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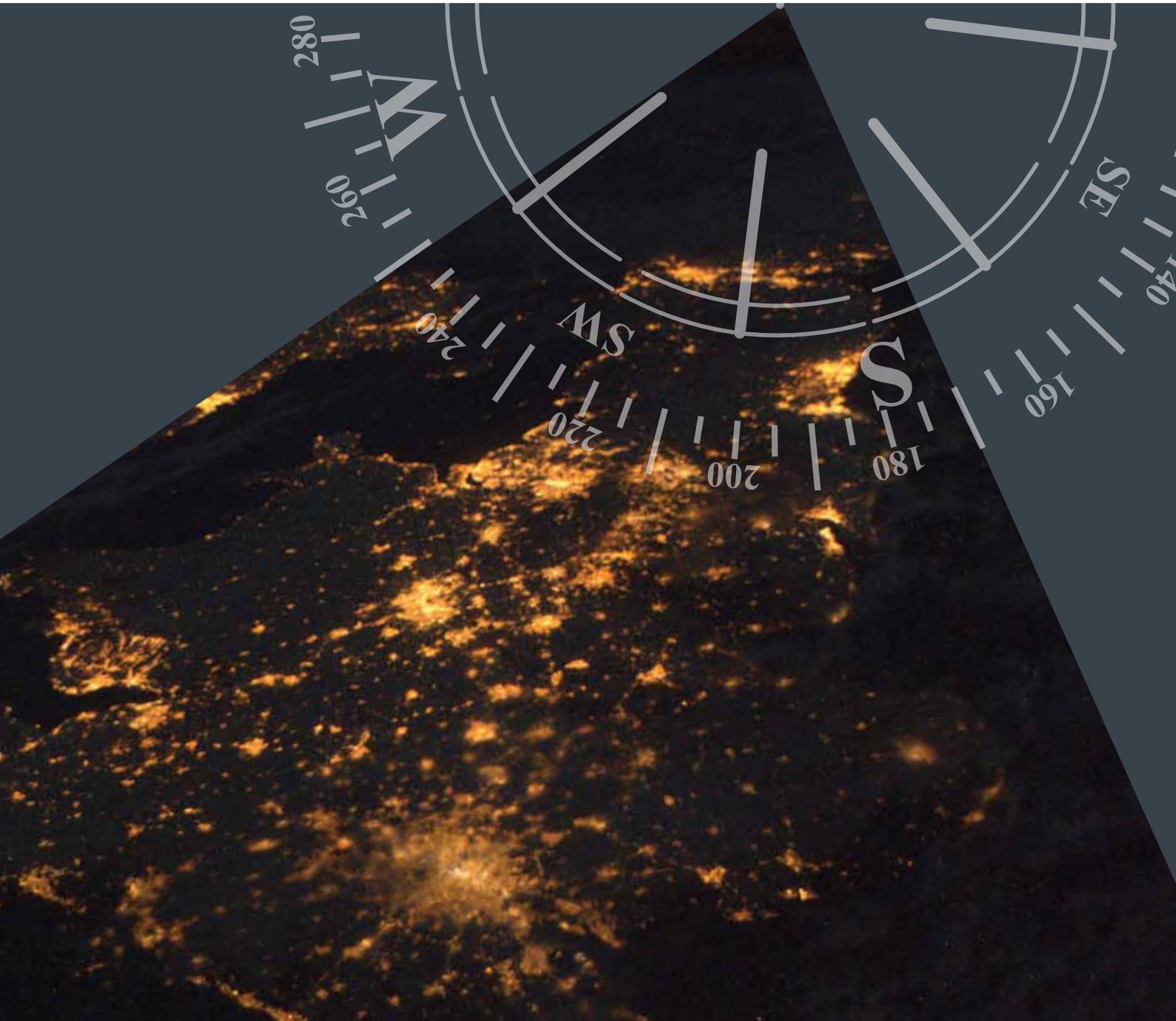
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RICS RESEARCH

