



In Association with



Low Carbon, Renewable Energy and Heat Mapping Study

May 2010



Prepared for
London Borough of Redbridge

Revision Schedule

Low Carbon, Renewable Energy and Heat Mapping Study May 2010

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Executive Summary

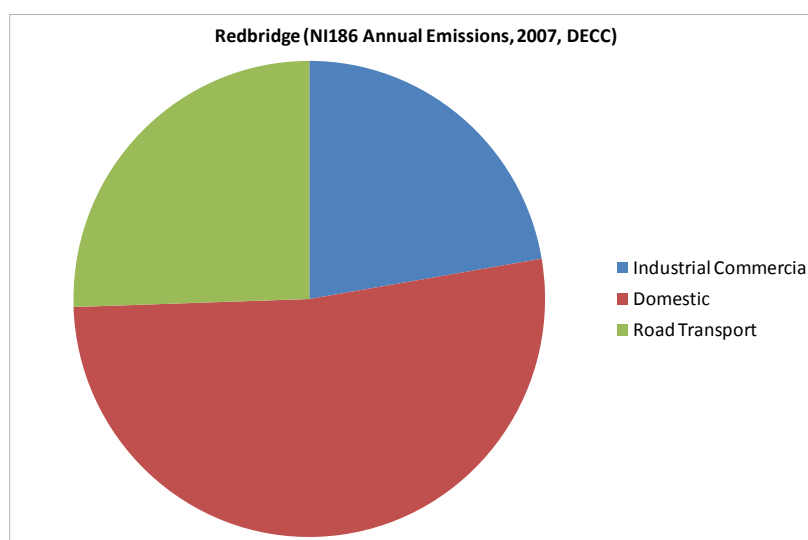
Purpose of the Study

Scott Wilson, in conjunction with its project partners Thameswey Energy and Cyril Sweett, has been commissioned by the London Borough of Redbridge in conjunction with the London Development Agency (LDA) to carry out a Low Carbon, Renewable Energy and Heat Mapping Study for Redbridge.

The study provides an evidence-base for the London Borough of Redbridge's (LBR) future energy policy, and looks at the technological and financial potential for different types of low carbon, decentralised and renewable energy technologies across the Borough, giving consideration to existing opportunities and constraints. The Heat Mapping Study, carried out in conjunction with the LDA, will form part of an evidence base for policies on decentralised energy in Redbridge and identify potential opportunities for decentralised energy networks in Redbridge.

The Borough's Carbon Emissions

An energy demand assessment was carried out as part of this study to assess carbon emissions arising from current and anticipated developments in Redbridge. This information was used to feed into the overall study, particularly the Heat Mapping section. The carbon footprint for Redbridge was found to be 1,033,000 tonnes CO₂ per year¹ (0.24% of UK total). The chart below illustrates that the majority of the Borough's emissions arise from the domestic sector, reflecting the mix of building stock. As explained further throughout this report, even with reduced emissions from new building stock there is a key role to play in reducing emissions from existing housing stock. For Redbridge, even by 2050, it is highly likely that existing dwelling will make up more than two thirds of the housing stock, with many of these existing dwelling being energy inefficient.

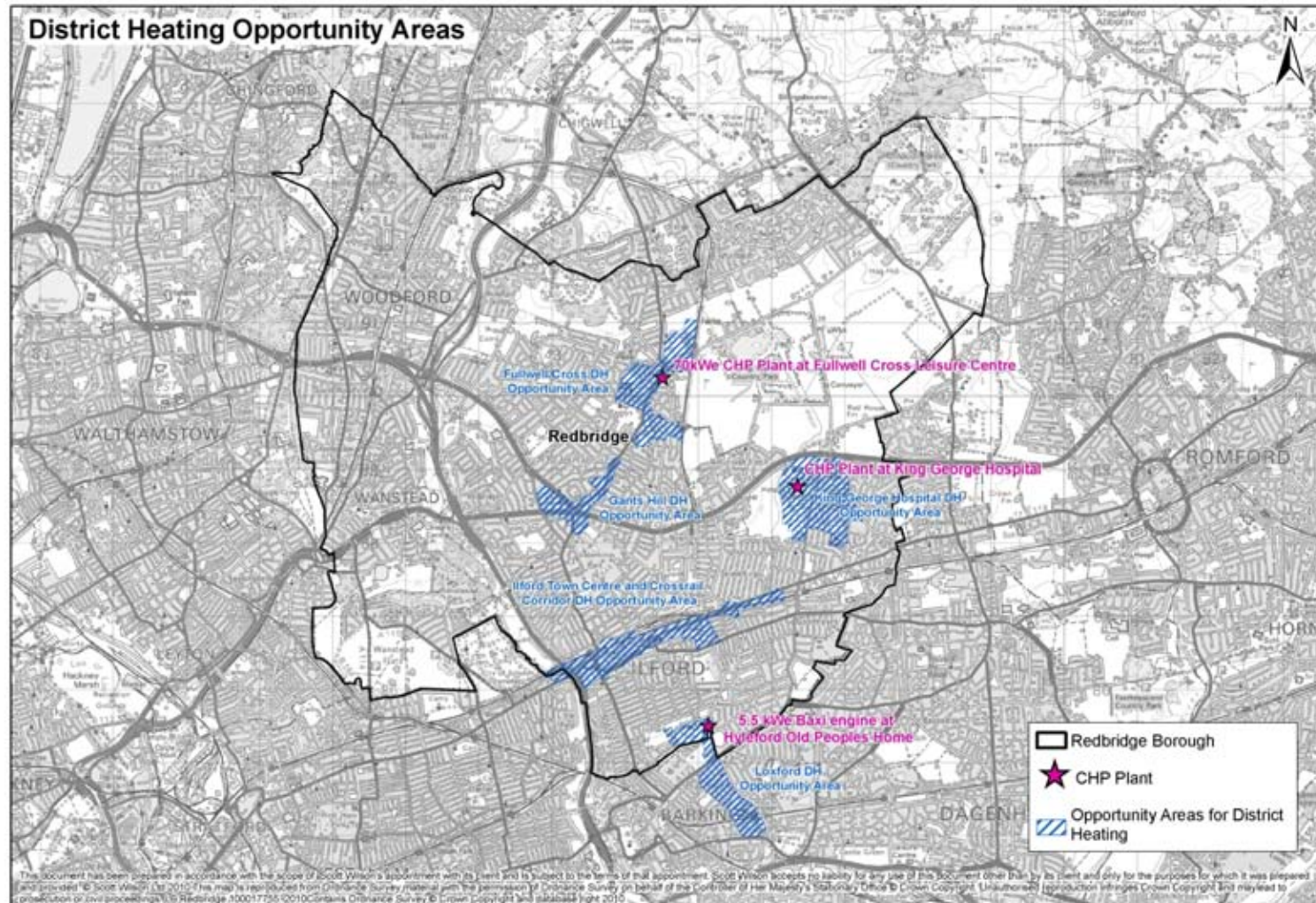


¹ Data from Department of Energy and Climate Change (2007 data)

Heat Mapping Study

The Heat Mapping Study involved working with the Council and other stakeholders to identify buildings with a high heat demand, which included housing estates, leisure centres, schools and hospitals. Identified buildings were both Council owned and privately owned, and included existing buildings and proposed new buildings. A range of stakeholders within the Borough were subsequently contacted to collate actual energy consumption and heat demand data. Data for private and public buildings were mapped using GIS by the LDA, in order to identify potential heat network 'clusters' within Redbridge which could form part of an existing or future decentralised energy network.

Five 'cluster' sites - Ilford Town Centre and the Crossrail Corridor, Gants Hill, Loxford School area, King George Hospital Site and Fullwell Cross - were identified as potential cluster sites for the deployment of a heat network. These clusters were put into an implementation plan (see Section 4.5) of prioritised decentralised energy opportunities for Redbridge. The potential cluster sites have been illustrated in the figure below:



The heat mapping section of this study will feed into the London Heat Map, as part of the LDA's Decentralised Energy Master Planning (DEMaP) programme.

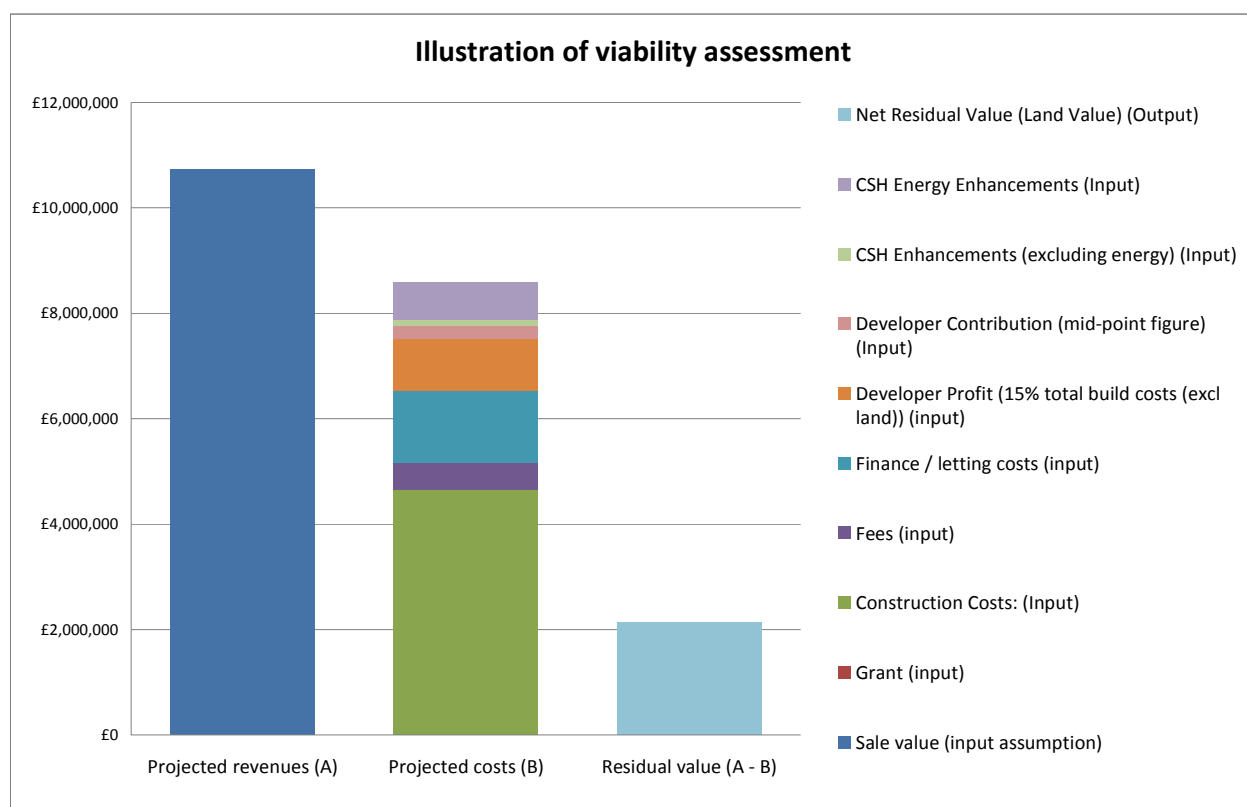
Low Carbon and Renewable Energy Constraints and Opportunities Analysis

An assessment of the opportunities and constraints associated with renewable energy resource potential within Redbridge was carried out, in accordance with the Department of Energy and Climate Change (DECC) methodology. An Energy Opportunities Map was developed summarising the potential for low carbon and renewable energy within Redbridge (see below),



GSHP are potentially suitable for all new developments, however their viability needs to be addressed on a site by site basis (Please refer to Section 5.11.3 for further details), and therefore have not been included in the figure above on the basis that their applicability extends across the borough.

Based on the baseline emissions calculations carried out as part of the study (see section 3), the proposed development areas identified in Redbridge's Local Development Framework and the emerging Crossrail Corridor Area Action Plan, and the heat demand data obtained as part of the heat mapping study; Ilford Town Centre, Gants Hill and the Crossrail Corridor were identified as strategic sites, and the technical viability of different combinations of renewable energy technologies for these sites has been discussed. Based on the technologies identified as suitable for each site, a land-value based viability test on the basis of market sales values was carried out. The various parameters considered in the land value (which is the residual value once all assumed costs have been derived from the total projected revenue) viability assessment study are illustrated in the figure below. In order for the land value to be positive it must exceed the existing use value (EUV).



It should be noted that the above is only an illustration and although cost inputs are specific to LBR the residual value or land value is generic and not specific to a site within LBR although the cost is in the order of cost expected for LBR.

A selection of development sizes (5 dwellings, 50 dwellings and 100 dwellings) was analysed and policy options proposed, following which an appraisal of the implications of imposing increasingly higher levels of the Code for Sustainable Homes on new development was carried out.

Key Findings of the Study:

- Through an analysis of domestic and commercial emissions projections, carried out as part of the Heat Mapping Study, it is evident that new build policy has only a limited level of impact on overall building stock emissions. Policy should therefore focus on existing buildings: guidance for Redbridge residents on incorporating energy efficiency and renewable energy technologies within existing homes has been provided in Appendix A.
- As part of the Heat Mapping Study, five 'cluster' sites were identified providing the best potential for the deployment of a heat network. These sites were put into a high level implementation plan (see 4.5) of prioritised decentralised energy opportunities for Redbridge. Existing development with the potential to act as anchor loads due to their high heat demand (over 200MW) were identified in terms of their juxtaposition to proposed development within the Borough. Workshops were held with key stakeholders in the Borough to ascertain local knowledge and provide the most viable sites with a synergy between existing development and new development. The five sites as outlined further in Section 4 are:
 - Fullwell Cross
 - King George Hospital
 - Ilford Town Centre (Total heat demand of 36,175MWh/year) & Crossrail Corridor (Total heat demand of 18,720MWh/year)
 - Gants Hill (Total heat demand of 4,473 MWh/year)
 - Loxford School Area
- Although energy data was sought from a number of Council and privately owned properties, limited actual data for the Heat Mapping exercise was available for privately owned buildings. This is important in terms of lessons learnt. Personally approaching stakeholders instead of requesting information via telephone, email and post would likely produce better results.
- Constraints and opportunities for renewable and decentralised energy resource potential within Redbridge have been mapped as illustrated previously, based on the methodology outlined in the latest PPS1 Supplement – Planning for a Low Carbon Future in a Changing Climate, which refers to DECC guidelines, titled *Renewable and Low Carbon Energy Capacity Methodology*².
- A Borough wide renewable energy appraisal to analyse the suitability of different renewable energy technologies for different areas of the Borough has been carried out. In addition, site specific analysis for low carbon and renewable technology feasibility has been provided for Gants Hill, Ilford Town Centre and the Crossrail Corridor. Overall, the three Strategic Sites are highly conducive to district heating solutions due to their high densities.

² DECC. Renewable and Low-carbon Energy Capacity Methodology: Methodology for the English Regions. January 2010

Nevertheless, microgeneration can greatly contribute to overall targets, especially during the earlier phases of development.

- In terms of development viability, for all areas of the Borough investigated, development delivers Land Values in a range that suggests viability. In particular the higher market sales values of Wanstead and East Redbridge suggest that these areas could generate the assumed level of developer profit and also high residual value. Of the three strategic sites investigated (Ilford Town Centre, Gants Hill and the Crossrail Corridor), the Crossrail Corridor shows the lowest level of value. In this area, the results show that even the delivery of Code Level 6 for five dwellings in line with the current Government timetable is not viable (e.g. delivers a negative land value) for urban infill development.
- Guidance for developers on the Code for Sustainable Homes has been provided in Appendix H to highlight the achievability of credits for Code Levels 3, 4, 5 and 6.

It should be noted that the residual values identified in the viability modelling have not been compared against the EUV and the development viability analysis has been developed to identify positive and negative trends and thus inform policy development. More detailed site specific viability analysis will be required at the time of application to support site specific verification.

1 Introduction

1.1 Background

Scott Wilson, in conjunction with its project partners Thamesway Energy and Cyril Sweett, has been commissioned by the London Borough of Redbridge (LBR) in conjunction with the London Development Agency (LDA) to carry out a Low Carbon, Renewable Energy and Heat Mapping Study for Redbridge.

The provision of decentralised, renewable or low carbon energy generation will be central to sustainable economic growth and development in Redbridge. It is vital that such development be coordinated through the spatial planning system incorporating technical input from the renewable energy and low carbon sectors. The Climate Change Supplement to Planning Policy Statement 1 (PPS1) is a key driver for this study, along with the need to address ambitious regional targets set out in the London Plan that are both deliverable and viable in accordance with the Council's wider objectives, such as affordable housing.

This Study provides an evidence-base for the LBR's future energy policy through an assessment of the technological and financial potential for different types of low carbon, decentralised and renewable energy technologies throughout the Borough, given existing opportunities and constraints. The Heat Mapping exercise undertaken as part of this Study identified areas of high heat demand in the Borough for possible decentralised energy networks.

An appraisal of the financial implications of imposing increasingly higher levels of the Code for Sustainable Homes for Redbridge and for specific strategic sites, and policy implications are also presented as part of this Study..

1.1.1 Key objectives of the study

The key objectives of the study are:

- To provide a Policy context to the study and review all relevant published documents and studies (Chapter 2).
- To provide a baseline assessment of carbon emissions arising from current and anticipated developments in Redbridge (Chapter 3), which will feed into the Heat Mapping Study.
- Undertake a Heat Mapping Study to identify areas in the Borough of high heat demand. As part of the Heat Mapping Study, collect energy data from key buildings in the borough, both Council owned and privately owned buildings. (Chapter 4).
- To develop a high level implementation plan highlighting key opportunities for decentralised energy within Redbridge (Chapter 4) as a key outcome of the Heat Mapping Study.
- To carry out a Borough-wide and site-specific renewable energy appraisal that will establish the technologies' suitability across the Borough (Chapter 5), and their potential contribution towards renewable energy and CO₂ reduction targets. This was completed in accordance with the methodology outlined in the latest PPS1 Supplement – Planning for a Low Carbon Future in a Changing Climate, which refers to DECC guidelines, titled *Renewable and Low Carbon Energy Capacity Methodology*.

- To assess the viability of renewable energy technologies across strategic sites - Ilford Town Centre, Gants Hill and the Crossrail Corridor (Chapter 6) - based on the renewable energy technologies identified above. The identification of decentralised energy for strategic sites within Redbridge will also feed into the Heat Mapping Study.
- To assess the financial implications of the Council requiring increasingly higher levels of the Code for Sustainable Homes within the Local Development Framework (Chapter 7).
- To discuss future policy options for Redbridge (Chapter 8) and to provide suggestions for energy efficiency measures and renewable energy technologies for existing housing stock in Redbridge, including guidance notes for Redbridge residents (Appendix A);

These deliverables will provide the evidence base for progressing opportunities for decentralised energy; support the LBR's emerging policies for adoption into the Local Development Framework and help the LBR with planning application negotiations. Furthermore, this data will also be used in preparing Redbridge-specific guidance for residents to install renewable energy technologies.

1.1.2 Key drivers for the study

The LBR is required to respond to policies and regulations regarding energy use and carbon dioxide emissions including:

- PPS1 Supplement on Climate Change, PPS 22 on Renewable Energy and the Climate Change Act, 2008
- The European Union target for 20% of energy to be provided from renewable energy resources by 2020.³;
- The UK-wide target of an 80% reduction in Carbon Dioxide (CO₂) emissions by 2050 based on 1990 levels⁴;
- The national Building Regulations for all new homes and non-domestic buildings to be zero carbon by 2016 and 2019 respectively⁵;
- National Indicators 185 (CO₂ reduction from Local Authority operations); 186 (Per capita reduction in Co₂ emissions in the Local Authority area); 187 (Tackling fuel poverty); and 188 (Planning to adapt to climate change).⁶;
- Achieving deliverable national and regional targets for renewable energy and greenhouse gas emissions;
- Reducing the Borough's energy consumption through existing stock;
- Responding to Climate Change as set out throughout the LBR's Core Strategy and the aspiration to achieve carbon-free development as set out in the Redbridge Local

³ Directive 2009/28/EC of the European Parliament and of the Council of 23 April 2009 on the promotion of the use of energy from renewable sources and amending and subsequently repealing Directives 2001/77/EC and 2003/30/EC.

⁴ Climate Change Act 2008

⁵ Building a Greener Future: Policy Statement (2007)

⁶ The New Performance Framework for Local Authorities and Local Authority Partnerships: Single Set of National Indicators, October 2007

Development Framework Borough Wide Primary Policies Development Plan Document (May 2008)⁷; and

- Local Strategic Partnership Objectives.

