 - Movement of people – particularly to London from elsewhere in the UK and from abroad.
 - Growth of wealth and incomes, and a strong rising demand for leisure and tourism activities.
 - Increasing social and economic polarisation.

²⁷⁷ GLA (2008) London Plan (consolidated with alterations since 2004)

²⁷⁸ CIRIA Report 523 'Sustainable Urban Drainage Systems, Best Practice Manual' 2000

²⁷⁹ 'Crazy paving. The environmental importance of London's front gardens' London Assembly Environment Committee, 2005

²⁸⁰ 'Crazy paving. The environmental importance of London's front gardens' London Assembly Environment Committee, 2005

²⁸¹ 'London under threat? Flooding risk in the Thames Gateway' London Assembly Environment Committee, 2005

- Increasing in positive views of diversity, and decreasing tolerance of discrimination, misuse of resources and pollution
 - The 2012 Olympic and Paralympic games.
- 3.237 The UK SDS and IPCC reports set the outline for sustainable development which the Mayor should work towards when making plans for London. No specific adaptive measures are included in the reports, but they provide a useful framework into which other plans or policies should fit.

Key existing sustainability problems and opportunities

- 3.238 Drawing on the review of other policies, plans and programmes and the baseline data, the key sustainability problems and opportunities for the SA and the CCAS to consider relating to the cross-cutting topic are summarised in Box 15.

Box 15: Key existing sustainability problems and opportunities – cross-cutting

Problems

- The rise in population will increase the pressure on water resources, drainage and sewerage infrastructure. There will also be an increase in the numbers of people living in flood risk areas. Both the pressures on water resources, drainage and sewerage infrastructure and flood risk are likely to be exacerbated by climate change.

Opportunities

- Increasing potential for regeneration and opportunities to include adaptation measures, such as SUDS, enhanced green space, etc.
- Regeneration also provides opportunities to create housing and other developments adapted to future climate change conditions.

Cross-cutting issues and policies - evolution of the environment in the absence of the CCAS

- 3.239 In the absence of the CCAS, over the intended timeframe of the Strategy²⁸², the environment under the Cross-cutting Issues and Policies theme is likely to evolve as follows:
- Climate change has the potential to affect all aspects of life in London, and may impact particularly on issues such as flooding, and the reliability of water supply. London's transport infrastructure is also likely to be affected. Overheating, and the impact of higher temperatures on air quality may also have negative health and quality of life impacts.
 - The projected increase in London's population will have significant effects on all aspects of water use, management and disposal in the capital. Overall demand for water could increase even where per-capita use falls. Population increases will also mean more pressure on green spaces, health care and social facilities, recreational facilities and transport infrastructure.
 - The scale of development planned in some areas of London, such as Thames Gateway, may increase flood risk elsewhere in the capital, or may expose more people to flood risk.

²⁸² The introduction to the draft CCAS notes that it considers the climate over the century (i.e. to 2100), but particularly focuses on the period up to 2031.