Hotting Up? An Analysis of Low Carbon Plans and Strategies for UK Cities

Volume 1: Main Findings



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Hotting Up? An Analysis
of Low Carbon Plans
and Strategies for UK Cities
Volume 1: Main Findings



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A report for Royal Institution of Chartered Surveyors

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Abbreviations

CERT	Carbon emissions Reduction Target
CESP	Community Energy Savings Programme
DECC	Department of Energy and Climate Change
ECO	Energy Company Obligation (Green Deal)
ESCo	Energy Supply Company
FIT	Feed In Tariff
GHG	Greenhouse Gas
RHI	Renewable Heat Incentive

Why the research was conducted

Cities are responsible globally for about 75% of energy consumption and 80% of greenhouse gas emissions, and by 2050, some 84% of people will live in cities. In the context of moving to a low carbon future, and in terms of tackling climate change, cities present us with huge environmental challenges, yet also offer huge opportunities, because they not only act as centres of innovations, and can offer economies of scale in technology deployment and access to capital, but also play a major role through their direct jurisdictional responsibility through production or reduction in greenhouse gas emissions (for example through transport, energy generation, land use planning and waste collection/disposal). Moreover, because of their concentrations of populations, they offer concentrated solutions to mass transit and energy efficiency, and they also have a direct impact in terms of climate change action due to their catalytic effect on stakeholders in the private sector and in civil society. These are all vital city attributes if we are to make the existing built environment sustainable and resource efficient by 2050.

The battle to create a sustainable low carbon future will be won or lost in our cities, and the UK is no exception. The top 20 cities in the UK by population size, for example, are responsible for more than 20% of carbon emissions and more than 20% of energy consumption, so local action by cities will be vital if we are to meet the UK national target of 80% reduction on 1990 levels by 2050. Some 80% of carbon emissions are in fact created locally, and so local authorities based in cities can act as very important agents in creating a step change in the way we occupy and use our built environment.

Reduced public spending and a changed political landscape in the UK, with a strong localism agenda in England, presents a fresh set of challenges for city-based local authorities. This research was therefore carried out in 2011 to analyse how UK cities were engaging with the low carbon agenda with a particular emphasis on mitigation measures. The research:

- Examines the background and legislative context for low carbon cities in the UK.
- Draws comparisons between UK approaches and international approaches (for example, the EU and Canada) where appropriate.
- Critically reviews and compares low carbon plans (including climate action plans) in UK cities in terms of their timeframes, targets, and pathways to the future.
- Identify the drivers and barriers to implementing such plans.
- Highlights best practice and best ideas in low carbon cities.

The research findings are relevant to RICS members in terms of providing an up to date and detailed analysis of which UK cities are 'leading' and which cities are doing less well in the 'low carbon stakes'. The other relevant audience groups include local authorities and planning authorities; developers/investors; national government and NGOs; community groups; property occupiers and owners; business sector and general public.

How the research was carried out

The research comprised the following stages:

- Detailed analysis of DECC carbon emissions (NI186) data and energy consumption for the UK's Top 20 cities by population size. This is based around an analysis of 2005-2009 data.
- Further analysis of the potential relationship between carbon emissions (NI186 data), energy consumption and other factors, such as waste per capita, population, density, geographic area and GDP per capita of the Top 50 cities. This is based around an analysis of 2008 data.
- An online survey of the Top 60 UK cities by population size (where respondents were senior climate change or sustainability officers) which examined such questions as:
 - To what extent are agreed low carbon/climate action plans and strategies in place?
 - What are the key drivers and barriers to successful action?
 - What are the key issues in developing such plans/strategies?
 - What carbon emissions targets are in place for which sectors?
 - What are the attitudes towards new initiatives such as the Green Deal, the Localism Bill and renewable energy targets?
 - How can we learn from best practice and best ideas in the field?
 - What needs to be done to enable cities to play a bigger role in developing a national low carbon transition plan?
 - What are the key constraints in devising such plans?

Some 52 full responses were received for the survey which represents an 86% response rate.