Furthermore, the current Redbridge Local Development Framework refers to the London Plan policy 4A.7 on renewable energy, which requires that new developments achieve a reduction in CO₂ emissions of 20% from onsite renewable energy generation.

Further policy context is discussed in Chapter 2 of this report.

1.1.3 Methodology and Structure of the Report

The structure of the report and the methodology followed is briefly described below:

Chapter 1 provides an overview of Redbridge Borough and the objectives and drivers of the Study. LBR publications and relevant studies were reviewed in addition to meetings with the Council, in order to describe the character of the Borough, housing figures and future projections, environmental constraints, and areas of historic interest within Redbridge;

Chapter 2 describes international, European, national, regional and local policy relevant to this Study, and provides the context in which the Study is to be carried out;

Chapter 3 presents an evaluation of the baseline Borough energy demand compared to national indicators discussed in Chapter 2 and provides future emissions projections in order to determine the carbon footprint of the Borough. DECC Data and National Indicators were used for relevant calculations, and the results obtained from this Chapter form the basis for calculating the heat demand within the Borough as part of the Heat Mapping Study. The viability of implementing policy to go beyond national standards for the Code for Sustainable Homes is also discussed in this Chapter, based on calculated emissions savings from proposed development. Guidance for Redbridge residents to improve energy efficiency and incorporate renewable energy within existing homes is provided in Appendix A;

Chapter 4 includes a data collection exercise including stakeholder consultation to obtain actual data to input into the London Heat Map developed by the LDA. This involved identifying major energy suppliers and consumers in the Borough. Actual energy demand data for over 80 Council owned properties and over 40 privately owned properties was sought. Information obtained in Chapters 2, 3 and 4 forms the basis of an implementation plan designed to facilitate the incorporation of decentralised energy within Redbridge;

Chapter 5 reviews the constraints and opportunities for low carbon and renewable energy in Redbridge Borough, based on the results obtained in Chapters 1, 3 and 4. The methodology is based on the DECC guidelines, titled *Renewable and Low Carbon Energy Capacity Methodology*. An Energy Opportunity Map for the Borough is provided, highlighting renewable energy/decentralised energy technologies suitable to various areas within the Borough;

Chapter 6 evaluates the policy options specific to the Redbridge context based on Chapters 1 and 5 and considers their application within the Borough, with specific focus on the strategic sites

⁷ London Borough of Redbridge. Local Development Framework, Borough Wide Primary Policies, Development Plan Document. May 2008

identified for this study (Ilford Town Centre, Gants Hill and the Crossrail Corridor). For each of the Strategic Sites we have used information provided from LBR regarding the number of dwellings and floorspace of non-domestic buildings and their phasing over the plan period. Using industry benchmark and government figures for the energy requirements for space and water heating and regulated and unregulated electricity use, we have calculated the overall carbon dioxide emissions and, hence, the baseline from which any improvement/emissions reduction is calculated.

Based on the results obtained in Chapter 5, recommendations for renewable energy technologies appropriate to each strategic site are provided. The identification of decentralised energy for strategic sites within Redbridge also feeds into the Heat Mapping Study;

Chapter 7 reviews development viability of the strategic sites for meeting specific levels of the Code for Sustainable Homes;

Chapter 8 evaluates policy options to determine policy orientation;

Chapter 9 provides conclusions and presents the main findings of this study and provides policy recommendations, including an outline of implications for the Council and its strategic partners.

1.2 Overview of Redbridge Borough

London Borough of Redbridge, located in North-East London, contains one Metropolitan centre: Ilford; four District centres: Gants Hill, Wanstead, South Woodford and Barkingside; and a number of Local centres and key retail parades. These have been illustrated in the figure below:

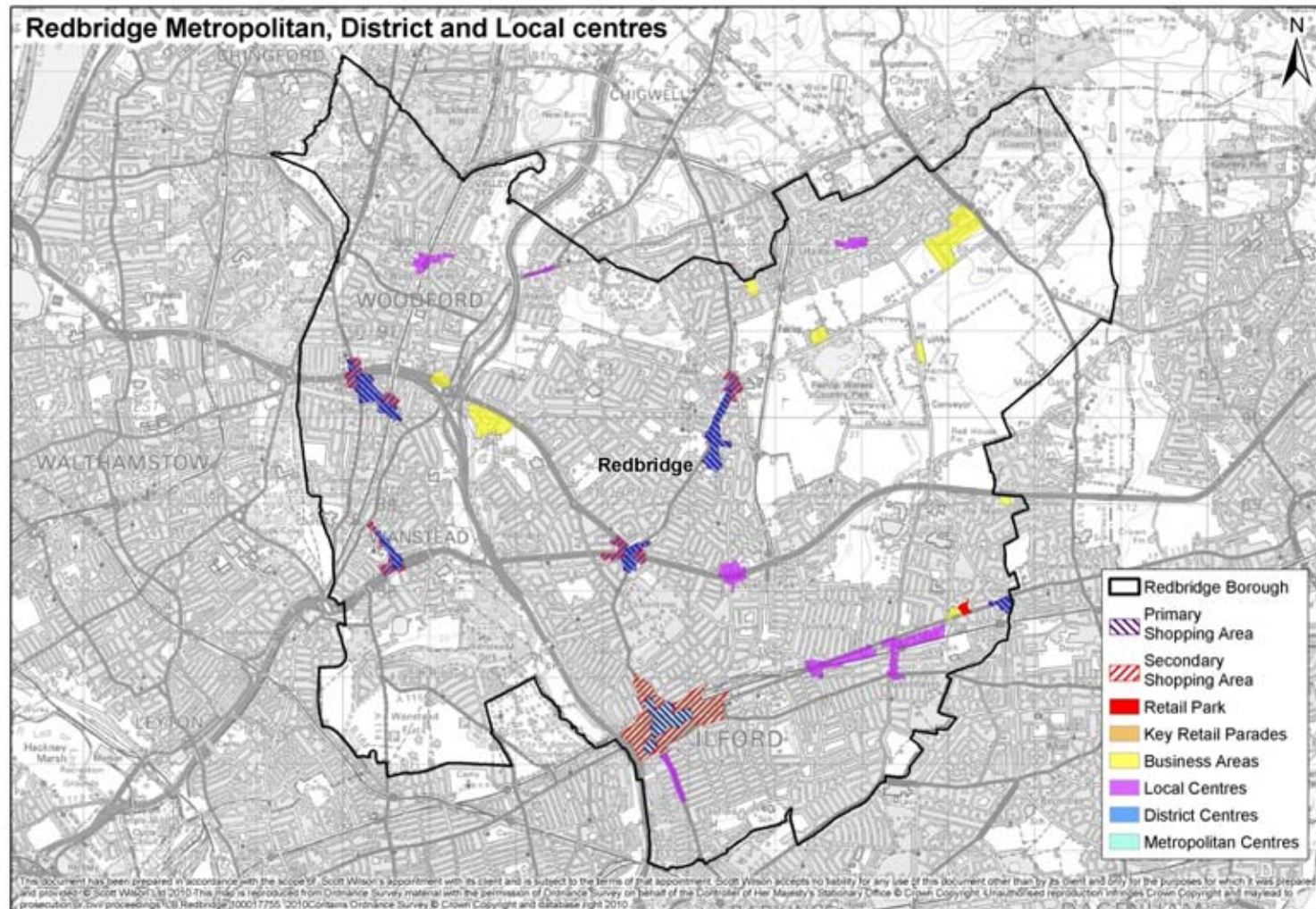


Figure 1-1: Redbridge Metropolitan, District, and Local centres

The Borough is predominantly residential with only two Strategic Employment Locations in Hainault Business Park (Hainault, East Redbridge) and Southend Road Business Area (Woodford Green, West Redbridge)⁸ and a number of light industrial areas, generally within close proximity to residential areas.

According to Strategic Policy 1 and Strategic Policy 7 within the Redbridge Core Strategy, new development will be focused on the hierarchy of town centres as follows:

Town Centre	Type of growth	New development to include
Metropolitan Centre of Ilford	Primary area of growth	Housing, retail, office and other commercial, cultural, health, leisure and community facilities. 35-50% of new housing to be within Ilford Metropolitan Centre
District Centres of Barkingside, Gants Hill, Wanstead and South Woodford	Some new development will be permitted	Housing, retail, office and other commercial, cultural, health, leisure and community facilities. 15-25% of new housing to be within the District and Local Centres.
Local Centres of Woodford Broadway/ Snakes Lane, Woodford Bridge, Manford Way, Seven Kings, Goodmayes, Ilford Lane and Newbury Park	Local level	Retailing, community facilities and social meeting places. 15-25% of new housing to be within the District and Local Centres and a further 25-35% will be distributed throughout the rest of the borough.

Table 1-1: Hierarchy of Town Centres within Redbridge

The proposed Crossrail network will have four stops within Redbridge Borough; Ilford, Seven Kings, Goodmayes and Chadwell Heath. A Crossrail Corridor Area Action Plan is underway, which identifies a potential capacity along the corridor of 2,000 new homes accompanied by a mixture of commercial, leisure and educational facilities.

1.3 Physical Context

Redbridge Borough covers over 5,600 hectares. Approximately one-third of the Borough lies within greenbelt land and there are 16 conservation areas. In total there are 485 hectares of forest and 243 hectares of green space and parks.

The latest mid year estimates (2008) indicate there are approximately 264,000 residents in Redbridge. Socio-economically, Redbridge's community is diverse with a mixture of affluent areas and pockets of social deprivation.

In the Government's Indices of Deprivation, Redbridge ranks as the 163rd most deprived Local Authority area in the country out of 354 Authorities⁹

The total existing housing stock comprises 98,431 homes¹⁰. A breakdown of the housing is provided in the table below, indicating that approximately 90% of homes are privately owned, compared to approximately 76% homes in London which are privately owned or rented¹¹:

⁸ LBR LDF Core Strategy, Development Plan Document, March 2008

⁹ LBR Local Implementation Plan 2005/06-2010/11

Housing in Redbridge	Numbers
Council Owned Homes	4,695
Housing Association Homes	5,471
Other Publicly Owned	123
Private Sector	88,142
Total	98,431

Table 1-2: Housing ownership in Redbridge

Social housing in Redbridge accounts for around 10% of the total housing stock, compared to 24% for London. As the Council can exercise more control over emissions standards from social housing, the potential for carbon reduction increases with an increase in the percentage of social housing stock. The figure below illustrates the density of the Council-owned housing stock, with dots in blue highlighting postcodes with tenure numbers over 71 dwellings.

¹⁰ LBR Affordable Housing Strategy 2008-2011

¹¹ Tenure by Region, 2007, http://england.shelter.org.uk/__data/assets/pdf_file/0005/166532/Factsheet_Housing_tenure.pdf

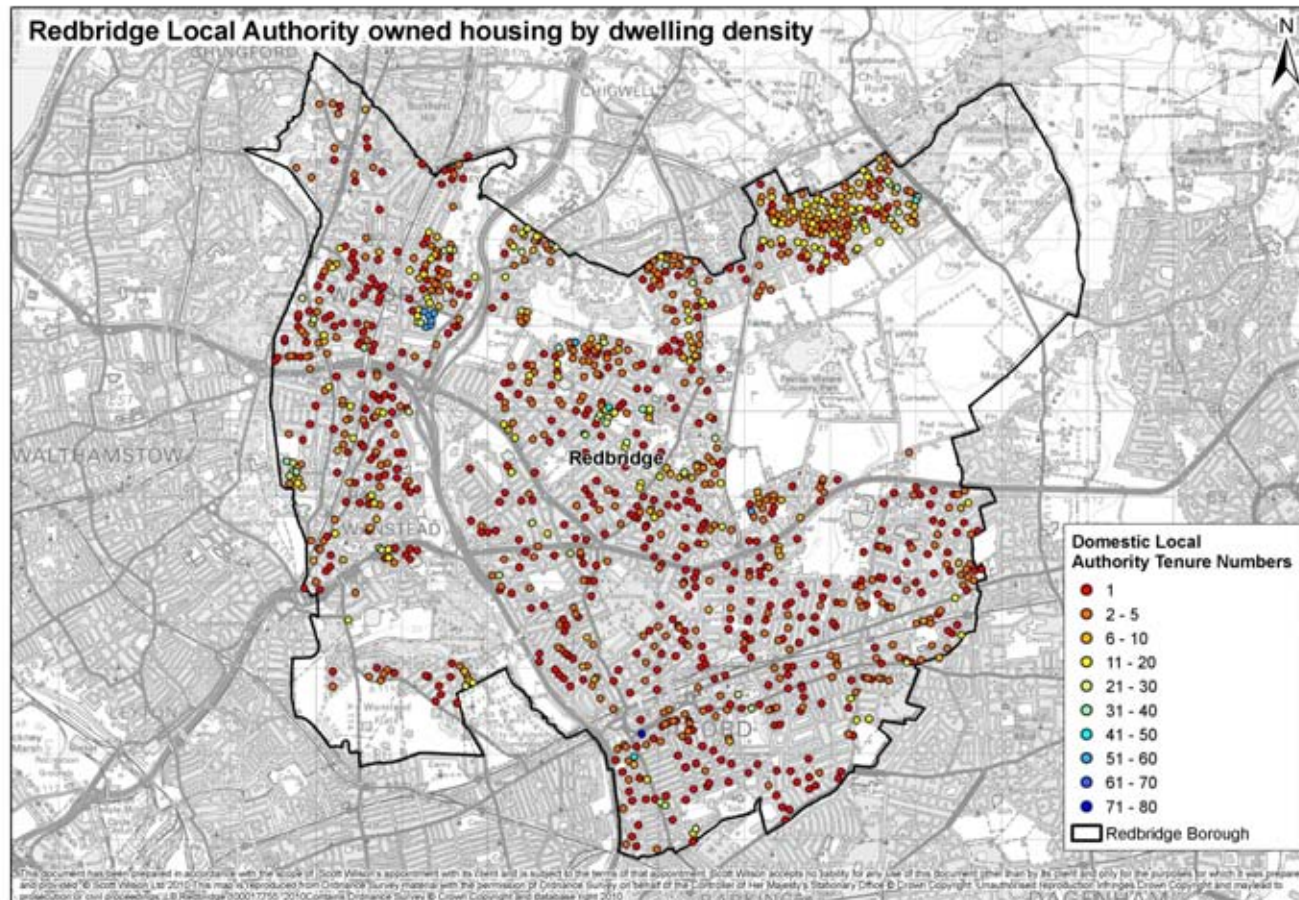


Figure 1-2: Redbridge Local Authority owned housing by dwelling density (excluding HA owned properties)

The London Plan sets out the housing provision targets for all London Boroughs¹². The current target for Redbridge is to supply a minimum of 9,050 new homes between 2007/08 and 2016/17 (which equates to some 905 new homes per annum).

The figure below provides the distribution of potential housing sites in Redbridge.

¹² The London Plan, Consolidated with Alterations since 2004, Table 3A.1. February 2008

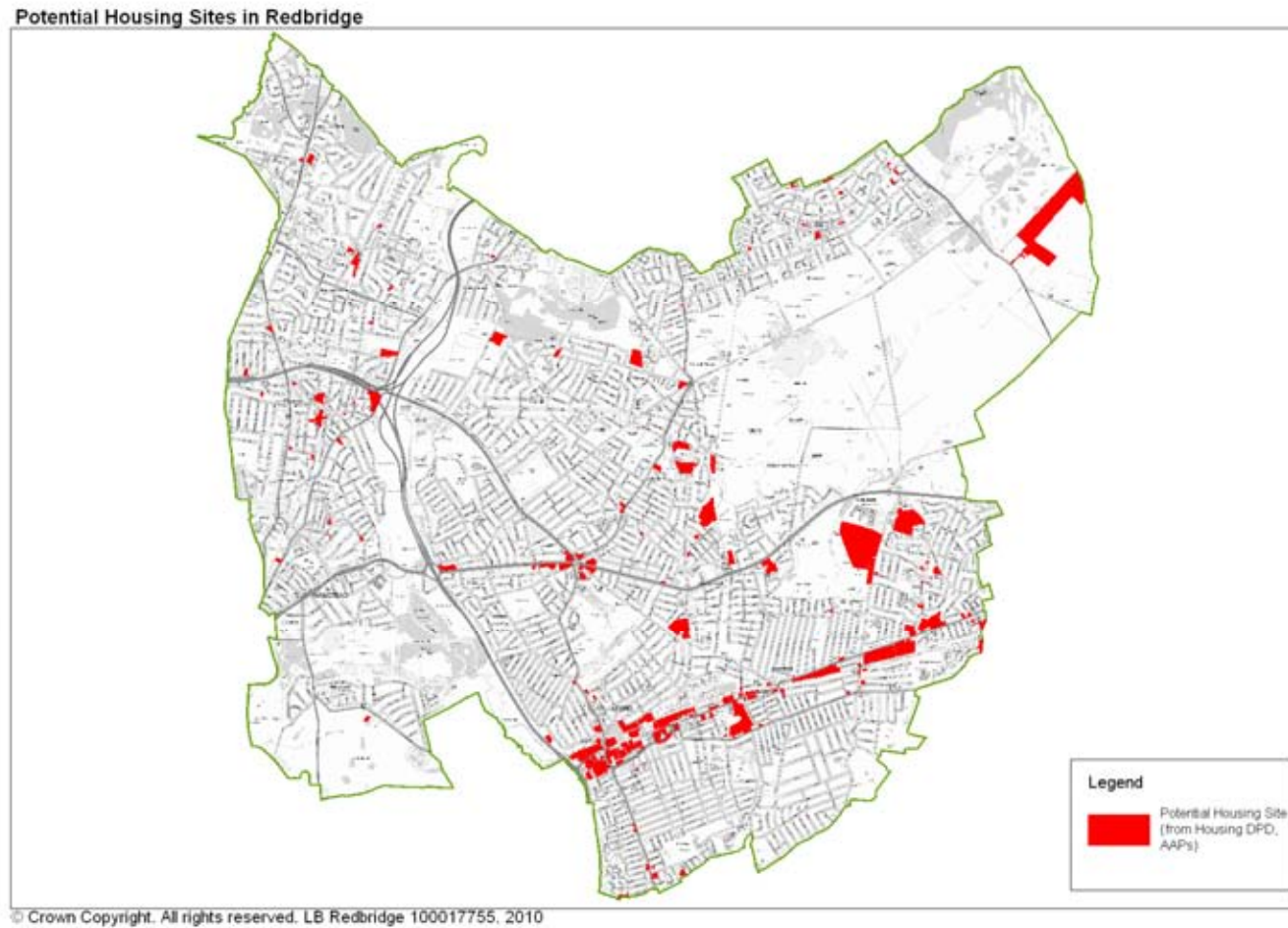


Figure 1-3: Potential Housing Sites in Redbridge¹³

¹³ Provided by the LBR, July 2010

In terms of non-housing growth, quantified growth in the Core Strategy is outlined to be 23,000m² of new high street and retail floor area in Ilford Town Centre. While other types of residential (e.g. hotels, residential institutions) and non-residential development (e.g. retail, office, industry) can and will occur, these are not quantified within the Core Strategy. However, the LBR have provided the relevant figures for the purpose of this study.

Redbridge, as with other London Boroughs, is being driven to address its current status and its potential to deliver sustainable development. In addition to policy outlined below, the State of the Environment Report (Environment Agency, 2007) and Reducing the South East's Ecological Footprint and Carbon Emissions (SEERA, August 2008) both refer to the need to significantly reduce carbon emissions. However, the extent to which carbon emissions reduction can be carried out through low carbon and renewable energy technologies depends largely on the environmental constraints to technology based on the physical characteristics of Redbridge Borough, including specific constraints such as land designations and flood risk, as outlined in the following sections.

The physical constraints identified in this section will form the basis for an opportunities/constraints analysis for renewable energy technologies identified in accordance with the DECC methodology in Section 5. The constraints analysis under the DECC methodology comprises a study of the physical environmental constraints, where the physical barriers to deployment are explored such as areas where renewables schemes cannot practically be built – e.g. large scale wind turbines on roads and rivers; and the planning and regulatory constraints, where a set of constraints relevant to each renewable technology are explored that reflects the current planning and regulatory framework, such as excluding from the assessment areas and resources which cannot be developed due to e.g. health & safety, air/water quality, environmental protection.

1.3.1 Environment

Although in a predominantly dense part of Greater London, Redbridge contains significant natural or semi-natural areas including woodland, comprising 3.7% by area of Redbridge; scrub, covering 1.4%; wetlands covering around 1.6%; grassland covering 25% and arable land covering 4.6%¹⁴.