- A further desktop-based study of exemplar, 'best practice' low carbon plans and strategies in the UK (Top 20 cities) and overseas was carried out (Bristol, Coventry, Plymouth, Cardiff, Glasgow, Vancouver, Copenhagen, Stockholm, Oslo, Hamburg), supported by five telephone interviews and follow-up email surveys.



Main research findings

City level analysis

- Larger UK cities (in terms of population and area) produce more emissions and consume more energy than smaller cities (in total and per capita terms). More densely populated cities are also more carbon and energy efficient in per capita terms than less dense cities. Increased wealth is more weakly associated with more emissions (in per capita terms) but cities that create more waste also tend to create more carbon emissions.

Low carbon action plans

- The majority of UK cities have agreed carbon reduction plans in place, either through: (i) climate change plans (65% of cases); (ii) low carbon plans for the local authority as an organisation (63%); (iii) some other kind of plan/strategy (e.g. sustainable energy or sustainable development) (42%); or (iv) a low carbon plan for the city as a whole (24%). Top 20 cities tend to have a more integrated approach in terms of linking low carbon agendas with climate change through their climate change plan.
- Within these plans, most UK cities have carbon reduction targets in place. Some 59% of UK cities have these targets in low carbon action plans/strategies and 53% have them in their climate change action plan/strategies. More needs to be done, however, because only 7 respondent UK cities had 2050 targets in place, and targets were frequently set for shorter timeframes.
- The research suggests that having a plan or strategy in place to reduce carbon emissions can make a significant difference to the amount of overall reduction in emissions over time.
- The most important low carbon ambitions for cities were (i) energy efficiency in residential buildings; (ii) waste management; (iii) jobs/skills economic growth. Retrofitting was much more important for Top 20 cities than other cities.

Drivers and barriers for a low carbon agenda in cities

- The drive to reduce energy costs, and green jobs/economic growth, and the increasing issue of fuel poverty were seen as critical drivers.
- In the wake of government cuts, funding issues were seen as a key barrier, not only in terms of capital projects or improvement grants, but also in terms of the provision of resources for local authority teams operating in the low carbon and climate change arena.
- There was still considerable uncertainty over how the localism agenda would play out and many people either did not know what the impact would be (48%), or felt that localism, and the removal of the NI186 carbon emissions indicator set, would have a negative impact (20%). If national targets are to be met, then local action is needed, but the localism agenda makes the government reluctant to impose targets on local authorities.
- Some 68% of respondents were positive towards the Green Deal, and the Top 20 UK cities were the most positive group amongst respondents, although there were also concerns expressed over uncertainty regarding the exact mechanisms of the deal.
- About half of respondents felt that the renewables target was also unlikely to be achieved by 2020, perhaps implying a tension between localism and the need to have a coherent set of mandatory local targets.

Critical success factors for cities

- **Frameworks for policy-making and implementation.** There is no single blueprint for success for a low carbon future, but cities which are successful in reducing carbon emissions within a broader low carbon framework also 'measure-commit-plan-measure-monitor'. UK cities should strive more to set carbon emissions targets in the context of national 2020 and 2050 targets.
- **Integrating low carbon and climate change agendas.** Cities are using a range of plans to tackle the low carbon agenda. The most successful cities integrate low carbon within a broader climate change strategy, set sectoral targets, and lead by example in their own administration.
- **Partnerships.** Strong and collaborative relationships with government, not for profit organisations, citizens, and business and industry are essential. Cities which have a history or tradition of environmental action are also leading by example, and cities which link with business through the green jobs/green growth agenda are also achieving success. Climate Change Partnerships in England are one example of success in this area. The Local Strategic Partnership model has also helped achieve success in England, although doubts remain as to whether and how the new Local Enterprise Partnerships will knit together to provide possible linkages between the existing 'green growth' and climate change/low carbon agendas in city-based local authorities.
- **Innovative financing solutions.** Cities which have developed innovative financing solutions to tackle energy efficiency and retrofitting issues are also leading by example. In some cities, this is leading to solutions which link with energy supply (Copenhagen) or with spatial planning innovations which have an in built fiscal incentive (Vancouver's Green Enterprise Zone).