There are two Sites of Special Scientific Interest (SSSI) in Redbridge – Hainault Forest and Epping Forest. Epping Forest is also a Special Area of Conservation (SAC) – a protected site designated under the EC Habitats Directive. Redbridge also has 35 Sites of Importance for Nature Conservation (SINCs) (which is made up of 5 sites of Metropolitan Importance, 10 Borough Grade 1 sites, 10 Borough Grade 2 sites and 10 sites of Local Importance). This information is illustrated in the figure below.

¹⁴ LBR Nature Conservation SPD, June 2006

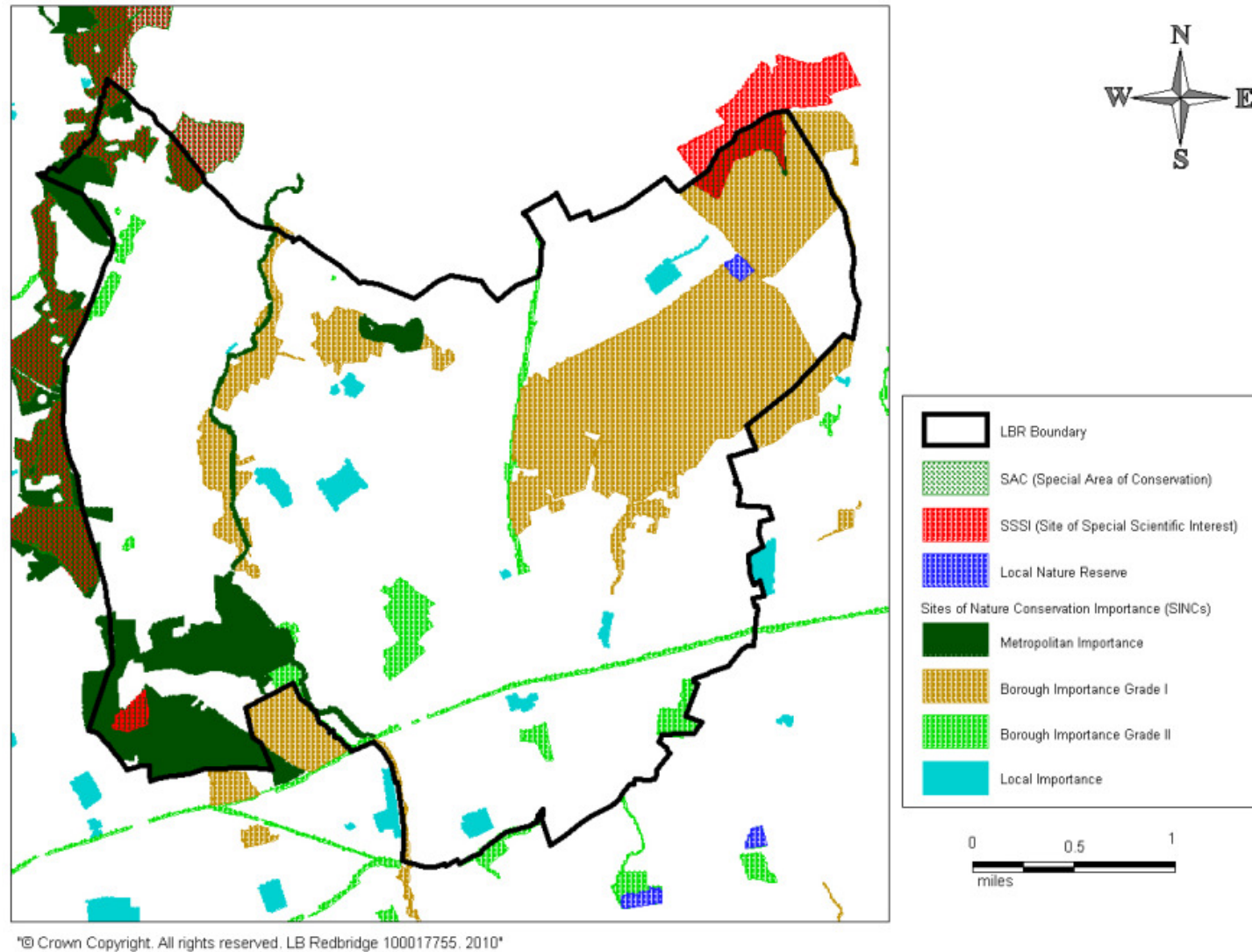


Figure 1-4: Environmental constraints within Redbridge

The main watercourses identified within the London Borough of Redbridge are the river Ching, Ashton Brook, Cran Brook, Loxford Water, Wells Brook and the River Roding. Due to the highly urbanised nature of this part of the catchment, the Loxford Water and Cran Brook are largely culverted and effectively part of the surface water sewer network. Redbridge has some land within flood zones 2 and 3, predominantly around the river Roding, which extends the length of the borough, and also around Loxford Water. Further details can be found in the Strategic Flood Risk Assessment commissioned by the LBR¹⁵. The figure below illustrates the flood risk sites in the Borough.

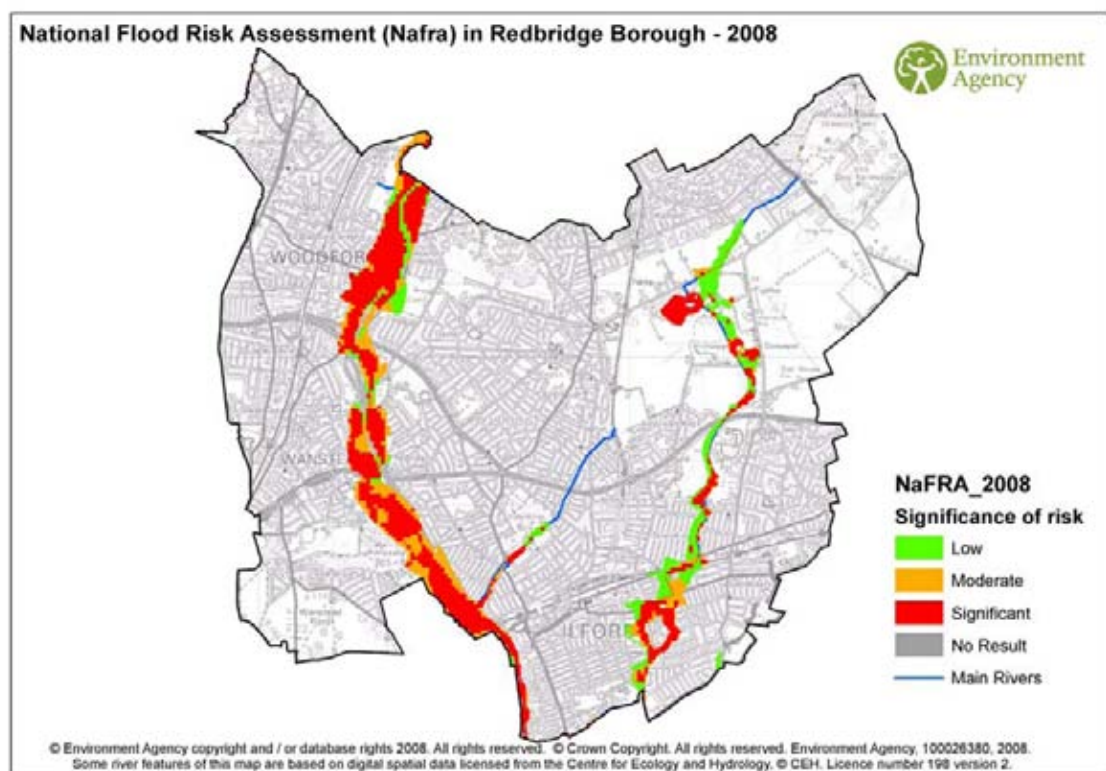


Figure 1-5: Redbridge Flood Risk Assessment map¹⁶

1.3.2 Historic Environment

There are 129 entries for Listed Buildings in Redbridge, representing nearly 200 listed buildings, which have been highlighted in the figures below. These heritage areas have been identified due to the potential restrictions on the application of technologies such as micro wind, PV's and Solar Hot Water; Ground sourced heating might be explored on properties with larger gardens. New multi-storey buildings in heritage areas are also likely to be restricted.

Figure 1-6 shows the registered heritage areas and Figure 1-7 shows listed buildings in the Redbridge area.

¹⁵ http://www.redbridge.gov.uk/cms/planning_land_and_buildings/planning_policy__regeneration/strategic_flood_risk.aspx

¹⁶ www.redbridge.gov.uk

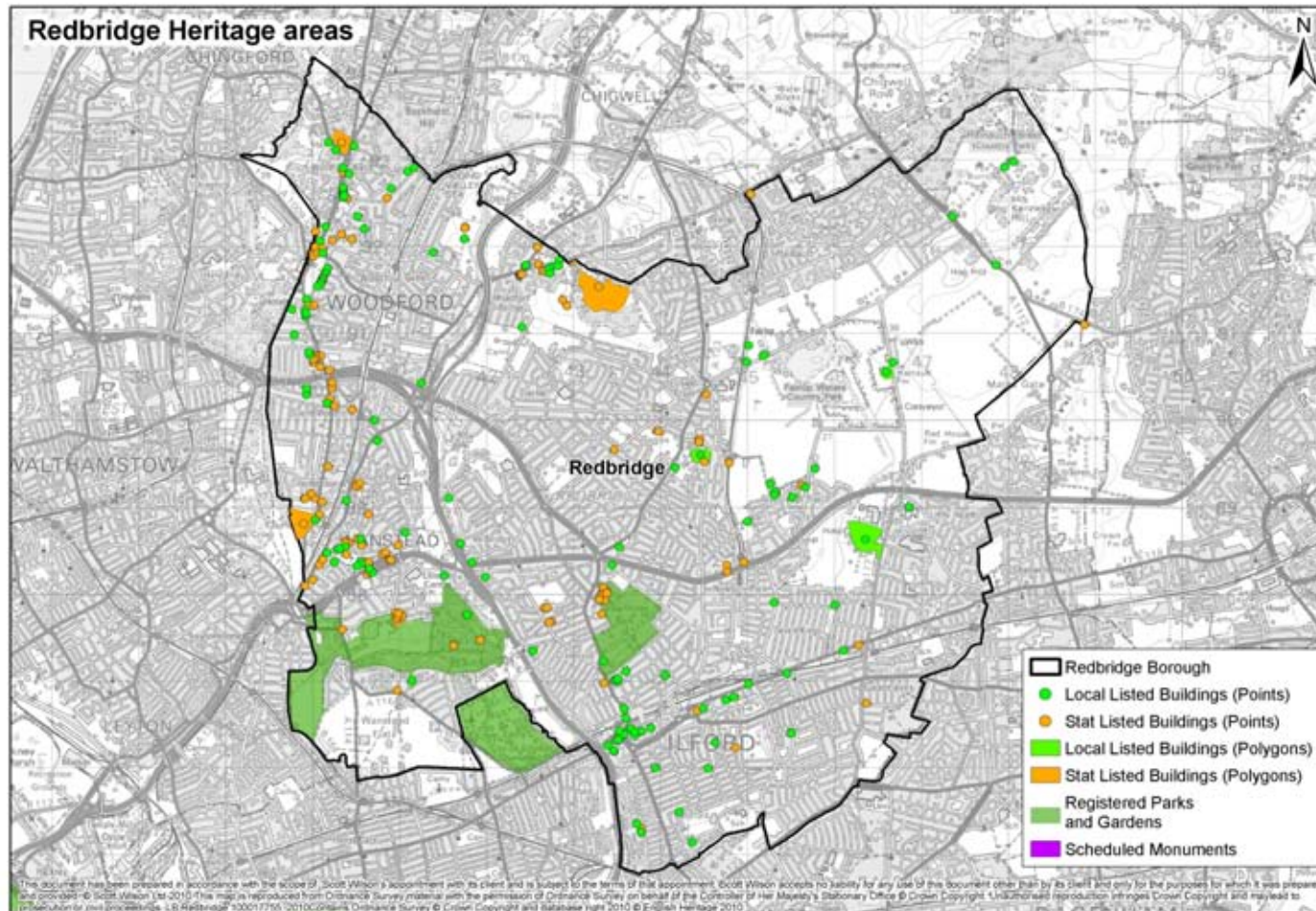


Figure 1-6: Redbridge Heritage areas and listed buildings¹⁷

¹⁷ Data provided by Redbridge Council GIS department., April 2010

2 Policy Context

2.1 International & European Policy

The following is a review of national, regional and local policies most relevant to this study.

2.1.1 Kyoto Protocol Agreement¹⁸

The Kyoto Protocol is an international agreement linked to the United Nations Framework Convention on Climate Change. The major feature of the Kyoto Protocol is that it sets binding targets for 37 industrialised countries and the European Community for reducing greenhouse gas (GHG) emissions. These amount to an average of five per cent against 1990 levels over the five-year period 2008-2012.

The Kyoto Agreement is currently being updated using the 'Bali Roadmap'. Following the Copenhagen summit in December 2009, no agreement was reached in terms of committing the UK to further carbon reductions, technology development and investment. Therefore, UK planning policy currently reflects ambitious internal targets that the Government has set (See Section 2.2 on National Policy).

2.1.2 EU Energy Performance of Buildings Directive (EPBD)¹⁹

The principal objective of the Energy Performance of Buildings Directive (EPBD) is to promote the improvement of the energy performance of buildings within the EU through cost-effective measures. Key requirements include:

- A calculation methodology, which must be implemented to ascertain the energy performance of buildings, taking account of all factors that influence energy use;
- Minimum energy performance standards to be set for buildings; and
- An energy performance certificate (EPC) to be produced for new buildings (refer to 2.1.4 below).

2.1.3 Renewable Energy (RE) Directive²⁰

The RE Directive sets out how the EU will increase the use of renewable energy sources in order to meet the overall target of **20% renewables by 2020**. Under this Directive, the UK will be required to ensure that at least 15% of its final energy consumption comes from renewables by 2020. The Directive sets the UK's interim targets at 4% for 2011/2012, 5.4% for 2013/2014, 7.5% for 2015/2016 and 10.2% for 2017/2018. According to the National Audit Office (NAO), the latest available data from 2008 reveals that only 5.5 percent of power was produced by green technology and just 2.3 percent of all its energy was generated from renewables²¹.

¹⁸ <http://unfccc.int/resource/docs/convkp/kpeng.pdf>

¹⁹ <http://ec.europa.eu/energy>

²⁰ http://www.r-e-a.net/document-library/thirdparty/rea-and-fgd-documents/REDDoc_090605_Directive_200928EC_OJ.pdf

²¹ National Audit Office (NAO), Government funding for developing renewable energy technologies, June 2010

2.1.4 Energy Performance Certificates²²

The Energy Performance Certificate (EPC) is a measure introduced across Europe to reflect legislation under the EU Performance of Buildings Directive (EPBD) which aims to reduce buildings' carbon emissions. An Energy Performance Certificate is required for all homes whenever built, rented or sold. The certificate records how energy efficient a property is as a building and provides ratings on a scale of A-G, with 'A' being the most energy efficient and 'G' being the least.

2.2 National Policy

The following sets out the overarching policies of the UK Government.

2.2.1 Securing the Future²³

Securing the Future is the UK's Sustainable Development Strategy (March 2005) which sets out the principles for sustainable development with a focus on environmental limits. Four priority areas were identified; consumption and production, climate change, natural resource protection and sustainable communities.

2.2.2 UK Strategy for Sustainable Construction²⁴

In June 2008, the Government released a Strategy for Sustainable Construction. The Strategy, developed in collaboration with the Strategic Forum for Construction, is aimed at "*providing clarity around the existing policy framework and signalling the future direction of Government policy*".

The Strategy for Sustainable Construction is a joint industry and Government initiative intended to promote leadership and behavioural change. The final Strategy was released on 11th June 2008.

2.2.3 Planning Policy Statement 1: Delivering Sustainable Development²⁵

PPS1 sets out the Government's overarching planning policies on the delivery of sustainable development through the planning system. It includes the key principle that local planning authorities should ensure that development plans promote the development of renewable energy resources. It also sets out that development plan policies should seek to promote and encourage, rather than restrict, the use of renewable resources, and that local authorities should promote small scale renewable and low carbon energy schemes in developments.

2.2.4 Planning Policy Statement: Planning and Climate Change Supplement to PPS1²⁶

In December 2007, the Government published Planning Policy Statement – Planning and Climate Change, a supplement to PPS1. This document gives an indication of the issues to be

²² <http://epc.direct.gov.uk/index.html>

²³ <http://www.defra.gov.uk/sustainable/government/publications/uk-strategy/>

²⁴ <http://www.bis.gov.uk/sustainableconstructionwww.berr.gov.uk>

²⁵ <http://www.communities.gov.uk/publications/planningandbuilding/planningpolicystatement1>

²⁶ Communities and Local Government (2007) *Planning Policy Statement: Planning and Climate Change* [online] available at: <http://www.communities.gov.uk/documents/planningandbuilding/pdf/ppscclimatechange.pdf>

taken into account in attempting to achieve sustainable development as a contribution to addressing climate change.

Key planning objectives include:

- Enabling new development, securing the highest viable standards of resource and energy efficiency and reduction in carbon emissions;
- Delivering patterns of urban growth that secure sustainable transport movements;
- Securing new development resilient to the effects of climate change; and
- Sustaining biodiversity.

PPS1 supplement on Planning and Climate Change requires Local Authorities to mitigate and adapt to climate change through appropriate location and patterns of development. It states that spatial strategies should abide by the principle that *“new development should be planned to make good use of opportunities for decentralised and renewable or low carbon energy”*. The Supplement, therefore, strengthens the requirement for planners to acknowledge a national need for renewable and low carbon technologies. Planning Authorities should provide a framework that promotes and encourages renewable and low-carbon energy and supporting infrastructure and develop positive policies towards that end.

The Supplement sets out several other measures intended to increase uptake of renewable energy in new development including to: promote consistency with PPS22; encourage the identification of suitable areas for renewables and supporting infrastructure; provide a proportion of energy supply for new development from decentralised and renewable or low-carbon energy sources. Further measures are set out through Local Development Orders (LDOs) including: selecting land for development; local requirements for energy supply to new developments; sustainable design of buildings; and impact of proposed development on renewable energy supplies.

Web-based Practice Guidance²⁷ has been developed to assist with the implementation of the PPS on Climate Change and to secure good practice. It draws upon the principles in PPS 22: Renewable Energy.

2.2.5 Planning Policy Statement: Planning for a Low Carbon Future in a Changing Climate Supplement to PPS1 (Consultation)

In March 2010 the Government published for consultation Planning Policy Statement: Planning for a Low Carbon Future in a Changing Climate. This consultation document brings together and will replace the 2007 Planning and Climate Change supplement to PPS1 with the 2004 PPS22 on Renewable Energy into a new draft PPS on Planning for a Low Carbon Future in a Changing Climate. It is proposed that this document will become a consolidated supplement to PPS1. This will support and provide an overarching framework for PPS25 on Development and Flood Risk and emerging planning policies on green infrastructure.

²⁷

<http://www.communities.gov.uk/planningandbuilding/planning/planningpolicyguidance/planningpolycystatements/planningpolycystatemnts/ppsclimatechange/practiceguidance/>

2.2.6 Planning Policy Statement 22: Renewable Energy²⁸

PPS 22 on Renewable Energy sets out UK National Policy on renewable energy. It includes a requirement for local authorities to allocate specific sites for renewable energy and to encourage developers to provide on-site renewable energy generation as appropriate.

It requires Local Planning Authorities and developers to consider opportunities for the incorporation of renewable energy into all new developments. Accordingly, Local Authorities should encourage renewable energy schemes through their inclusion in Local Development Documents.

2.2.7 Planning Policy Statement 3: Housing²⁹

PPS3 comments on sustainable housing and affordable housing and states that “*Local Planning Authorities should encourage applicants to bring forward sustainable and environmentally friendly new housing developments, including affordable housing developments, and in doing so should reflect the approach set out in the forthcoming PPS on climate change, including the Code for Sustainable Homes*”.

2.2.8 Climate Change Act³⁰

The Climate Change Act 2008 sets targets for green house gas emission reductions through action in the UK and abroad of at least 80% over 1992 levels by 2050, and reductions in CO₂ emissions of at least 26% by 2020 against a 1990 baseline. As part of the package of measures to achieve this, Government has set a target to generate 20% of the UK's energy demand from renewable sources by 2020.

The Climate Change Act, passed in November 2008, and PPS 22 set out the Government's policies and targets on carbon emissions and renewable energy. These are primarily to:

- Reduce UK greenhouse gas emissions to 12.5% below 1990 levels by 2008-2012;
- Reduce UK CO₂ emissions to 26% below 1990 levels by 2020, with a long term target of 80% below 1990 levels by 2050;
- Meet 10% of UK electricity demand from renewable energy by 2010 and 20% by 2020;
- Have at least 10 GW (gigawatts) of combined heat and power (CHP) capacity in the UK by 2010; and
- Comply with the system of binding five year “carbon budgets”, with requirements set out for the Government to report every 5 years on their progress against these and on other climate change impacts and policies.

The April 2009 Budget included a proposal to amend the Climate Change Act to include an interim target for the period covering 2018 – 2022 and increase the 26% reduction in CO₂ emissions to 34%.

²⁸ ODPM (2004) *Planning Policy Statement 22: Renewable Energy* [online] available at:

<http://www.communities.gov.uk/publications/planningandbuilding/pps22>

²⁹ <http://www.communities.gov.uk/publications/planningandbuilding/pps3housing>

³⁰ The Climate Change Act 2008 is available at: <http://www.defra.gov.uk/environment/climatechange/uk/legislation/>

2.2.9 UK Renewable Energy Strategy³¹

Published in July 2009, the UK Renewable Energy Strategy aims to tackle Climate Change by reducing carbon dioxide emissions and setting guidelines and targets to increase the renewable energy supply in the UK. It sets out the path for the UK to meet its legally-binding EU target to ensure 15% of its energy comes from renewable sources by 2020; this is almost a seven-fold increase in the share of renewables in scarcely more than a decade.

2.2.10 Planning & Energy White Papers³²

The UK Fuel Poverty Strategy (2001) set out how the Government proposes to ensure affordable warmth for all households. The subsequent Energy White Paper: Our Energy Future – Creating a Low Carbon Economy (2003) includes the key energy policy goal to “*ensure that every home is adequately and affordably heated*” and the aim “*in England, within reason, for no household to be in fuel poverty by 2016*”. The revised 2007 Energy White Paper includes a strategy to accelerate the deployment of low carbon technologies.

The 2009 Energy White Paper: *The UK Low Carbon Transition Plan* sets out a twelve-year plan for the UK to reduce CO₂ emissions by 18% on 2008 levels.

2.2.11 UK Building Regulations³³

The 2006 amendments to Part L of the Building Regulations aim to reduce CO₂ emissions from buildings. Key additional requirements of Part L are as follows:

- New buildings must produce 20-28% less CO₂ than a 2002 Building Regulations compliant building;
- All new buildings must be designed to meet the design CO₂ emission target using the Simplified Buildings Energy Model (SBEM) or other approved software;
- Systems should be provided with appropriate controls to enable the achievement of reasonable standards of energy efficiency in use;
- In buildings with floor areas greater than 1,000m², automatic meter reading and data collection facilities should be included; and
- An Energy Performance Certificate (EPC) must be provided for buildings over 1,000m².
- Consequential improvements apply where the floor area is over 1000 m² and there is increase in capacity of a fixed building service, or a new extension. The principal works (to new or extended parts) must comply with guidance, and consequential improvements (to the rest of the building) must bring the thermal properties up to stated values, and then upgrade services over 15 years old, install metering and low-zero carbon within stated economic limits and a cap of 10% of principal works cost. Please refer to Section 8 for further details.

³¹ http://www.decc.gov.uk/en/content/cms/what_we_do/uk_supply/energy_mix/renewable/res/res.aspx

³² <http://www.communities.gov.uk/publications/planningandbuilding/planningsustainablefuture>

³³ www.communities.gov.uk

2.2.12 Code for Sustainable Homes

The Code for Sustainable Homes (CSH) was introduced in April 2007 as a voluntary measure to provide a comprehensive assessment of the sustainability of a new home and replaces the EcoHomes methodology. The Code Level is awarded on the basis of achieving a minimum overall score and a set of mandatory minimum standards for the categories of waste, materials, surface water run-off, energy and potable water consumption.

Ratings under the Code are attributed to each dwelling type within a development and specific mandatory energy targets are set for each level of the Code as outlined in Table 2-1 below.

CSH Level and Star rating	Energy Requirements (Improvement over TER)	Overall Performance Improvement over Baseline
Level 1 (*)	10%	36%
Level 2(**)	18%	48%
Level 3 (***)	25%	57%
Level 4 (****)	44%	68%
Level 5 (*****)	100%	84%
Level 6 (*****)	Zero Carbon	90%

Table 2-1: CSH Level and Performance Improvement

The targets above are based on improvements to Part L of the Building Regulations. Currently Level 6 of the Code (zero carbon) is obtained through offsetting all of the CO₂ from both Part L regulated energy uses and non-regulated energy sources such as household appliances and cooking (not assessed under Part L). Unregulated energy use accounts for approximately 30-40% of a household's energy consumption and will require a reduction on the Target Emission Rate (TER) of approximately 150% to attain Code 6. See Figure 2-1 which illustrates regulated and unregulated emissions.

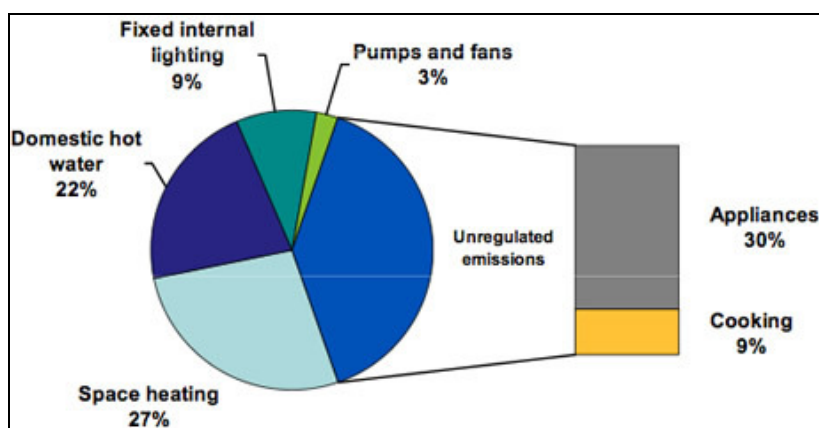


Figure 2-1: Regulated and unregulated emissions as defined by Part L

'Zero carbon' homes as defined by the Code are required to have a maximum heat loss parameter (HLP) from the building fabric of $0.8\text{Wm}^2\text{K}$. Additionally, low and zero carbon energy generation are required to be either located on the development site or be physically connected to a dwelling via private wire or a District Heat (DH) network. The Code is currently undergoing consultation, which is likely to replace the HLP measure with an energy demand measure in kWh/m^2 . Furthermore, Building Regulations will be requiring higher energy efficiency levels as part of the Roadmap to zero carbon homes. There is still ambiguity over the definition of zero carbon and how this is defined by part L of the Building Regulations, however the consultation paper released by the Department of Communities and Local Government³⁴ sets out the following:

1. A minimum standard of energy efficiency will be required.
2. A minimum carbon reduction should be achieved through a combination of energy efficiency, onsite low and zero carbon (LZC) technologies, and directly connected heat. This is referred to as achieving carbon compliance.
3. Any remaining emissions should be dealt with using allowable solutions, including offsite renewable energy.

2.2.13 BREEAM

BREEAM (Building Research Establishment Environmental Assessment Method) is a tool used to review of the sustainability performance of non-domestic buildings. Depending on the type of building and the use of the building, it can be assessed under various BREEAM methodologies. For each issue, there are a number of credits available. Where the building attains or exceeds various benchmarks of performance, an appropriate number of credits is awarded. The weightings obtained for each credit are applied to the individual issue categories to provide an overall BREEAM Assessment score.

Depending on the number of credits attained in the various issue categories, the results are translated into a corresponding overall single score which gives consideration to the environmental weightings. This single score translates into the BREEAM rating, in accordance with the thresholds illustrated in **Table 2-2**.

BREEAM Industrial Rating	Percentage Score
Pass	>30%
Good	>45%
Very Good	>55%
Excellent	>70%
Outstanding	>85%

Table 2-2: BREEAM score and associated rating

³⁴ <http://www.communities.gov.uk/publications/planningandbuilding/futureofcodeconsultation>

2.2.14 Future Energy Targets – Non-Domestic

Subsequent policy and standards have also been set in order to create a step change to zero carbon for non-domestic buildings. The UK Sustainable Construction Strategy sets out and anticipates the following step change to zero carbon with new schools, public sector buildings and other non-domestic buildings to be zero carbon from 2016, 2018 and 2019 respectively. See Table 2-3 below:

Year	Anticipated Carbon Reduction Targets												
	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
Dwellings	Part L 2006	25% improvement over Part L 2006			44% improvement over Part L 2006			Zero Carbon					
Schools	Part L 2006	25% improvement over Part L 2006			44% improvement over Part L 2006			Zero Carbon					
Public buildings	Part L 2006	25% improvement over Part L 2006			44% improvement over Part L 2006			Zero Carbon					
Non-residential buildings	Part L 2006	25% improvement over Part L 2006			44% improvement over Part L 2006			Zero Carbon					
Equivalent CSH Rating	Level 3	Level 3			Level 4			Level 6					

Table 2-3: Anticipated Carbon Reduction Targets all Building Types

2.2.15 Climate Change Levy³⁵

Renewables are exempt from the CCL, which is designed to encourage the business and public sectors to improve energy efficiency and reduce emissions of greenhouse gases through a price based signal on energy usage.

2.2.16 Carbon Reduction Commitment Energy Efficiency Scheme (CRC)³⁶

The CRC Energy Efficiency Scheme, aimed at reducing carbon emissions from large organisations, requires commercial and public sector organisations consuming at least 6,000MWh of electricity on all half-hourly (HH) electricity meters to participate in mandatory emissions trading. Registration for the cap-and-trade scheme began in April 2010, and the first capped phase will begin in January 2013.

2.3 Regional Policy

2.3.1 The London Plan³⁷

This Low Carbon, Renewable Energy and Heat Mapping Study responds to the London Plan, which is the Mayor of London's spatial development strategy for London. The London Plan climate change policies as set out in chapter 4A collectively require developments to make the fullest contribution to tackling climate change by minimising carbon dioxide emissions, adopting sustainable design and construction measures, prioritising decentralised energy supply, and incorporating renewable energy technologies with a target of 20% carbon reductions from on-site renewable energy. The policies set out ways in which developers must address mitigation of and

³⁵ <http://www.ccleavy.com/>

³⁶ <http://www.environment-agency.gov.uk/business/topics/pollution/98263.aspx>

³⁷ <http://www.london.gov.uk/thelondonplan/thelondonplan.jsp>

adaptation to the effects of climate change. Policies 4A.2 to 4A.8 of the London Plan focus on how to mitigate climate change and the carbon dioxide reduction targets that are necessary across London to achieve this.

2.4 Local Policy

A number of key policy documents within the Local Development Framework have been adopted, including the Core Strategy (March 2008), Borough Wide Primary Policies (May 2008), Development Sites with Housing Capacity (May 2008), Development Opportunity Sites (May 2008), Ilford Town Centre Area Action Plan (May 2008) and the most recent Gants Hill District Centre Area Action Plan (May 2009).

Redbridge Borough does not have its own policy on renewable energy, but relies instead on London Plan Policy 4A.7 Renewable Energy. This states that all new development should seek to achieve a minimum of 20% on-site renewable energy generation.

2.4.1 The Local Development Framework

The Local Development Framework (LDF) comprises a series of Development Plan Documents (DPDs) which contain the policies, and Supplementary Planning Documents (SPDs) which enlarge on, or explain how the policies will be applied.

2.4.2 London Borough of Redbridge Core Strategy and Development Plan Documents³⁸

Redbridge has a sound Core Strategy in place that addresses climate change/adaptation at a strategic level, as well as five other sound DPDs that respond to climate change/adaptation at a local level.

Strategic Policy 1 Overall Growth states that the Metropolitan Centre (Ilford) will be the primary area for growth, followed by some growth in the District Centres, with little change expected to occur in the Local Centres.

Strategic Policy 7 Housing, supported by the Borough wide Policy H1 Housing Provision aims to distribute new housing as follows:

- Ilford Town Centre: 35%-50%
- District and Local Centres: 15-25%
- Rest of the Borough: 25-35%

The Borough aims for 90% of new housing to be on previously developed land.

Strategic Policy 2 Green Environment sets out the various types of land which need to be protected, including Green Belt and Metropolitan Open Land, Sites of Special Scientific Interest and a range of sites of acknowledged nature conservation value. It also provides protection for the borough's waterways and floodplain, for natural habitat and trees.

³⁸ http://www.redbridge.gov.uk/cms/planning_land_and_buildings/planning_policy__regeneration/idoc.ashx

Strategic Policy 3 Built Environment states the Council's determination that all new development should be well designed and gives special attention to development in Conservation Areas, and of listed buildings. It also calls for minimisation of energy use and greenhouse gas production and for water conservation measures.

The Ilford Town Centre Area Action Plan (AAP) and the Gants Hill District Centre AAP provide a detailed expression of the Core Strategy in the context of these two town centres, and have been discussed in further detail in Chapter 6.

2.4.3 Sustainable Design and Construction Supplementary Planning Guidance³⁹

The Sustainable Design and Construction Supplementary Planning Guidance (SPG) (May 2005) has been developed to promote sustainable practices in design and construction and is aimed at developers and refers to the design and construction of new developments of all sizes. LBR is aiming to update this guidance in 2010.

2.4.4 Sustainable Design and Construction Checklist⁴⁰

The Council requires all proposals to be designed in accordance with the principles of sustainable development. The Sustainable Design and Construction (SDC) Checklist, based on the Code for Sustainable Homes (CSH), is required to inform a Sustainability Statement that must form part of the Design and Access Statement required for all planning applications involving new dwellings.

2.4.5 Redbridge Environmental Action Plan 2007-2017⁴¹

The Redbridge Environmental Action Plan (REAct), adopted in July 2008, identifies climate change adaptation as a key issue, and broadly identifies the potential impacts of climate change. REAct brings together all the existing plans and strategies dealing with different environmental matters.

2.4.6 Local Area Agreement⁴²

The Local Area Agreement (LAA) is a commitment by the Council and other service providers to support the delivery of the borough's Sustainable Community Strategy, which has an overarching priority of addressing climate change.

Redbridge has signed the Nottingham Declaration on Climate Change. This commits the Council to delivering the UK Climate Change Programme at the local level. The Council will regularly negotiate CO₂ reduction targets with central Government as part of the Local Area Agreement process for relevant National Indicators (NI 185).

³⁹ http://www.redbridge.gov.uk/cms/planning_land_and_buildings/planning/sustainable_planning/the_councils_sustainability.aspx

⁴⁰ Sustainable Design and Construction, Planning Application Checklist, April 2008

⁴⁰ http://www.redbridge.gov.uk/cms/planning_land_and_buildings/planning/sustainable_planning/idoc.ashx?docid=3705f33b-8b58-42ee-92f6-93af2b107e1c&version=-1

⁴¹ http://www.redbridge.gov.uk/cms/the_environment/what_we_are_doing_in_redbridge/our_environmental_action_plan.aspx

⁴²

http://cms.redbridge.gov.uk/environment__planning/planning_and_regeneration/regeneration_in_redbridge/local_area_agreement.aspx

The Council has taken part in the Local Authority Carbon Management Programme, in association with the Carbon Trust. This has identified a baseline of carbon emissions from Council activity of 30,000 tonnes in 2005. This detailed investigation will be used as the Redbridge baseline emission data when setting and reporting against CO₂ targets.

2.5 UKCIP09 Projections

2.5.1 Introduction

The UK Climate Projection⁴³ (UKCIP09) provides projections of climate change for the UK, giving greater spatial and temporal detail than previously released UK climate scenarios. The work of the UK Climate Projections programme gives perspective to the targets and aims of the carbon reduction measures that Redbridge is adopting.

The UKCIP does not attempt to predict the degree to which economic and social change will affect emissions levels, but rather takes as its starting point three different emissions scenarios (A1FI or 'high', A1B or 'medium' and B1 or 'low'), and then calculates the probability of different climate scenarios resulting from these emissions level changes. The levels of annual global emissions adopted under different scenarios are illustrated in Figure 2-2 below.

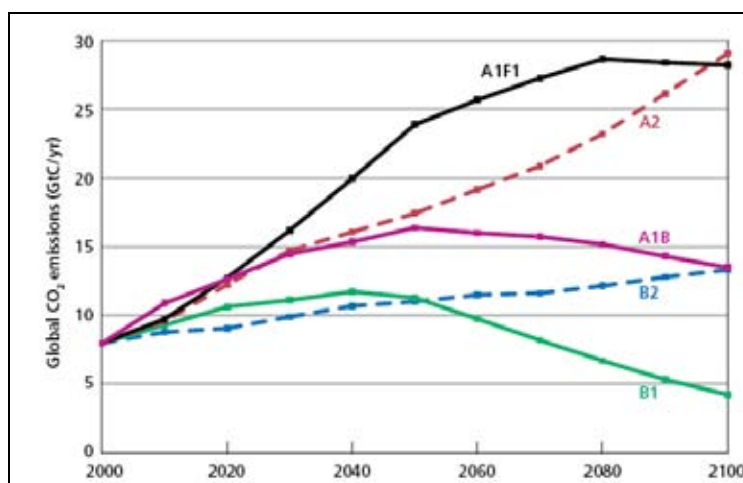


Figure 2-2: Global annual CO₂ emissions under the three IPCC scenarios in UKCIP09⁴⁴

NB: The dotted lines in Figure 2-2 show UKCIP02 scenarios.

The figure below⁴⁵ illustrates projections in global temperature from 21 global models (mean series shown in black dots) under the A1B ('medium') emissions scenario.

⁴³ UK Climate Impacts Programme, DEFRA, DECC, DOE, The Scottish Government, the Welsh Assembly Government, the Met Office Hadley Centre, July 2009.

⁴⁴ www.ukcip.org.uk

⁴⁵ Ibid, page 29

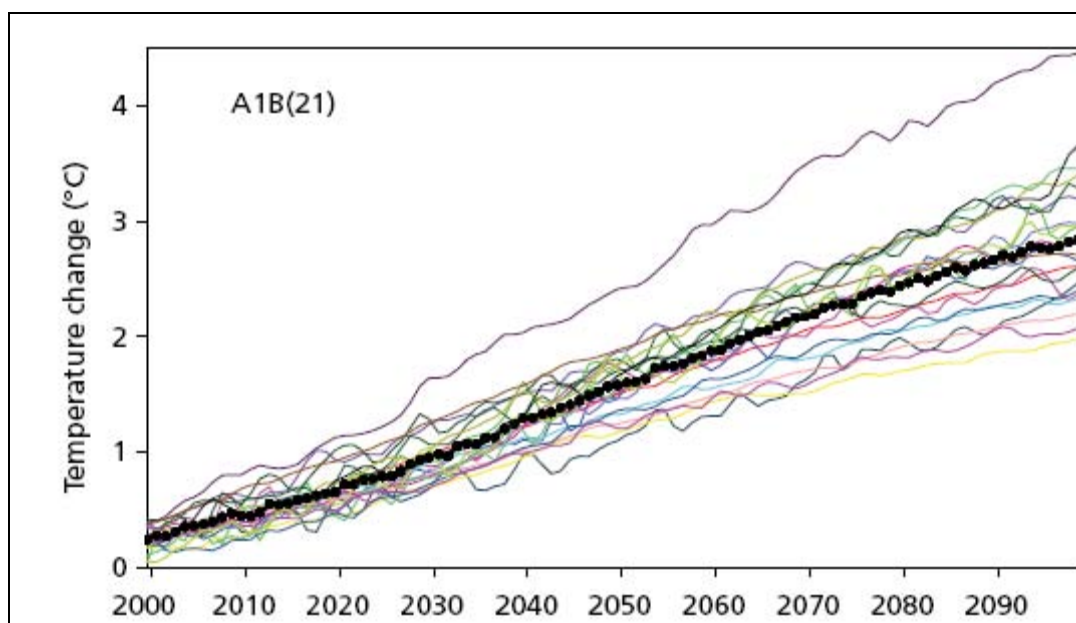


Figure 2-3: Temperature changes under A1B emissions

Whilst global weather changes are critical to the sustainability of human existence, local climate changes also bring home the relevance of intervention at a local level.