Conclusions and policy implications

The results of the research suggest that UK cities (and their constituent local authorities) and national government need to take the following actions.

UK cities should...

Do more to develop fully integrated low carbon plans and strategies. Although there has been progress towards implementing low carbon plans and strategies, cities need to do more to:

- work with government to introduce low carbon budgets (LCBs) which tie in with national carbon emissions targets.
- ensure the low carbon agenda is fully developed and integrated with wider climate change plans and strategies, and that the linkages with good sustainable local and national planning principles are fully developed.
- ensure carbon emissions targets are realistic and challenging.
- integrate sectoral carbon emissions targets within their plans.
- use proper measuring planning and monitoring techniques to ensure change happens.

Help play a leading role in developing and promoting a low carbon economy. The role of the new Local Enterprise Partnerships (LEPs) and how these work together will be critical. It will be important for LEPs to ‘mesh’ together with the existing Local Strategic Partnerships. Cities will need to be proactive in driving change but may well require further resources from national government to be able to do so effectively.

Help develop networks to ensure best practice, through such bodies as the Local Government Association (LGA) in UK and ICLEI. Global initiatives are helping provide cross-boundary knowledge and learning, and UK cities need to work together more closely to share best practice, within a more fully developed, national ‘low carbon city’ framework supported by government, building on the initial work of the Carbon Trust in this area.

UK government should....

Develop a new policy framework which recognises the role of cities in the climate change and low carbon agendas. The majority of the UK’s population lives in cities, and they are vital in providing a focus for tackling climate change and responding to the low carbon agenda through technology deployment and access to finance. A new ‘low carbon city’ framework, which builds on the existing DECC low carbon pilots, should be developed and the concepts of ‘low carbon city’ and ‘low carbon society’ should be clearly defined within this framework.

Introduce mandatory local carbon budgets.

The government should work with local authorities to introduce mandatory low carbon budgets (LCBs) for all local authorities, including those in cities. These LCBs should be anchored within the NI186 (or equivalent) carbon emissions indicator set. Monitoring of progress towards carbon emissions targets should also be carried out, preferably at central and local government level, and the system could, for example, be underpinned by centralised low carbon fiscal/grant incentives or grant penalties tied into local government funding.

Help resolve funding delay issues and use the Green Investment Bank (GIB) to assist in funding city-based low carbon plans.

The government needs to take urgent action to address the funding crisis for low carbon projects. Delays in the Green Deal, the recent reduction in Feed In Tariffs (FITs), and the deferred implementation of the GIB have led to further uncertainty. More certainty should be provided so that local authorities can become Green Deal providers. Government also needs to work with the funding institutions to help develop new vehicles for financing the low carbon economy in cities: this could be through such initiatives as ‘City Investment Funds’.

The *implications for RICS and its members* are that the context for a low carbon built environment needs to be understood at a city level. This is essentially a ‘scale’ issue and those cities which are leading by example in the low carbon agenda are the cities most likely to provide a successful low carbon built environment and related buildings and infrastructure, both of which will help underpin property asset values and quality of life for their citizens. RICS members have an important role to play, not only in the overall building ‘lifecycle’, but also in the retrofitting agenda, which will become increasingly important at a city level.

So understanding the context for UK cities and their engagement with the low carbon agenda is not only important for potentially ‘picking winners’ in, for example, the sustainable property investment and development arena, but also for offering the potential for business opportunity through expert advice and input to stakeholders in cities who are currently performing less successfully in the low carbon agenda.

1.1 Introduction

This part of the report examines the background and context to the research. Drawing on UK and international literature the chapter analyses the relationship between cities and carbon emissions; the concept of a low carbon city and the related theoretical perspectives; and the policy responses at a national and local level to the low carbon agenda, before identifying the key research questions which the current research addresses.

1.2 What is a city?

There are a wide variety of definitions used to define cities globally, but it is important to understand these variations because the extent of the geographic area of a city and its legislative boundaries will influence not only how greenhouse gas emissions and other key measures are assessed, but also the extent to which a city carries jurisdictional weight in influencing the low carbon agenda across key stakeholder groups. As an example of this variation, it has been shown how eight different lists of the world's largest 20 cities varies, with only four cities appearing on all eight lists and four different areas competing for the first two ranks (Forstall et al., 2009).