For London, under a medium emissions scenario, the following statements are made by UKCP09⁴⁶ for 2080:

- Under medium emissions, the central estimate of increase in winter mean temperature is 3°C; it is very unlikely to be less than 1.6°C and is very unlikely to be more than 4.7°C. A wider range of uncertainty is from 1.4°C to 5.7°C.
- Under medium emissions, the central estimate of increase in summer mean temperature is 3.9°C; it is very unlikely to be less than 2°C and is very unlikely to be more than 6.4°C. A wider range of uncertainty is from 1.4°C to 8.1°C.
- Under medium emissions, the central estimate of change in winter mean precipitation is 19% (increase); it is very unlikely to be less than 3% and is very unlikely to be more than 44%. A wider range of uncertainty is from 3% to 58%.
- Under medium emissions, the central estimate of change in summer mean precipitation is -23% (decrease); it is very unlikely to be less than -48% and is very unlikely to be more than 7%. A wider range of uncertainty is from -56% to 13%.

2.6 Relevant Studies

2.6.1 North East London Biomass Supply Chain Study

The North East London Biomass Study establishes potential demand for and supply of biomass fuel in the London Boroughs of Barking & Dagenham, Havering and Redbridge. The study

⁴⁶ <http://ukcp09.defra.gov.uk/content/view/38/6/>, accessed 02 November 2009

highlights that a 20% offset from renewable energies becomes increasingly challenging for residential developments in blocks with more than 25 dwellings. This is due to the decrease of roof area per dwelling available for photovoltaic (PV) panels.

The Study shows that the combined existing, planned and proposed capacity for Biomass in North East London is 5.2 MW (thermal), excluding a large 8.8MW waste treatment project using waste wood. The Study highlights that if wood products are diverted from recycling to wood fuel production this could have a detrimental impact upon the councils' ability to meet their recycling targets, which could potentially act as a deterrent to using wood products as a fuel.

In terms of Air Quality Management Areas, the Mayor's draft states that small biomass installations must be considered inappropriate for AQMAs unless it can be demonstrated that they will not cause any reduction in air quality.

In terms of wood pellet supply for use within North East London, the study includes capacity from wood pellets transported from as far as Canada. This has been justified by the finding that a significant carbon saving was found despite large distances of transportation, compared to fossil fuel alternatives (the overall carbon content of wood fuel imported from Canada was found to be half that of natural gas).

3 Heat Mapping Study: Redbridge Energy Demand and Future Emissions Projections

3.1 Introduction

This chapter forms the evidence base for the Heat Mapping Study which has been described in further detail in chapter 4. The aims of the energy demand assessment and carbon mapping undertaken on behalf of the LBR were twofold: first, to quantify the level of emissions currently generated by the building stock in the Borough; and, second, to identify those areas with the highest density of carbon emissions. The high density emissions areas represent locations where greatest impact on the overall carbon footprint could be made through suitable policy intervention, and provide an indication of the areas with a high heat demand within Redbridge.

3.2 Methodology and Data Sources

Several sources of data have been explored and adapted in compiling the base data to create a carbon snapshot of Redbridge. Avenues explored included:

- Census 2001 data
- Valuation Office Agency data
- National Statistics Office data
- National Grid
- LBR supplied data
- BRE published data
- DECC published data
- Correspondence with stakeholders

A number of previous statistical studies have addressed the issues of fuel use at a Borough level, and high quality data (e.g. that has achieved the status of National Statistics) is available.

The figures corresponding to the National Indicator 186 methodology have been selected for this study in order to ensure compatibility between this document and the Council's internal monitoring and reporting methodology.

3.3 Redbridge Borough Carbon Footprint

The domestic sector has the highest carbon emissions in Redbridge, accounting for 52% of the total⁴⁷. Domestic gas use is the highest contributor. The industrial and commercial sector and the transport sector have carbon emissions accounting for 23% and 24% respectively⁴⁷. The carbon

⁴⁷ Redbridge Borough: Environmental Summary, London State of the Environment report, Environment Agency, 15th February 2010

emissions associated with Redbridge account for 2.3% of total London emissions in 2005, which ranks 25th out of 32 London boroughs.

DECC has published data for Redbridge in the following form, based on 2007 data, as shown in Table 3-1:

Tonnes CO ₂ p. a. in thousands	Industrial Commercial Agriculture	Domestic	Road Transport
Redbridge (NI186, 2007)	230	539	264

Table 3-1: Redbridge Carbon Emissions Derived from DECC Data

The results highlighted above summarise the Borough-wide carbon emissions. A pie chart of emissions by sector for the Borough is shown below, illustrating the contribution of the built-environment to the wider basket of carbon emissions.

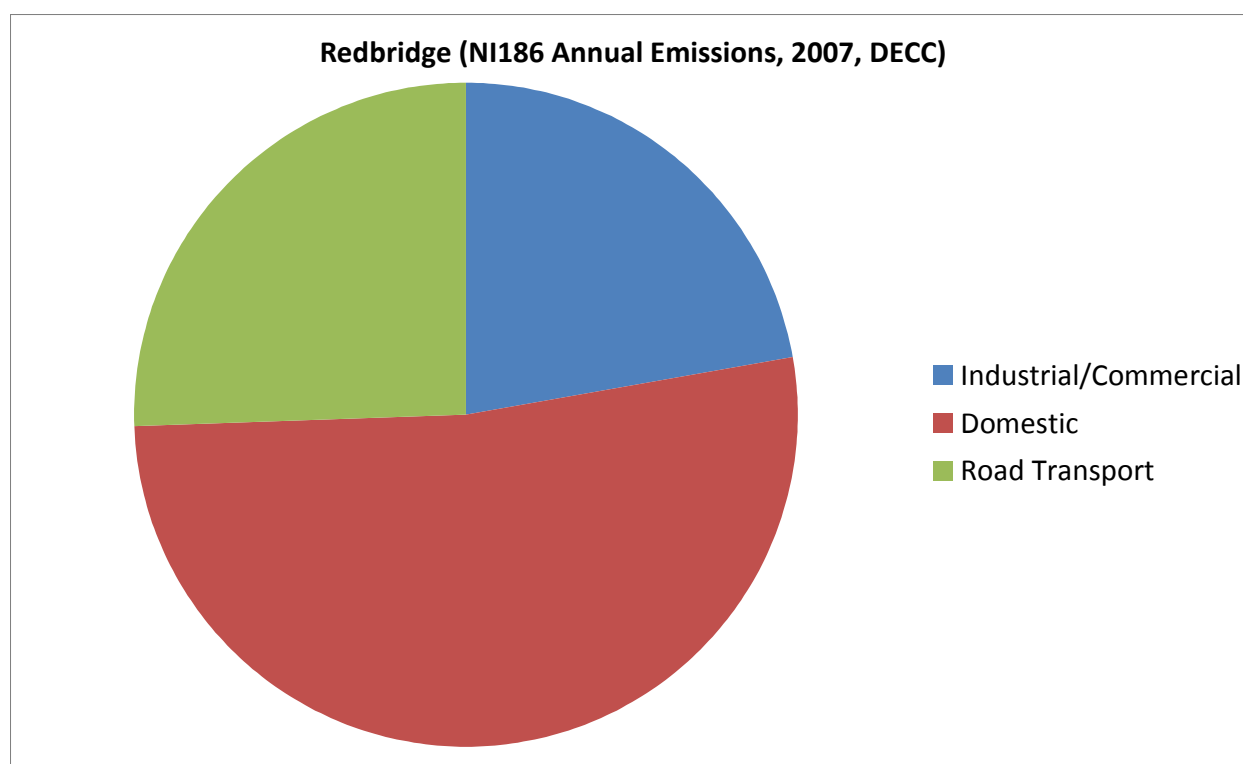


Figure 3-1: Carbon Emissions by Sector in Redbridge

This chart illustrates that the majority of the Borough's emissions arise from the domestic sector, reflecting the mix of building stock.

The overall carbon footprint for Redbridge is illustrated in the table below:

NI186 DECC 2007 figures	Total NI186 Carbon Footprint thousands of tonnes carbon dioxide per annum (% of UK total)
Redbridge	1,033 (0.24%)
UK Total	432,727(100%)

Table 3-2: Redbridge Overall Emissions Footprint

In the national context, the figures for electricity consumption on a per dwelling basis (kWh per customer) can be seen to be fairly low for domestic properties, and low in terms of industrial / commercial consumption levels, as displayed on the following⁴⁸ maps. This can be attributed to the fact that London is a high density area, with a large number of customers in a very small area, as compared to the rest of the UK (e.g. rural areas).

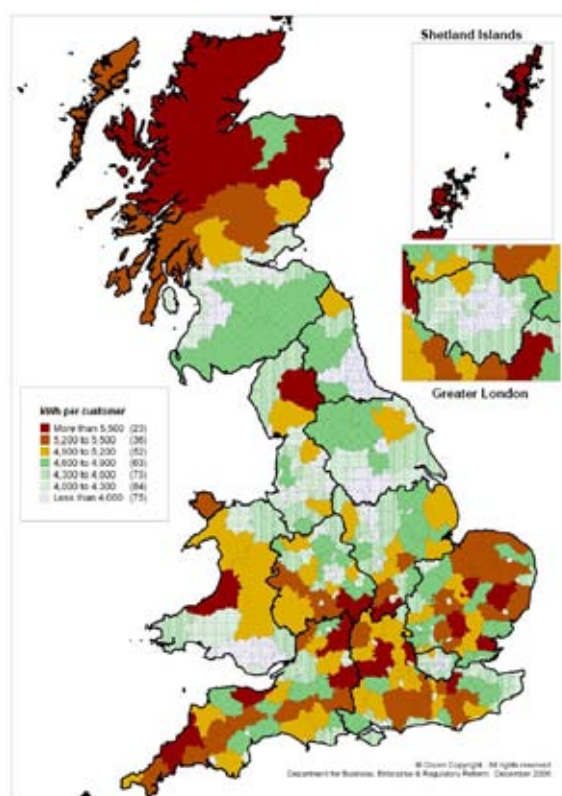


Figure 3-2: Average Domestic Electric Consumption per Meter Point in 2007 (kWh)

⁴⁸ DECC, Maps showing domestic, industrial and commercial electricity consumption at local authority level, Publication URN 09D/535,

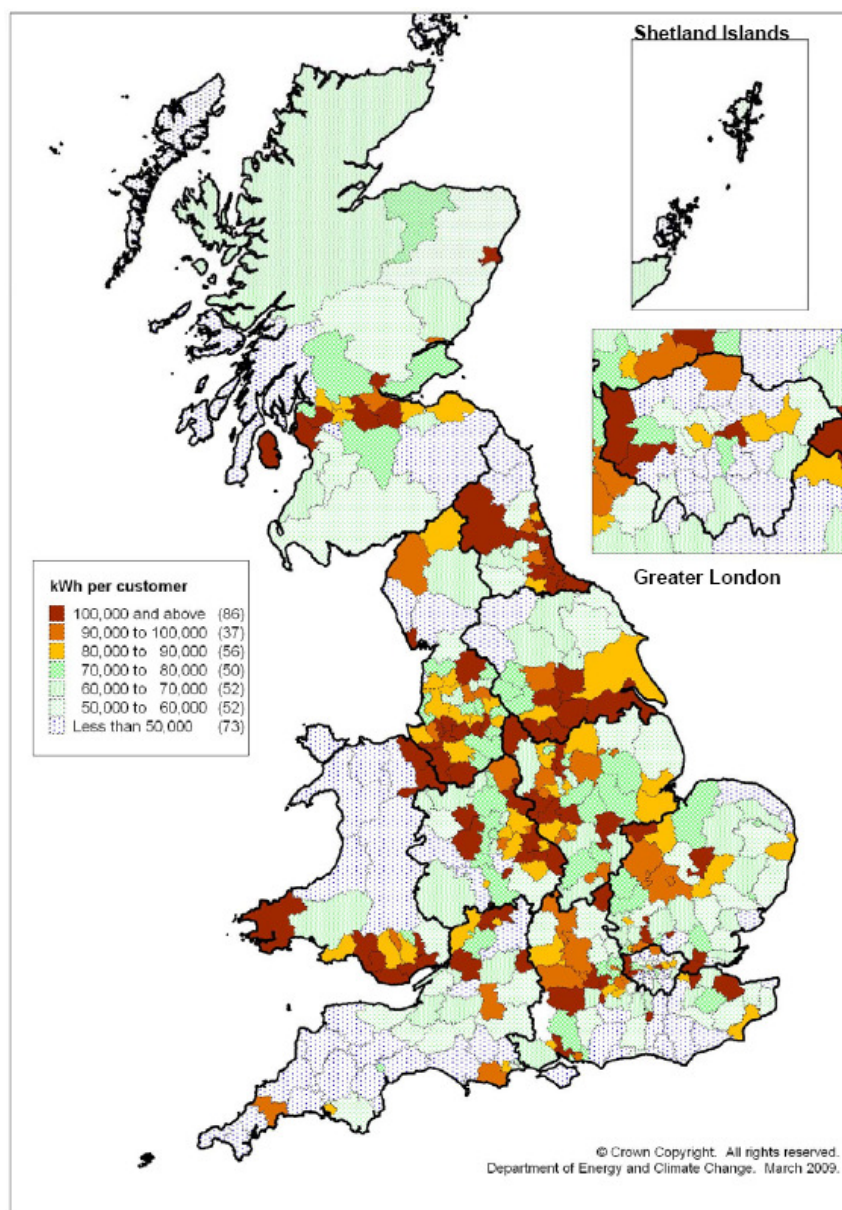


Figure 3-3: Average Industrial / Commercial Electricity Consumption per Meter Point in 2007 (kWh)

On a regional basis, the following figures illustrate the NI186 (DECC 2007) figures for per capita emissions in all London Boroughs.

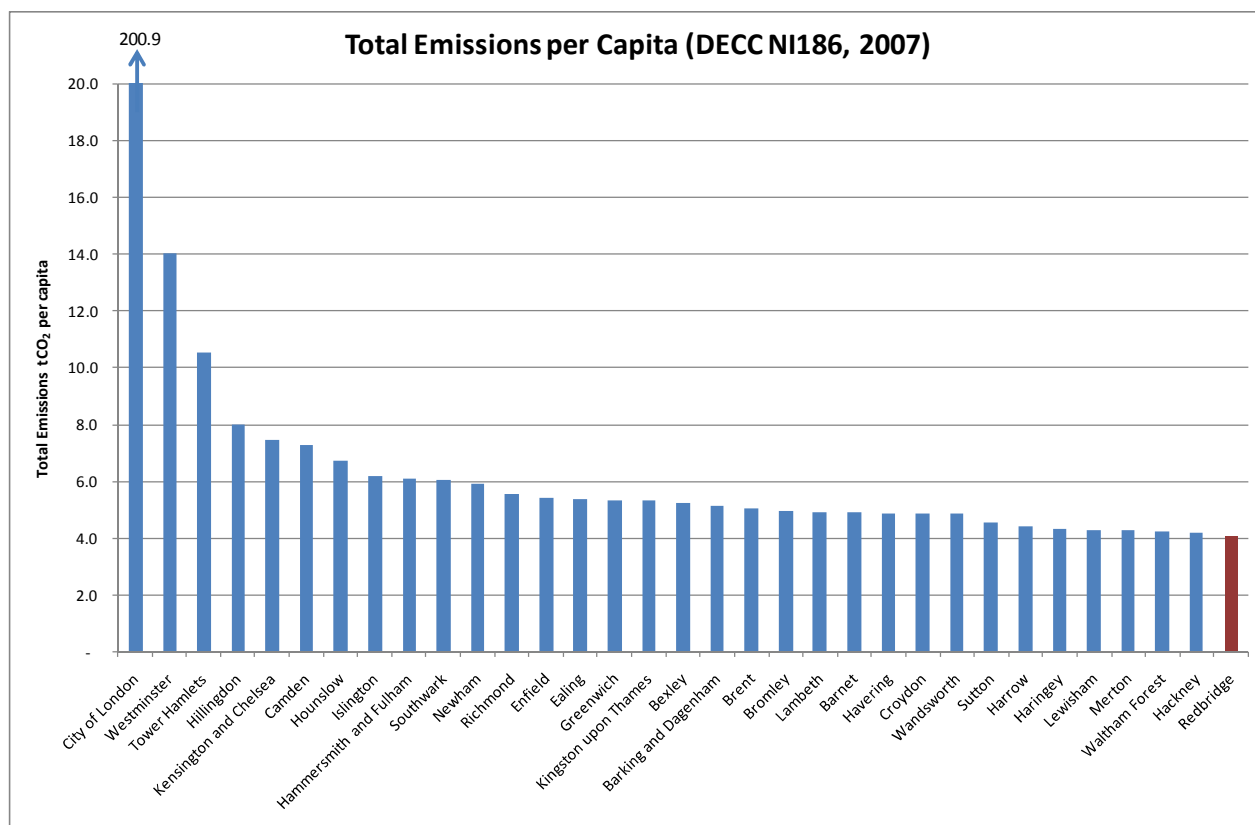


Figure 3-4: London Boroughs Total Emissions Per Capita (DECC, NI186, 2007)

This graph illustrates that Redbridge has the lowest level of per capita emissions of all the London Boroughs. When compared with the graph below, the reason for this can be derived:

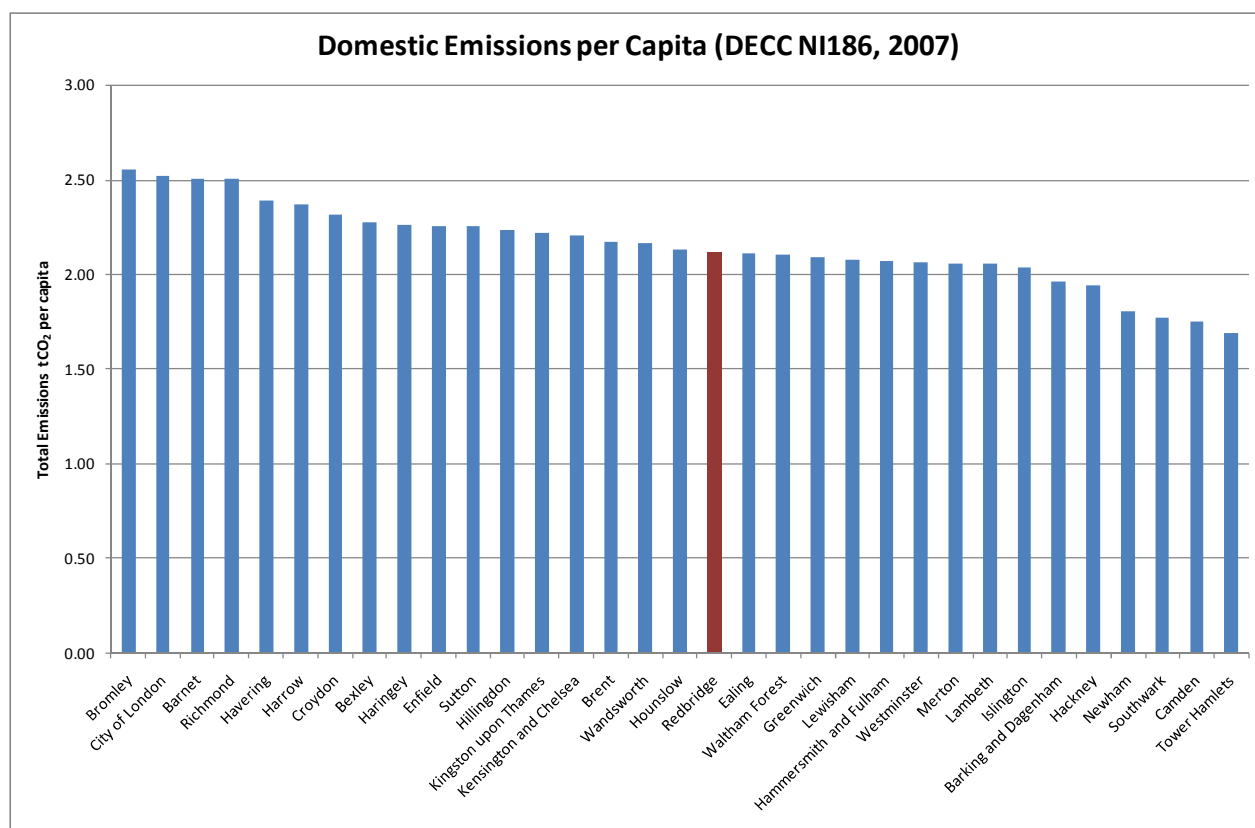


Figure 3-5: Per Capital Domestic Emissions (NI186, DECC, 2007)

Domestic emissions in Redbridge are shown to be mid-range amongst the London Boroughs, and hence it can be deduced that the low level of overall total per capita emissions is a result of low levels of industrial, commercial and agricultural emissions on a per capita basis within the Borough.

3.4 Local Emissions Distribution

Using 2001 Census data, a map of the distribution of emissions within the Borough can be extrapolated from the fossil fuel demand density map for heating and electricity in Redbridge (transport excluded). This is displayed below:

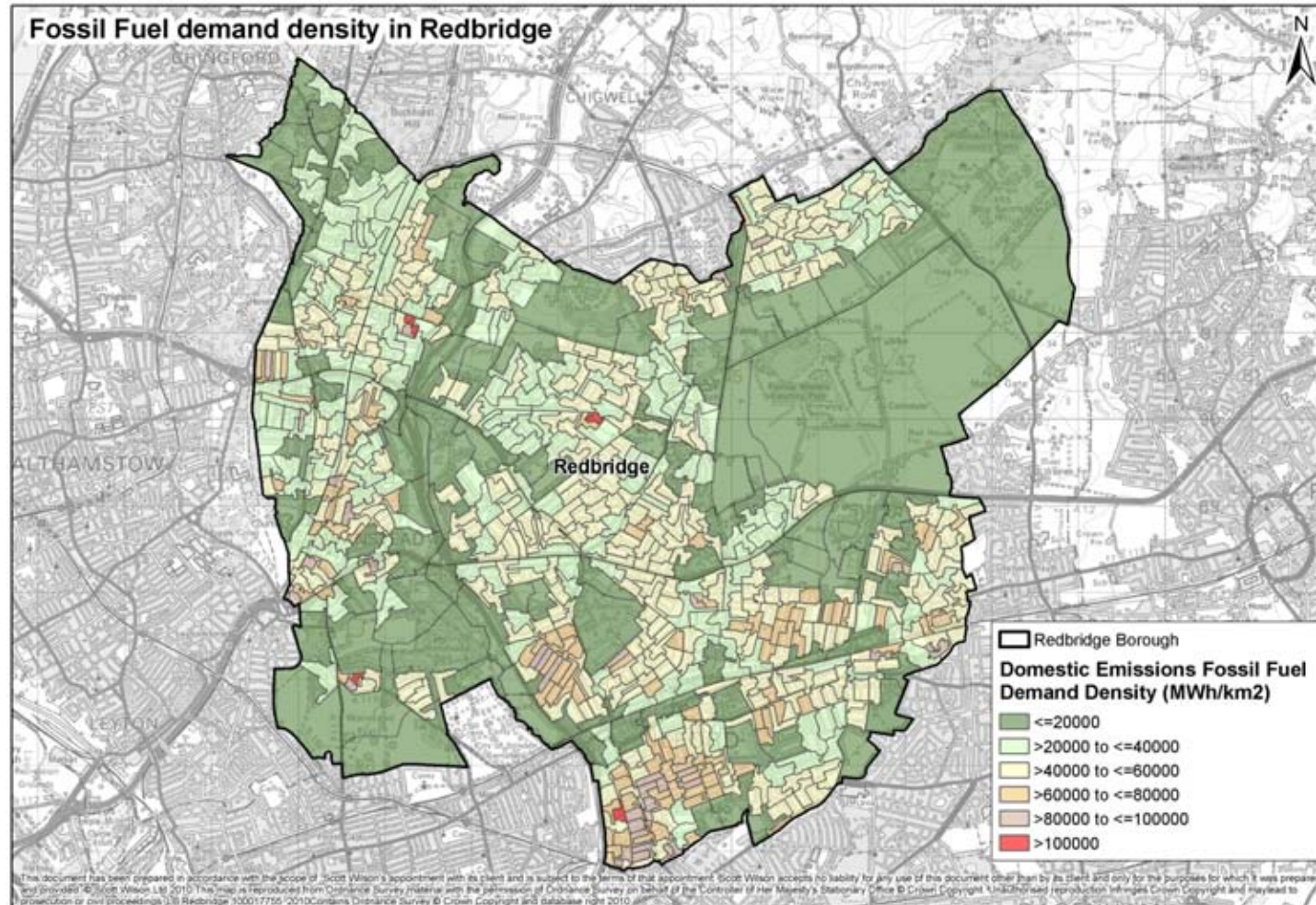


Figure 3-6: Fossil Fuel demand density in Redbridge

Since the figure above is based on Census data (and takes into account growth since 2001 and latest ONS data), which illustrates domestic density rather than individual buildings with heat demands of over 200MW (which is the basis for selection of buildings in the heat mapping study in Chapter 4), a direct correlation cannot be made between the figure above and areas of high heat demand identified in Chapter 4. Although in general the figure above suggests low fossil fuel demand, DH cluster areas can still be identified within a census output area as DH opportunities relate to individual buildings with heat demands of over 200MW. This explains the anomaly between the fossil fuel demand density areas in Redbridge and the areas identified as opportunity areas of district heating in Chapter 4.

Valuation Office Agency (VOA) data has not been used in this study due to legal issues. Commercial development has therefore been extracted from the available DECC data source.

3.5 Emissions Projections

This study has analysed carbon emissions projection modelling for the period until the end of 2017. Using DECC energy consumption information as the starting point for analysis, the level of impact on the different policy options for energy is investigated. It must be noted that in contrast to NI186 emissions figures (which adopt different year on year emissions factors that reflect historic generation fuel mix), the analysis contained within this section adopts Part L2A (2006) emissions factors, and hence the base figures for emissions differ somewhat from the NI186 figures shown above.

3.5.1 Domestic Emissions Scenarios

We have modelled three policy scenarios, equivalent to minimum Government Standards (Option 1 – 2010 Building Regulations), an accelerated timetable of imposition of Government standards (Option 2), and a third option which is more ambitious in its aspirations, imposing zero carbon standards even earlier than under Policy Option 2. The three scenarios are represented by the following timetables of Code for Sustainable Homes Levels:

CFSH Levels	2010/2011	2011/2012	2012/2013	2013/2014	2014/2015	2015/2016	2016/2017
Option 1	3	3	3	4	4	4	6
Option 2	4	4	4	5	5	6	6
Aspirational standards	4	5	5	6	6	6	6

Figure 3-7: Modelled CSH scenarios

3.5.2 Housing Projections

Drawing on information provided by the Council (See Appendix B.2), Scott Wilson has compiled the following projections of housing numbers for the plan period. This summary has been used to assess the impact of the policy options outlined above.

The basis for the projection of housing expansion has been provided by the Council and can be summarised as follows:

Redbridge Borough	2010-2013	2014-2016	2017-2019	2019+
Numbers of net new residential properties	3384	3520	1593	765

Table 3-3: Number of new dwellings projected by period based on the Council's most recent housing trajectory (2009 Annual Monitoring Report), adopted AAP's and the emerging Crossrail Corridor AAP,

A residual floor space of 72m² per dwelling has been assumed based on information provided by the Council.

3.5.3 Domestic Emissions Projections

Given the policy scenarios and housing build projections outlined above, the following domestic emissions scenarios have been modeled.

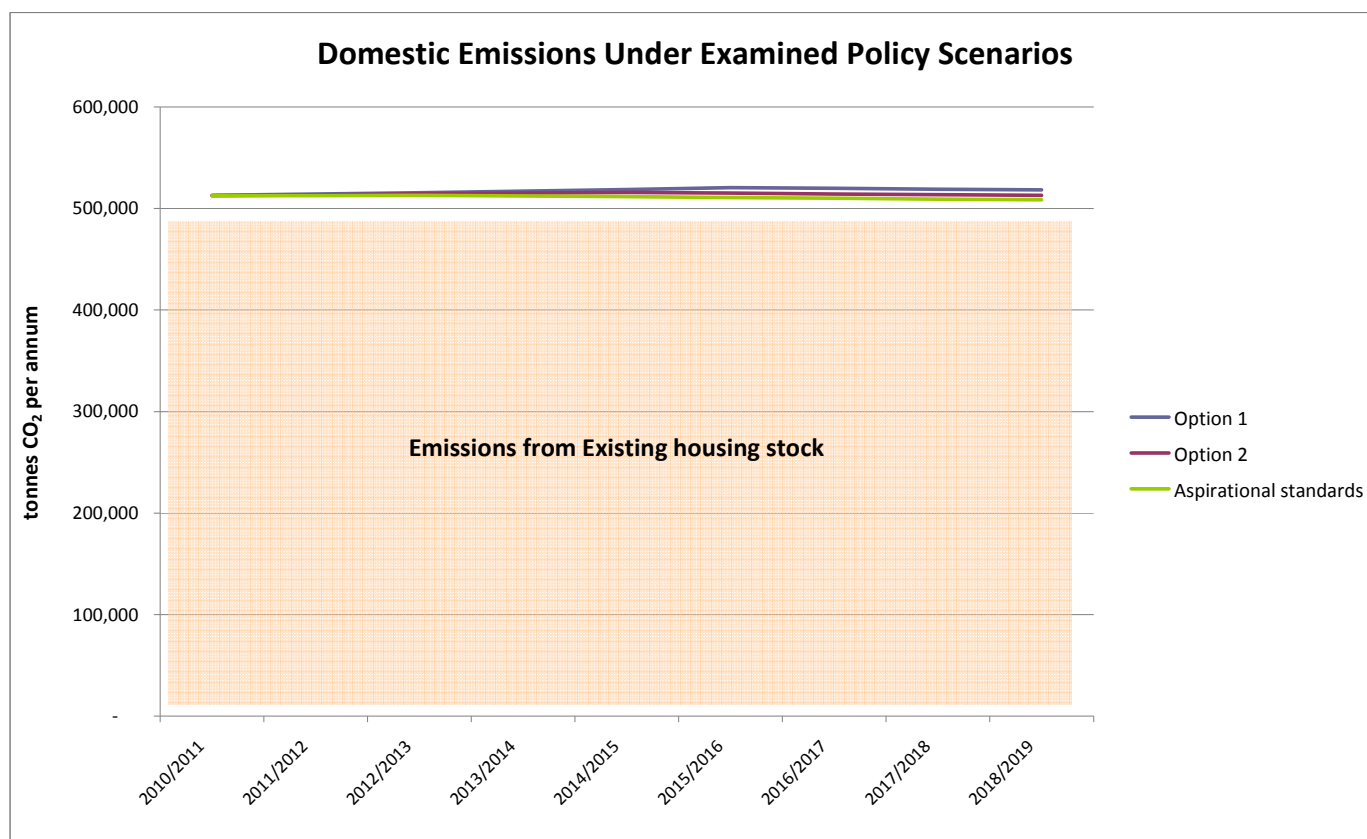


Figure 3-8: Domestic emissions projections under examined policy scenarios

This graph is a key finding of this study. It illustrates the degree to which the acceleration of the imposition of standards will impact overall sector carbon emissions. The area on the graph below 500,000 tonnes CO₂ per annum represents the potential for reduction in emissions from existing domestic buildings. The graph illustrates that any additional policy intervention (bringing forward planned legislation by 2 or 3 years) makes little difference in overall carbon emissions, compared to the potential for reduction in emissions from improvements in the existing stock. This is largely due to the fact that existing housing stock in Redbridge consists of around 99,000 homes, while domestic new build will range from around 800 new homes per year to around 1200 new homes per year between 2010 and 2019. Therefore the potential for carbon reduction through improvements in Building Regulations for new build is restricted in Redbridge. For example, total carbon emissions from existing and new buildings in 2010/2011 (using Option 1) is 513,026 tonnes CO₂ per year. Accelerating the introduction of Code Level 4 from 2013/2014 to 2010/2011 enables us to implement improvements in the 846 new homes planned in 2010/2011, which brings carbon emissions for 2010/2011 down to 512,475 tonnes per year, a reduction of 0.12%. Certain assumptions have been made for reduction in emissions from existing homes, i.e. marginal improved energy efficiency over the planning period. These measures, coupled with the aspirational standards are evident in the dip in emissions around 2016.

It must be noted that these modelling results represent a scenario where all new homes projected to be built are subject to the emissions requirements of the policy scenarios, rather than introducing a policy size threshold level above which more challenging environmental targets would be implemented,⁴⁹ or distinguishing between the strategic sites and non-strategic site new-build elements.

3.5.4 Commercial/ Industrial New Build Rates

Three policy scenarios were modelled for the non-domestic sector as for the domestic sector, equivalent to minimum Government Standards (Option 1- 2010 Building Regulations), an accelerated timetable of imposition of Government standards (Option 2), and a third option which is more ambitious in its aspirations, imposing zero carbon standards even earlier than under Policy Option 2. The three scenarios are represented by the following timetable:

	% reduction in emissions from 2006 Part L scenario	2010/ 2011	2011/ 2012	2012/ 2013	2013/ 2014	2014/ 2015	2015/ 2016	2016/ 2017	2017/ 2018	2018/ 2019	2019/ 2020
Option 1	regulated energy	25%	25%	25%	44%	44%	44%	100%	100%	100%	100%
	non-regulated energy	0%	0%	0%	0%	0%	0%	0%	0%	0%	100%
Option 2	regulated energy	44%	44%	44%	100%	100%	100%	100%	100%	100%	100%
	non-regulated energy	0%	0%	0%	0%	0%	0%	100%	100%	100%	100%

⁴⁹ A minimum number of 10 dwellings often constitutes a large development to which renewable energy policy targets apply.

Aspirational standards	regulated energy	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
	non-regulated energy	0%	0%	0%	100%	100%	100%	100%	100%	100%	100%

Figure 3-9: Non-domestic emissions reductions by policy options

The projections for Commercial / Industrial uses have been provided by the LBR Council. The Council has provided floor area figures for each period of anticipated development (e.g. 2014 – 2016) matching anticipated Building Regulation revisions.

Figures in Table 3-4 have been assumed for future non-domestic uses (Use Classes Order types B1, B2, B8) and retail (A1, A2, A3, A4 and A5).

Redbridge Borough	2010-2013	2014-2016	2017-2019	2019+
m² of net new non-domestic properties	50,640	73,060	53,145	13,000

Table 3-4: Non-domestic floor area projections based on the phasings outlined in the adopted AAP's and the emerging Crossrail Corridor AAP

The baseline energy consumption figures for the existing non-domestic building sector have been derived from the Commercial and Industrial from DECC statistics⁵⁰.

⁵⁰ Publication URN 10D/487A, DECC.

3.5.5 Non-domestic Emissions Projections

Given the policy scenarios and non-domestic build projections outlined above, the following emissions projections have been developed:

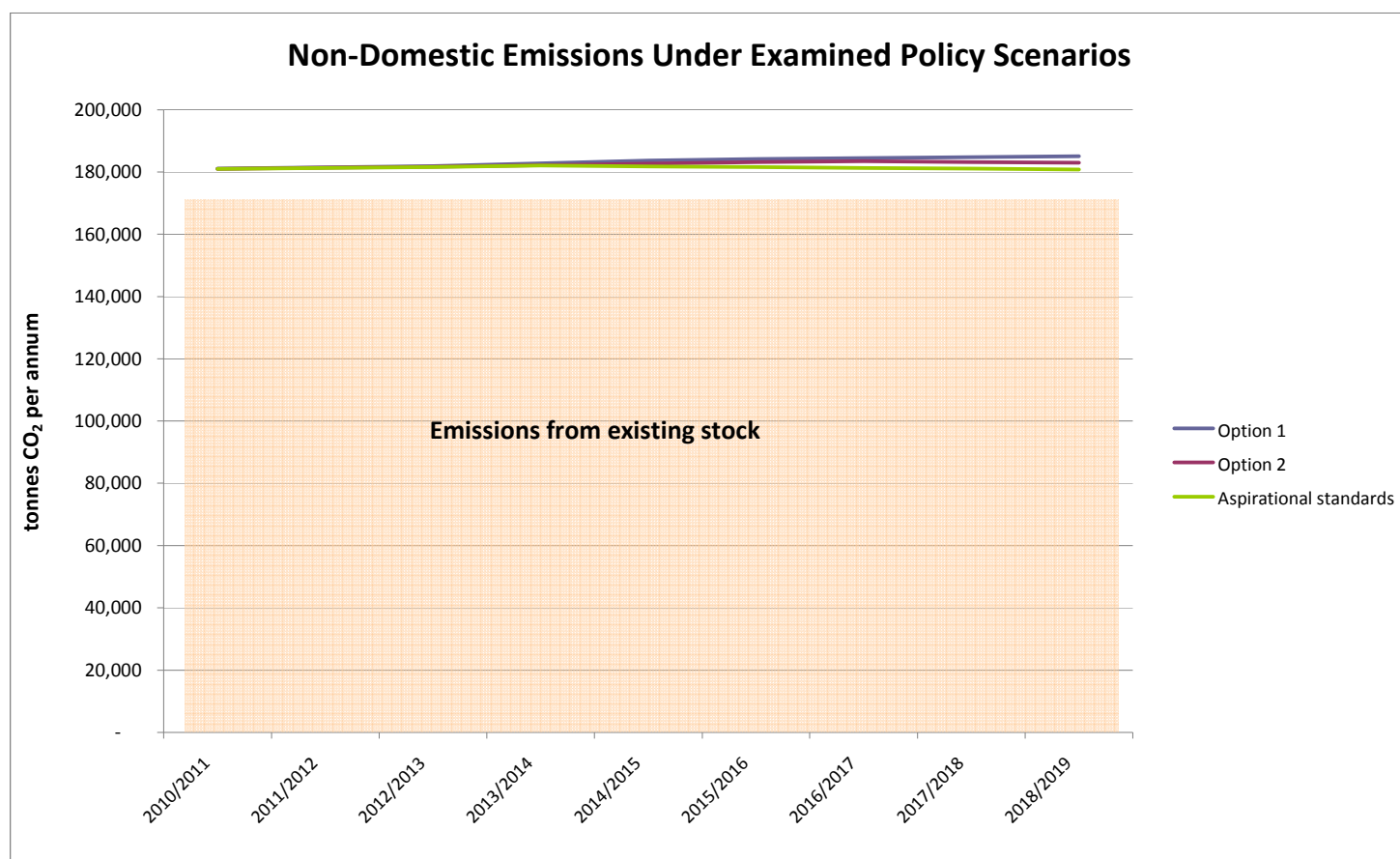


Figure 3-10: Commercial emissions projections under varying policy scenarios⁵¹

The figure above illustrates the degree to which the acceleration of the imposition of standards will impact overall sector carbon emissions. In terms of overall carbon emissions from the Commercial sector, the difference between the three options is not significant. The area on the graph below 180,000 tonnes CO₂ per annum represents the potential for reduction in emissions from existing commercial buildings.

⁵¹ Please note that these emissions have been calculated from energy consumption projections and emissions factors. The emissions factors that have been adopted in calculation are those from the Building Regulation Approved Document Part L2A (2006). These figures differ from those used in the NI186 methodology, which reflect the actual recorded national generation mix. Projection of the generation mix into the future is beyond the scope of this report and hence fixed figures have been adopted.

3.6 Policy Orientation

The figures above for domestic and commercial emissions projections illustrate clearly that there is only a limited level of impact on overall building stock emissions that new-build policy can make. If the overall goal of Redbridge's policy framework is to reduce carbon emissions, then this analysis strongly points towards the need for policy measures that target the emissions of existing buildings as well as new construction. **Appendix A** provides guidance to Redbridge residents on behavioural changes to reduce domestic energy consumption and measures to improve energy efficiency in existing housing.

4 Heat Mapping Study: Input into London Heat Map and Decentralised Energy Implementation

Following the baseline energy demand assessment, input was provided into the London Heat Map, prepared by the London Development Agency (LDA), with the objective of identifying opportunity areas in Redbridge for district heat networks. Energy data from key buildings was collected and fed into a detailed mapping exercise to map areas in the borough of high heat demand.

The London Heat Map provides a web-based GIS resource containing high level data on decentralised energy across London. The London Heat Map is part of the Decentralised Energy Master Planning (DEMaP) programme, developed by the LDA to meet the Mayor's target of 25% of London's energy supply from decentralised energy by 2020.

Within Redbridge Borough, the heat mapping exercise was carried out in four stages:

- Data collection of actual heat demand for buildings (including energy load mapping, which has been presented in Chapter 3) to identify areas of highest heat demand as well as the locations of any existing combined heat and power plants or decentralised energy networks. A number of stakeholders were contacted, both Council and private landlords, to gather data;
- Completion of LDA spreadsheet in order to obtain GIS outputs;
- Workshop to review opportunities for district heating based on existing and proposed development;
- Identification of 'clusters' of buildings which may have the best potential for future DE networks or connections to existing networks.
- Completion of a high level implementation plan to prioritise DE opportunities for Redbridge.