Cities may be treated as municipalities or local authority areas (for example, USA, Canada or UK) or as larger 'metropolitan areas (encompassing labour markets) or 'urban areas' (for example, Australia and New Zealand) formed from an area of continuous urban development (Demographia, 2011). Indeed, in many global studies of cities, the term 'city' is often used to include larger 'urban areas' (UN Habitat, 2011).

In the UK, city status is officially conferred by the ruling monarch and this is based on a number of criteria, including population size. Moreover in the UK, there are a number of 'large towns' or 'urban areas' which do not have 'official' city status but are often treated synonymously with the term 'city' (Cowan, 2005)¹.

1.3 Cities and carbon emissions

Today some 50% of the world's population, or 3.5bn people, live in cities, but between now and 2050, the world urban population is expected to increase by 84%, to some 6.3bn (UN, 2010). This means that by the middle of this century, the world urban population will be the same size as the world's population was in 2004 (UN, 2010). Nearly all the expected growth in the world population over the period to 2050 will be concentrated in the urban areas of the less developed countries which is expected to increase from 2.5bn to 5.2bn in 2050. Although megacities (with populations exceeding 10 million inhabitants) will increase in number from 21 today to 29 in 2025, they will only account for 10% of the urban population in 2025, whereas 45% of the world's urban population between 2009 and 2025 is expected to come from the growth of smaller cities (i.e. population of less than 500,000)(UN, 2010).

Whilst some previous projections for particular cities have proved to be over-estimates, such dramatic general increases in population are also expected to be accompanied by other demographic changes. In developed countries, for example, populations are ageing and stabilising. As a result, most of the economic growth that is expected over the next decades is expected to come from developing or emerging economies, and the BRIC countries in particular (JLL, 2010).

Rapid urban growth carries both costs and benefits. The concentration of such huge populations in cities (primarily driven by rural depopulation (Satterthwaite, 2007)) and the continued quest for economic growth have substantial implications for the world in terms of environmental impact, resource depletion, deteriorating ecosystems and climate change and present huge challenges in meeting the goal of sustainable development (WBCSD, 2010). For example, cities are responsible for some 75% of global energy consumption and 80% of greenhouse gas emissions (United Nations, 2007)². This impact is part of what has been termed by some as the 'anthropocene' (Hodson and Marvin, 2010a), which suggests that we have entered a new era (which started with the industrial revolution) when human activities have had a significant global impact on the Earth's ecosystems.

Yet cities also have potential benefits in ensuring that infrastructure and services and technological deployment to offset environmental impact could potentially benefit from increased concentration and economies of scale. On the other hand, in many instances, cities have only in the last few decades developed robust and effective governance and planning systems to be able to set up pathways to achieving sustainable development, and in the developing world, many cities still lack such systems (OECD, 2009). In short, cities are both a cause of environmental impact but also the 'victims', as they struggle to come to terms with mounting environmental and socio-economic pressures.

¹ This point is discussed in more detail in Section 2 of this report, which explains in more detail how the term city is defined for the empirical part of this research. ² It should be noted, as Dodman (2009) suggests, however, that in most cases the per capita emissions from cities are lower than the average for the country in which they are located.

1.4 Why is there a focus on cities?

In response, cities around the world have developed a variety of strategies to protect their ‘ecological security’, or the capacity that cities can mobilise to secure resources (such as water, energy, waste and flood protection), in order to ensure their continued economic and social development (Hodson and Marvin, 2009). Other cities have focused on tackling climate change to reduce carbon emissions, and examples here include the C40 initiative and the Clinton Climate Initiative, both of which represent new global networks.

Cities, of course, contribute to climate change through direct emissions within their boundaries, through greenhouse gas emissions outside their boundaries, but are embodied in civil infrastructure and urban energy consumption, and through city-induced changes to the earth’s chemistry and surface reflectivity (OECD, 2010a).

Cities also matter, not only because that is where the majority of the world’s population lives, and where a majority of carbon emissions are produced (Table 1.1), but also because there are economies of scale in deploying technologies to tackle climate change, they act as centres of innovation and offer important access to capital, but also act as catalysts for social learning. Cities are often large economies in themselves and their impact is proportional to the level of output and the combination of energy resources that they use (World Bank, 2010; United Nations Environment Programme, 2011).

Moreover, because of their population concentration, cities tend to be relatively ‘good’ performers in terms of per capita emissions. The per capita emissions of cities can be relatively low, in comparison with the country in which they are located, and rich cities tend to use more energy than poor cities (World Bank, 2010; United Nations Environment Programme, 2011). Moreover, denser urban areas and compact cities tend to be more energy-efficient than less dense sprawling cities, particularly in relation to transport systems (Glaeser, 2009).

Cities therefore have an important role to play beyond their direct responsibility for reducing carbon emissions. In terms of mitigation, for example, they play a major role firstly through the direct jurisdictional responsibility through production or reduction in greenhouse gas emissions (for example through transport, energy generation, land use planning and waste collection/disposal); secondly, because of their concentrations they offer concentrated solutions to mass transit and energy efficiency; and thirdly they have a catalytic effect in terms of climate change action because of their catalytic effect on stakeholders in the private sector and in civil society (UN Habitat, 2011).

Table 1.1 The 50 Largest Cities, C40 Initiative cities and Top 10 GHG Emitting Cities in the World

Population (Millions)		GHG Emissions (M tCO ₂ e)		GDP (bn \$ PPP)	
1.	China: 1,192	1.	USA: 7,107	1.	USA: 14,204
2.	India: 916	2.	China: 4,058	2.	50 Largest Cities: 9,564
3.	50 Largest Cities: 500	3.	50 Largest Cities: 2,606	3.	C40 Cities: 8,871
4.	C40 Cities: 393	4.	C40 Cities: 2,364	4.	China: 7,903
5.	USA: 301	5.	Russian Federation: 2,193	5.	Japan: 4,354
6.	Indonesia: 190	6.	Japan: 1,374	6.	Top 10 GHG Cities: 4,313
7.	Brazil: 159	7.	Top 10 GHG Cities: 1,367	7.	India: 3,388
8.	Russian Federation: 142	8.	India: 1,214	8.	Germany: 2,925
9.	Top 10 GHG Cities: 136	9.	Germany: 956	9.	Russian Federation: 2,288
10.	Japan: 128	10.	Canada: 747	10.	UK: 2,176

Source: adapted from World Bank, 2010

Cities therefore have emerged as ‘first responders’ in the mitigation of, and adaptation to, climate change (Rosenzweig et al., 2010). In terms of mitigation, for example, cities have the potential to take action in terms of urban form and structure; the built environment; urban infrastructures; transport; and carbon sequestration. For example, urban sprawl can be tackled through such measures as limiting urban expansion, reducing travel and increasing energy efficiency. Economic incentives, regulatory requirements and information programmes can be used to help in the re-design and re-use of the built environment, and the drive to ensure secure energy supplies and create financial savings can help provide renewed infrastructure. Finally, the transport sector can be influenced by cities through low carbon infrastructure; fleet renewal; fuel switching and demand reduction measures for private vehicles.

Adaptation responses by cities are also vital to consider as part of an integrated approach to climate change (World Bank, 2010). Existing buildings, infrastructure, energy systems and other key components are relatively long lasting but may be vulnerable to climate change impacts because of their location (for example, low lying or coastal cities). Adaptation in this sense can be seen as the long term increase in the capacity to cope with changes in circumstances (Cox and Johnson, 2010).

At a broader level, dealing with transformation to a low carbon future presents a substantial cost for infrastructure in cities. A recent report by Booz and Company (2010) for the WWF suggested that the economic challenge for both developed and developing nations is ‘gargantuan’ over the next 30 years. Booz’s analysis suggests that global urban infrastructure and usage expenditures over the next three decades will exceed \$350 trillion (or seven times global GDP). This is partly because as smaller cities mature over time, they generally follow a predictable pattern of expenditures and emissions related to infrastructure development and usage. In the UK, this view of infrastructure renewal is supported by a recent Core Cities report (Core Cities, 2010) which suggests there is an escalating infrastructure deficit estimated at £500bn nationally over the next 10 years.