4.1 Data Collection

The first phase of the data gathering involved identification of the priority buildings within the Borough and presentation of these on a GIS map, alongside new developments identified within Redbridge's Local Development Framework. .

The data collection process is illustrated in the flow diagram in Appendix D.2

In order to establish the energy demand from priority buildings, LBR and the LDA requested actual rather than benchmark data be used, where available, to complete the Heat Mapping spreadsheet (Template provided in Appendix D.4), which was forwarded to the LDA for further evaluation through GIS.

The London Heat Map was evaluated to identify high heat demand providers (areas in dark red in the figure below). Around fifty buildings were selected and the establishments are presented below, with an index of the buildings (including addresses) provided in Appendix D.1.

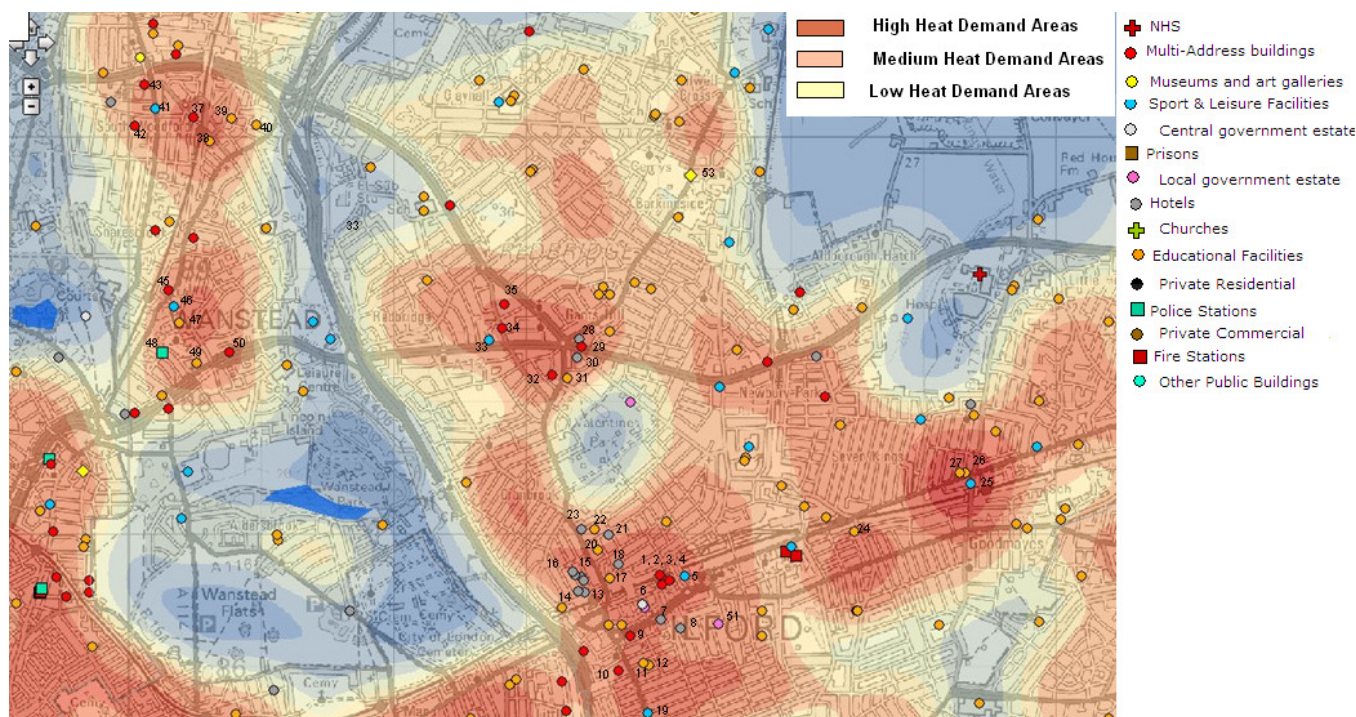


Figure 4-1: London Heat Map showing areas of high heat demand within Redbridge

Potential heat customers in Redbridge that were investigated included properties with a fossil-fuel consumption above 200 MWh p.a, which excludes the vast proportion of small retail units with low district heating connection potential, but includes the majority of significant heat users and large multi-occupancy residential blocks. It is the density of heat demand in a particular area that is the key indicator for district heating viability (setting aside transaction and contractual issues). A combination of premises which came into this threshold and properties selected from the Heat Map illustrated in Figure 4-1 was evaluated in terms of its potential contribution to the growth of a wider heat network.

The information gathering exercise for private buildings involved identifying names and contact numbers for over 40 stakeholders by establishing preliminary contact via telephone to identify a suitable individual to address queries to and obtaining email addresses of relevant individuals. Postal addresses were also confirmed at this stage and relevant individuals were sent a letter requesting information to be provided to Scott Wilson and the Council for the heat mapping study. The responses to the initial telephone conversation were fairly positive with over 60% of the people contacted willing to provide input to the Study. Telephone contact was mainly established with proprietors of hotels, managers of schools (where LBR did not have data), and managers of leisure centres. The Council provided assistance in identifying management

agencies for certain multi-residential buildings, and these were contacted in the second phase of phone calls.

The letter sent to each identified establishment provided a written description of the aims and justification for the data request. A spreadsheet to be filled in and returned was provided with the letter. Stakeholders were given the option of either filling in the spreadsheet or providing Scott Wilson with their annual energy bills to simplify the process and facilitate the extraction of relevant information.

Following the letter, a second round of phone calls was conducted, the results of which were poor. Only two stakeholders responded positively, agreeing to provide information on energy bills. Contact could either not be established with the remaining respondents due to a number of reasons including closure of schools for Easter vacation, or a number of respondents avoiding phone calls despite repeated attempts to contact them. For multi-residential buildings, although contact was established with a few managers, they could not provide details on energy consumption due to individualised billing systems.

Energy demand data for over 80 Council owned properties and over 40 privately owned properties was sought. Those establishments which responded fairly positively in the first round of calls, or with whom telephone contact could not be established, were selected for a site visit, carried out by the LBR Council. Approaching premises and personally requesting information was considered to be more likely to be successful, although details on energy consumption were not obtained despite the visits.

A summary of the stakeholder responses has been provided in Appendix D.3.

Limited actual data was available, other than Council data, which we consider important in terms of lessons learnt for future exercises. It is understood that other boroughs participating in the DEMaP process have experienced similar difficulties with regard to private data collection.

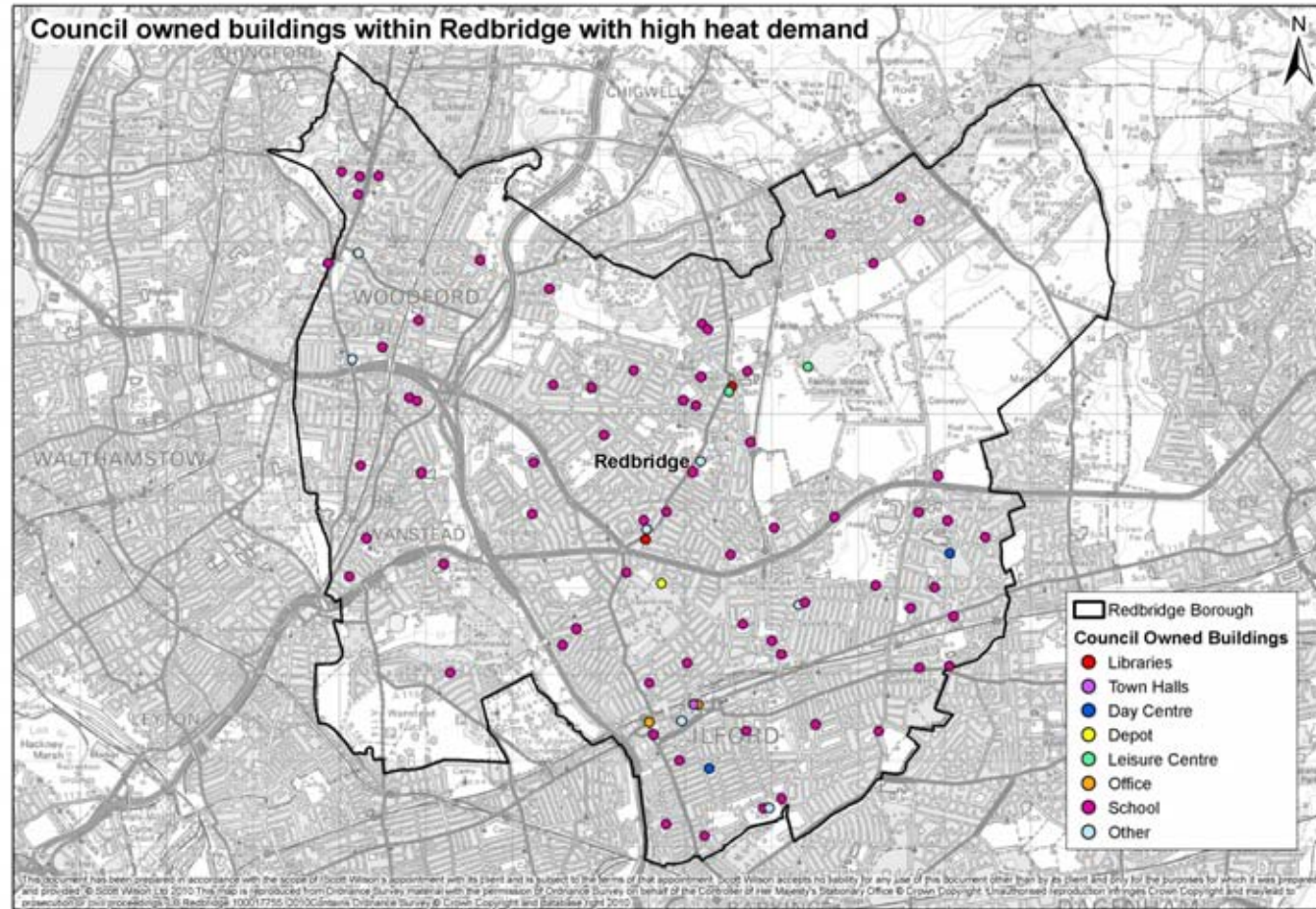


Figure 4-2: Council owned buildings within Redbridge with high heat demand

Successful energy data gathering was carried out on over 80 Council owned properties including schools, leisure centres, office buildings, youth centres and the Town Hall, which have been highlighted in the figure above.

Please refer to Appendix C for a list of the Council owned properties illustrated in these figures including heat demands and contact details for the properties.

The figure below illustrates both the private buildings and the Council owned properties selected for the heat mapping study. Details including addresses and estimated and actual heat demand for the buildings are provided in Appendix C, D. 1 and D.3.



4.2 Completion of LDA Spreadsheet in order to obtain GIS outputs

In order to complete the LDA data spreadsheet as accurately as possible, data obtained from the stakeholder consultation for the private buildings was entered into the spreadsheet. Buildings were viewed on Streetview to ascertain actual size of the property and narrow down the selection process for obtaining actual data, thus excluding those buildings too small to have a significant heat demand. Floor areas for private buildings were obtained via GIS and post code data.

Actual energy information for Council owned properties (over 80 properties were identified) with heat demands of over 200MWh was collated and their OS grid points referenced. Refer to results in Appendix C where heat demands from Council buildings have been summarised in the London Heat mapping template (provided in Appendix D.4).

Both sets of data for private and public buildings were mapped using GIS by the LDA, in order to identify potential heat network 'clusters' (as derived from Figures 4.5 and 4.5, giving preference to both existing and proposed developments with a high heat demand) within a practicable range of the buildings in question. Thresholds for facilitating this evaluation was mapped by the Scott Wilson GIS Team in order to identify relationships between existing developments with a demand over 200MWh illustrated in Figure 4-4 and proposed developments with high heat demand as illustrated in Figure 4-5.

Figures 4.4 & 4.5, illustrate existing buildings with a suitable heat demand and proposed buildings with a high heat demand (over 200MWh). These sites were derived from the heat demand analysis as summarised in Appendix C & D. The GIS images were presented at the heat demand workshops (as outlined in Section 4.3) with LBR and the LDA in attendance, and used to discuss potential relationships with proposed development. The objective was to identify key areas where heat demand was at its highest but was in closest proximity to newly proposed development where surplus heat could be used by customers. Figure 4.5 identifies key anchor loads such as hospitals, schools and leisure centres as these proposed developments provide the greatest opportunity for an energy profile, suitable for decentralised energy such as Combined Heat and Power. Cluster areas were then identified in conjunction with the LDA and LBR as illustrated in Figure 4.6. Clusters have been sized according to 100, 500 and 1000MWh clusters

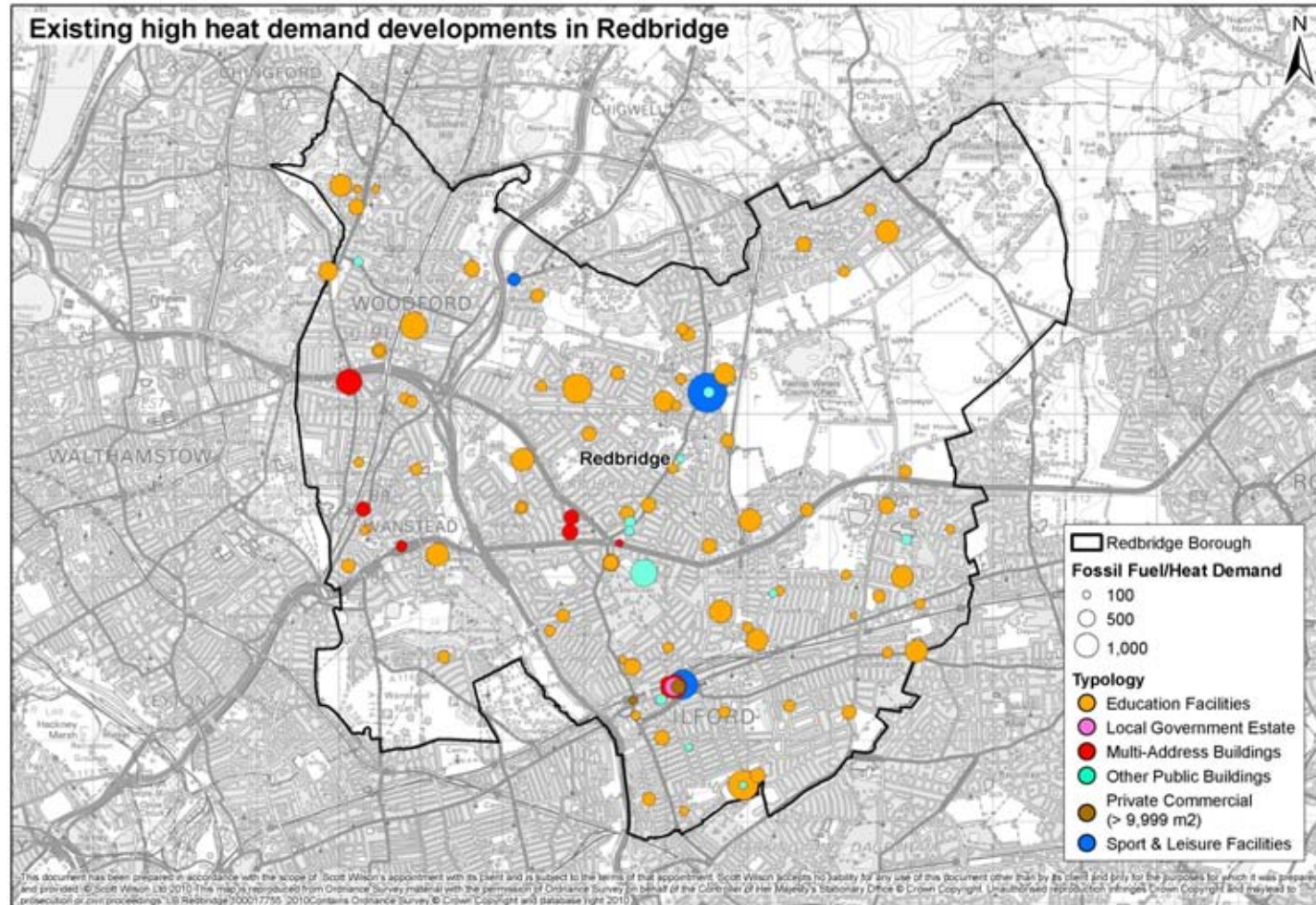


Figure 4-4: Existing Buildings within Redbridge with High Heat Demand

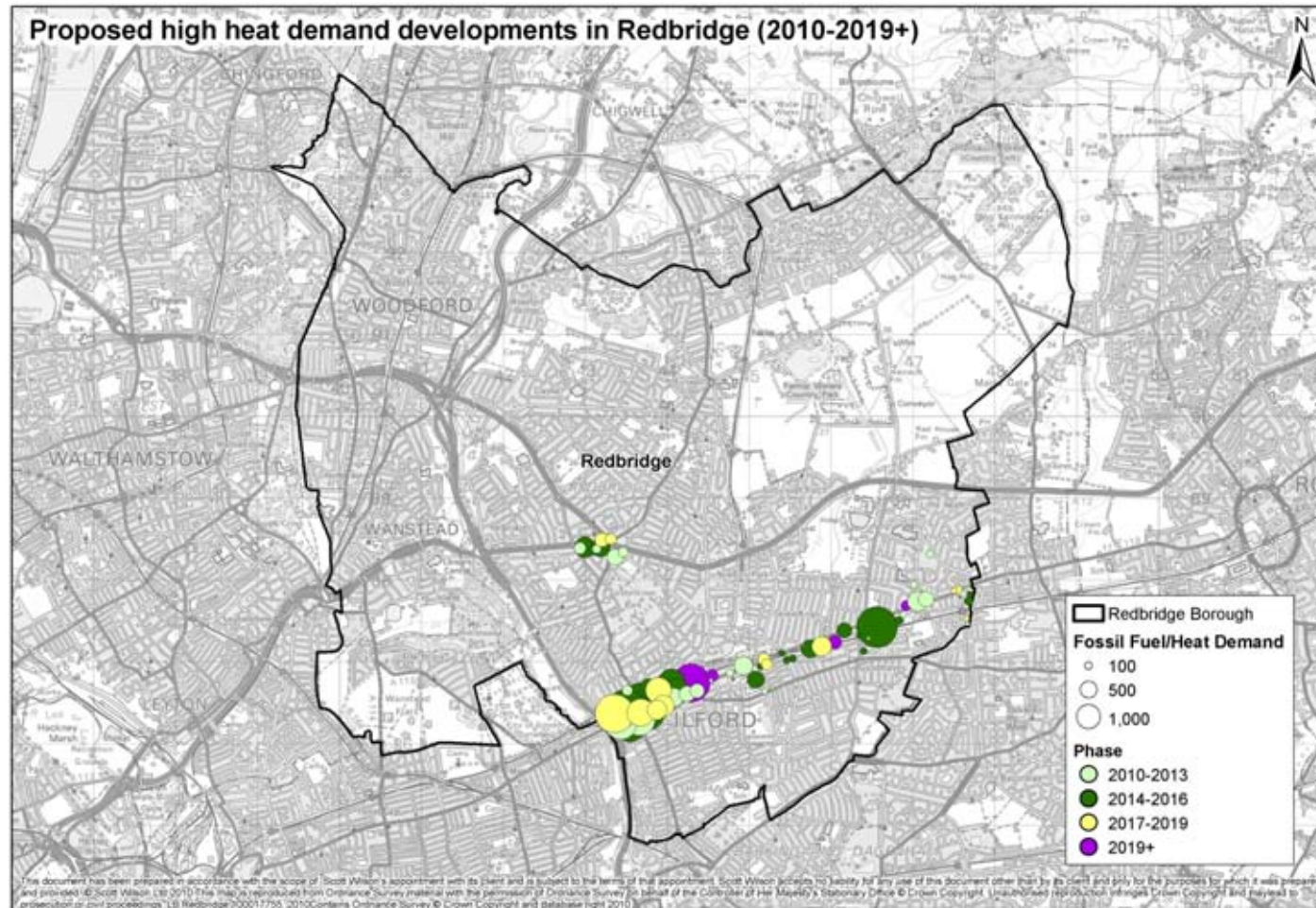


Figure 4-5: Proposed Buildings within Redbridge with High Heat Demand

4.3 Workshop to review opportunities for district heating based on existing and proposed development

In order to objectively determine the most suitable location for the deployment of a heat network or number of heat networks in the London Borough of Redbridge the study team held two workshops to confirm potential locations which could potentially be further evaluated through future phases of the DEMaP programme.

The study team held an initial workshop with the Council and the LDA on the 27th April, 2010 to discuss potential synergies including consideration of building type, proximity to each other, tenure (public or private), suitable distance and thus identify borough specific locations for the deployment of a heat network. This workshop enabled the study team to determine a shortlist of five locations within the Borough which would be evaluated in further detail in conjunction with local stakeholders.

4.4 Identification of 'clusters' within Redbridge

As a result of the workshops, five cluster sites were identified to be the most suitable for a district heat network in Redbridge as outlined in Figure 4-6 below include:

- Fullwell Cross
- King George Hospital
- Ilford Town Centre & Crossrail Corridor
- Gants Hill
- Loxford School area

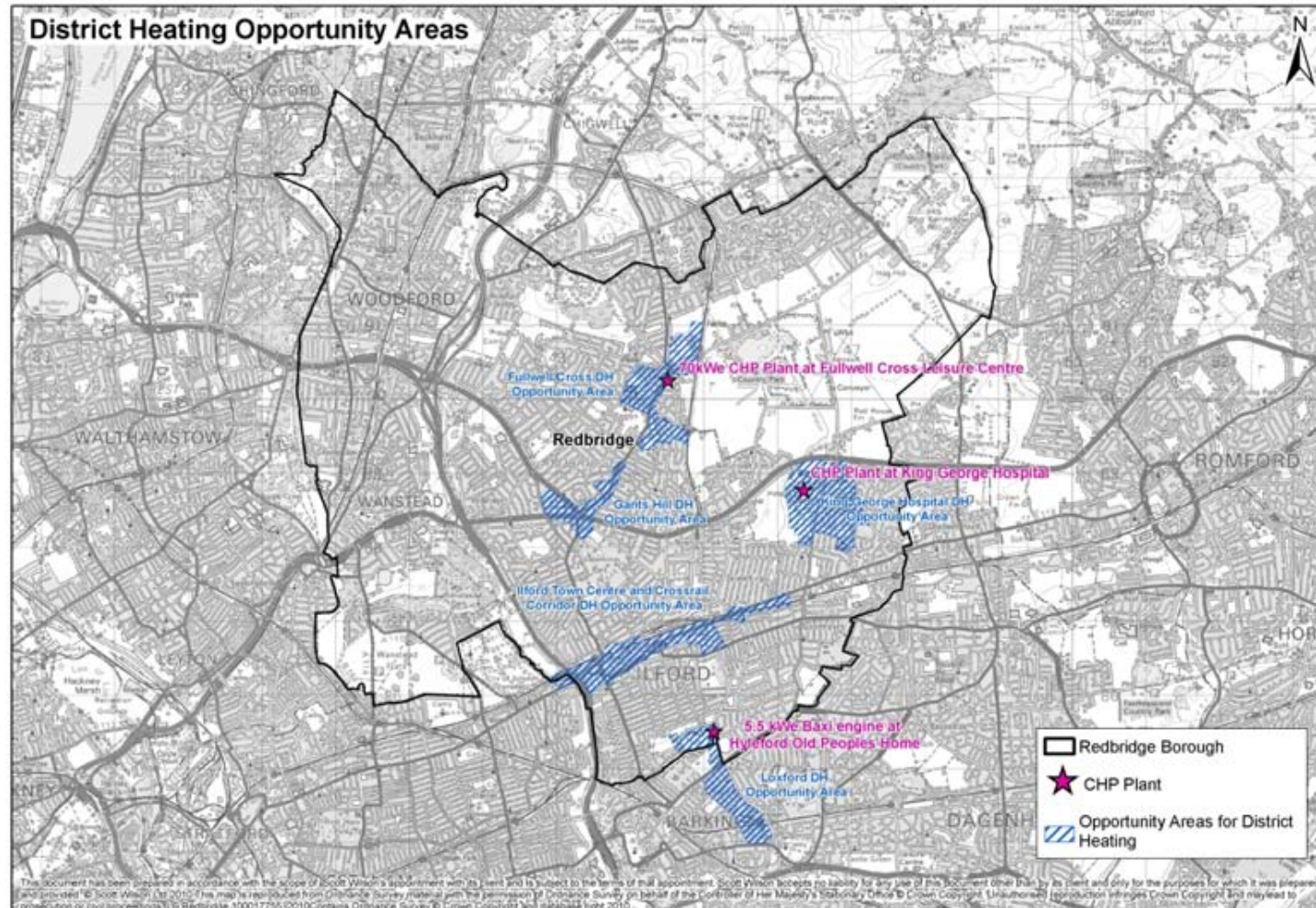


Figure 4-6: District Heating Opportunities in Redbridge

Existing CHP plants in Redbridge have been highlighted in the figure above. These potential sites are evaluated in further detail in the implementation plan table. The table highlights their level of priority, key barriers, next steps, key dates and individuals responsible for championing the liaison required to develop these opportunity areas at the Feasibility Stage. A list of sites is also provided in the implementation plan table below.

It is also noted that the proponents of the Five Oaks Lane development in the north-east of the borough are also considering a site wide heating network.

4.5 Stakeholder Workshop – Implementation Plan

Once the five cluster areas had been identified the study team held a stakeholder workshop on 25th May, 2010. The objective was to present the findings of the study, review each of the five cluster areas identified above and determine suitable synergies from existing buildings to proposed development in each location. A range of stakeholders were invited. Please refer to Appendix D.5 for the list of stakeholders.

Stakeholders were asked to provide local knowledge and input to existing and proposed development within the cluster areas identified having been presented the findings of the study. As a result of this feedback the study team have developed the following implementation plan to facilitate the development of further feasibility of these locations in phase 2 of the LDA's DEMaP programme.

Site One – Fullwell Cross

PRIORITY	DH Opportunity Site	Priority & Basis of Site Selection	Potential Anchor Nodes & Individual Responsibility	Key Barriers	Opportunities & Next Steps
	(Identified by location, name of opportunity area)	(Basis of assessment of delivery potential - High Medium or Low priority)	(Key Opportunity Buildings & Individual contacts within the Council responsible for liaison)	(Potential barriers for delivery of opportunity identified)	(Next steps for LA to facilitate delivery of opportunity identified)
High	Fullwell Cross	Medium Priority Potential for expansion of existing CHP serving Fullwell Leisure and library plus major development proposed for school (relocation of Ilford Jewish Primary School) and housing south of Fullwell Cross – establishment of a new (larger) primary school at Ilford Jewish Primary School site if relocation successful.	Fullwell Cross Leisure (Kevin O'Brien, LBR) Fullwell Library (Kevin O'Brien, LBR) Tesco, Barkingside (Brian Hoy, LBR) Thomswood Medical Centre (Sean O'Sullivan, PCT) Craven Bank Gardens (Bob Watling, RH) Bernardos – (John Pearce, LBR) Redbridge Sports Centre (Kevin O'Brien, LBR) Fairlop Clinic (Sean O'Sullivan, PCT) Barkingside School (John O'Keefe, LBR) Ilford Jewish Primary School (John O'Keefe, LBR) King Solomon High School (John O'Keefe, LBR)	- Good mix of existing and proposed development although distances likely to be problematic for DH pipe work, particularly superstore and housing south of Fullwell Cross - Neighboring school (which may be a suitable anchor load) to Fullwell Leisure is in green built land and so many not be able to be expanded due to local contention - Underfloor heating in library not working efficiently and asbestos in floor which would complicate retrofit and subsequent use of heat within these buildings. - Old landfill site below golf course unlikely to provide methane to feed into DH network as covered for 30 years plus.	Opportunities - Existing 70 kWe CHP exists in the sports centre which provides heat to adjacent Fullwell library. - Potential space in the basement of the leisure centre for extending existing CHP - Good mix and scale of both existing and proposed development suitable for further evaluating synergies for DH networks. Next Steps - Evaluate status of each building node including status of building services. - Liaise with developers to discuss potential for site to connect to district heating scheme.

*High (Green), Medium (Amber) or Low (Red) based on potential for delivery

Site Two – King George Hospital

PRIORITY	DH Opportunity Site	Priority & Basis of Site Selection	Building Potential Anchor Nodes & Individual Responsibility	Key Barriers	Opportunities & Next Steps
	(Identified by location, name of opportunity area)	(Basis of assessment of delivery potential - High Medium or Low priority)	(Key Opportunity Buildings & Individual contacts within the Council responsible for liaison)	(Potential barriers for delivery of opportunity identified)	(Next steps for LA to facilitate delivery of opportunity identified)
	King George Hospital Site	High Priority Publicly owned hospital as anchor load, private development planned adjacent to the hospital on existing mental health hospital site and college. The hospital gas consumption is 35,000MWh and the total annual utility costs are approximately £2million	King George Hospital (Jandi Pearman, BHR) Goodmayes Mental Health Hospital (Sean O'Sullivan, PCT) Redbridge College (David Hughes, LBR) North East London Foundation Trust (Sean O'Sullivan, PCT)	- Existing CHP at King George is currently not working effectively. Study being undertaken to determine why and potential future opportunities. - Potential local competition for heat if the proposed refurbishment works are currently being run off Ground Source Heat Pumps as is thought to be the case.	Opportunities - Existing CHP in King George Hospital may be in need of refurbishment and upgrade. Study to determine what needs to be done currently being undertaken. - Surplus heat is now available as the laundry is now cleaned off site - Goodmayes Hospital – understood to be already considering Ground Source Heating - Goodmayes Hospital to be relocated to Chapter House and then potential refurbishment into residential. - Redbridge College also proposed for redevelopment (either on current site with an element of relocation or potential relocations to the Crossrail Corridor). - Less stakeholders minimising complexity of negotiations. - Considerable heat loads in the order of 200MW within close proximity to developments which will require additional heat Next Steps - Obtain information regarding the existing CHP currently under evaluation - Evaluate status of each building node including status of building services - Applications for development adjacent to King George's hospital to be determined in terms of programme. - Further information to be ascertained on refurbishments of Goodmayes Hospital and Redbridge College - Liaise with PCT to discuss potential for hospital to be developed as an anchor load for the development of district heating scheme - Other stakeholders to be engaged including Mental Health Trust, Hospital Trust and NHS Poly Clinic

*High (Green), Medium (Amber) or Low (Red) based on potential for delivery

Site Three- Ilford Town Centre and Crossrail Corridor

PRIORITY	DH Opportunity Site	Priority & Basis of Site Selection	Potential Anchor Nodes & Individual Responsibility	Key Barriers	Opportunities & Next Steps
	(Identified by location, name of opportunity area)	(Basis of assessment of delivery potential - High Medium or Low priority)	(Key Opportunity Buildings & Individual contacts within the Council responsible for liaison)	(Potential barriers for delivery of opportunity identified)	(Next steps for LA to facilitate delivery of opportunity identified)
High	Ilford Town Centre & Crossrail Corridor	High Priority Private development and public development planned for completion in coming years and within planned period which may be suitable as anchor loads	Crossrail Tunneling Academy (Mike De Silva, Crossrail)* British Telecom Office Building (Judith Carlson, LBR) Crossrail Station & mixed use (Mike De Silva, Crossrail)* Post Office (Judith Carlson, LBR) Town Hall (David Hughes, LBR) Esporta (Kevin O'Brien, LBR) Lynton House (Brian Hoy, LBR) Police Station (Judith Carlson, LBR) Cricklefields Academy (John O'Keefe, LBR) PCT Polyclinic (Sean O'Sullivan, LBR PCT) Harrison Gibsons (David Hughes, LBR)	- Majority of developments which would provide key anchor loads (high heat demand) are proposed post 2013 - Station services and infrastructure may prevent installation of DH network potentially making it cost prohibitive. - Cost of supplying heat may be prohibitive due to complexity of infrastructure provision - Location of energy centre and CHP engines to be determined – town centre location is potentially constrained for space	Opportunities - Staged implementation of development with suitable mix and scale of developments may be suitable to match CHP profiles - CHP is already identified in the Ilford AAP and so will be strongly encouraged throughout development of Ilford Town Centre. - AAP could limit the use of other heat producing technologies such as GSHP which could compete with heat required to make community heating viable. - Suitable locations could be identified for energy centers along side rail corridor which would be less visually intrusive and objectionable. Next Steps - Ensure other heat producing technologies are limited in local AAP - Phasing and timing of relevant local development to be determined. - Definition over the phasing of development and linkage with existing developments throughout the Corridor to be identified both spatially and in terms of development programme to ascertain potential phasing and suitable locations for energy centers

* Sustainability Manager Crossrail – key contact and involvement to be confirmed

*High (Green), Medium (Amber) or Low (Red) based on potential for delivery

Site Four- Gants Hill

PRIORITY	DH Opportunity Site	Priority & Basis of Site Selection	Potential Anchor Nodes & Individual Responsibility	Key Barriers	Opportunities & Next Steps
	(Identified by location, name of opportunity area)	(Basis of assessment of delivery potential - High Medium or Low priority)	(Key Opportunity Buildings & Individual contacts responsible for liaison)	(Potential barriers for delivery of opportunity identified)	(Next steps for LA to facilitate delivery of opportunity identified)
	Gants Hill	Low Priority Publically owned community and education facilities as anchor loads	Redbridge Institute of Adult Education (John O'Keefe, LBR) Beehive Lane Residential (Bob Watling, RH) Cranbrook Road Residential (Bob Watling, RH) Gearies Junior School (John O'Keefe, LBR) Wentworth House (Bob Watling, RH) Kenwood Gardens (Brian Hoy, LBR) AAP opportunity sites (Eastern Avenue) (David Hughes, LBR)	- Gants Hill station was used as a munitions factory during the Second World War and its structure was re-inforced. It may therefore be prohibitive and costly to include DH infrastructure such as pipe work under the ground - Ground conditions already identified to be an issue for TFL on the roundabout - Distance between key nodes such as community facilities and Redbridge Institute of Adult Education likely too great to ensure viability of DH infrastructure	Opportunities - Redbridge owned properties may facilitate the negotiations of DH potential subject to its viability. 400 homes currently have obtained consent with further 400 in the process – significant heat load for potential for deployment of heat network Next Steps - Identify status of existing building services and ascertain if refurbishment is likely. - Date of community facilities applications to be determined.

*High (Green), Medium (Amber) or Low (Red) based on potential for delivery

Site Five- Loxford School area

PRIORITY	DH Opportunity Site	Priority & Basis of Site Selection	Potential Anchor Nodes & Individual Responsibility	Key Barriers	Opportunities & Next Steps
	(Identified by location, name of opportunity area)	(Basis of assessment of delivery potential - High Medium or Low priority)	(Key Opportunity Buildings & Individual contacts responsible for liaison)	(Potential barriers for delivery of opportunity identified)	(Next steps for LA to facilitate delivery of opportunity identified)
	Loxford School area	Low Priority Publically owned schools or hospital as potential anchor loads	Loxford School (John O'Keefe, LBR) Care Village PCT (Brian Hoy, LBR) South Park Clinic (Kevin O'Brien, LBR) Upney Hospital (Barking & Dagenham) Lower Barking Abbey School (Barking & Dagenham)	▪ Cross boarder initiative required ▪ Existing buildings only – currently limited proposals for new development ▪ Distance of hospital from schools for installation is likely to be too great for installation of heat mains (up to 2.5 miles)	Opportunities ▪ Loxford School currently has an existing energy centre which may provide initial anchor load and infrastructure for deployment of heat network Next Steps ▪ Evaluate status of each building node including status of services, including size type and space availability of energy centre at Loxford School ▪ Liaise with schools and Barking & Dagenham PCT to discuss potential for Upney Hospital to link into the development of district heating scheme, subject to viability

*High (Green), Medium (Amber) or Low (Red) based on potential for delivery

4.5.1 Summary of Preferential Sites

From the tables presented above it is evident that some sites are more preferable to the deployment of a district heat network and therefore warrant further evaluation at the Phase 2 Feasibility Stage of the DEMaP programme.

Of highest priority are the King George Hospital and the Ilford Town Centre & Crossrail Corridor sites.

King George Hospital Site

King George Hospital currently holds the greatest potential for the deployment of a district heat network as an existing CHP boiler generates steam for the hospital, located in the centre of the site in the Steam Boiler House. It incorporates a waste heat steam boiler utilising the high grade energy from the CHP exhaust gases. Where additional demand is required 2 steam boilers take the additional load.

The total full load rating of the electrical generator plant is 1,070kW and the total electrical energy output of the CHP system – 1,806,564KWh. Electricity generated is 11,000MWh, heat generated is 35,000MWh and the total cost of the system annually is approximately £2M⁵²

The Steam Boilers and CHP waste heat boiler have been designed to meet the loads of the on site laundry and Sterile Services (or Decontamination Units). However, the laundry has now been shut down at the hospital. And this is now contracted off site leaving surplus heat to be used elsewhere. This highlights potentially the greatest synergy for further evaluation at the feasibility stage as there are sites in close proximity which could potentially utilise this surplus heat. The implementation plan table identifies Goodmayes Mental Health Hospital and the Redbridge College which have been highlighted for likely relocation and redevelopment in the near future. All of these sites are in close proximity to King George Hospital.

Ilford Town Centre & Crossrail Corridor

With the regeneration of Crossrail Corridor and Ilford Town Centre in its early stages this cluster area is of high importance for further evaluation for the potential for a heat network. Numerous public buildings and private buildings, both existing and proposed, as outlined in the implementation tables above will need to be investigated to ascertain within this site where there is potential synergies in terms of energy load profiles and also to ascertain suitable locations for an energy centre or number of energy centres.

To support its deployment CHP is already identified in the AAP and so will be strongly encouraged throughout development of Ilford Town Centre. The AAP could limit the use of other heat producing technologies such as GSHP which could compete for heat required to make community heating viable thus ensuring the greatest potential for CHP and a community heating network. Suitable locations would need to be identified for energy centres, potentially along side the rail corridor which would be less visually intrusive.

It should be noted that some fairly significant barriers exist which would need to be overcome. As stated in the table above this includes existing services and infrastructure which may prevent the installation of a district heat network, potentially making it cost prohibitive.

⁵² Source of information: Jandi Pearman, BHR Hospitals, Outcome of Workshop organised by SW and LBR, May 2010

Fullwell Cross

The Fullwell Cross cluster has fairly good potential for warranting further evaluation for district heating. The site has an existing 70 kWe CHP which exists in the sports centre and provides heat to adjacent Fullwell library. Additionally there is potential space in the basement of the leisure centre for extending the existing CHP. However, the neighbouring area is green belt and so development which could utilise surplus heat and warrant the refurbishment of the CHP is currently uncertain. Other suitable anchor loads and potential users of heat are considered to be too greater distance away, for example the Sainsbury's superstore (of which no immediate refurbishment is expected or confirmed at present) is approximately 2.5 miles away and thus it is likely to be cost prohibitive to run the heat network infrastructure to the south of the site, even when suitable heat users or producers have been identified.

Gants Hill & Loxford School Area

Both Gants Hill and Loxford School area have been considered low priority sites as the barriers for the deployment of district heating is currently considered too great. Gants Hill has limited opportunities in terms of anchor loads in close proximity and the Gants Hill underground station was used as a munitions factory during the Second World War, during which time the roof was reinforced against aerial bombing. Therefore it is likely to be prohibitive and costly to include infrastructure such as pipe work under the ground. Ground conditions have already been identified to be an issue by Transport for London during the recent enhancement works at Gants Hill.

Loxford School area was originally identified as it presented perhaps the greatest opportunity for a cross boarder initiative with London Borough of Barking and Dagenham. However, although Loxford School currently has an existing energy centre which could have provided the initial anchor load and infrastructure for the deployment of heat network, there is insufficient new development in close proximity to warrant further evaluation at this stage.

4.5.2 Data Collection, Lessons Learnt & Scope

We would suggest that future data collection for the initial collation of heat demand (in order to feed into the LDA spreadsheet) prioritises site visits and personal contact instead of communication via email, phone and post. Despite repeated attempts to obtain details on annual energy and heat demand from owners of private buildings in Redbridge, responses were limited. Without any direct incentive (although each potential heat customer was advised of the potential future benefits) to provide information for the Study, stakeholders contacted were not willing to participate in the Study. Obtaining data for multi residential buildings, which were identified as high heat demand properties, was complicated by individualised billing for flats. Contact with energy companies in the Borough to obtain data could be explored in the future, as a more efficient alternative to direct stakeholder contact.

It should be noted that the total heat demand has not been identified for the five sites as only the three strategic sites of Ilford Town Centre, Crossrail Corridor and Gants Hill have been evaluated in depth. It is expected that the heat demands and energy profile analysis for the specific buildings identified would be evaluated further in the Stage 2 Feasibility Study.