1.5 What is a low carbon city?

A low carbon development plan (LCDP) offers one way in which climate change responses and sustainable development ambitions can be linked, and in this context, a LCDP should be viewed as part of, but not synonymous with sustainable development (King, 2009). A variety of definitions of LCDP (or low carbon economy (LCE) or low carbon society (LCS) that would result from this plan) have been developed. Skea and Nishioka (2008), for example, suggest that a low carbon society should:

- Take actions that are compatible with the principles of sustainable development ensuring that the development needs of all groups within society are met;
- Make an equitable contribution towards reducing global carbon emissions;
- Demonstrate a high level of energy efficiency and use low-carbon energy sources and production technologies;
- Adopt patterns of consumption and behaviour that are consistent with low levels of greenhouse gas emissions.

Whilst these are generic in application, there are different implications for different countries at different stages of development. For example, for developed nations, this involves making deep cuts by the middle of this century, whereas developing countries will need to achieve a level of cuts that is compatible with wider development goals. Other definitions include (King, 2009):

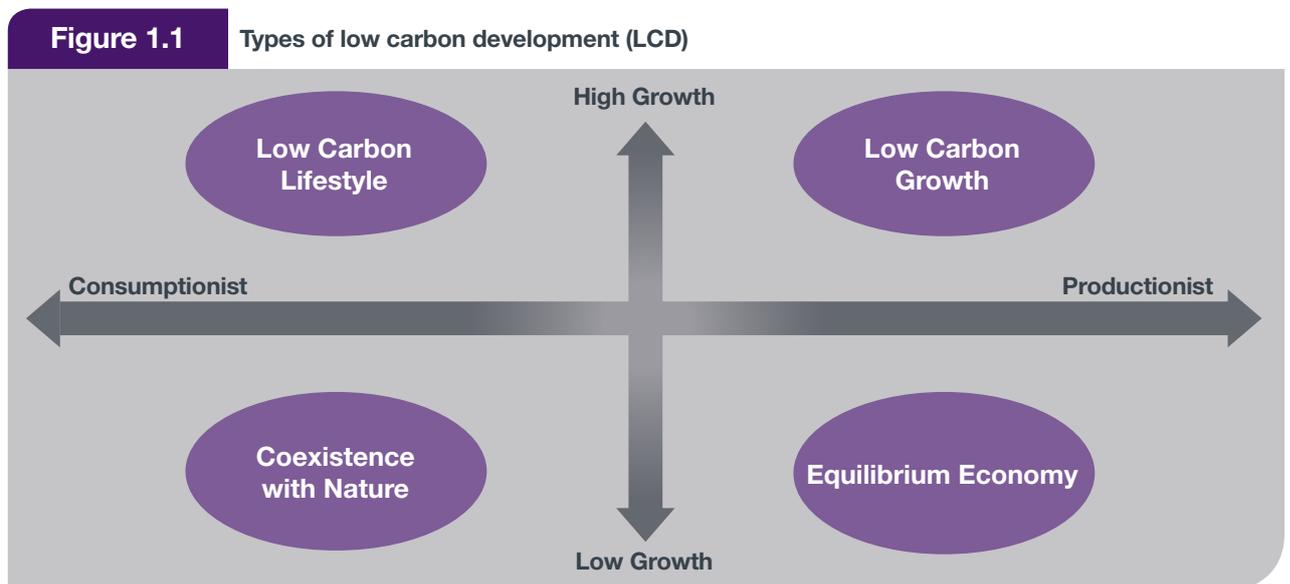
- A development path that simultaneously restrains energy demand growth, drives new production towards low carbon sources, and provides sufficient, secure energy supply for global economic growth (Renewable Energy and Energy Efficiency Partnership, 2007)
- Sustainable growth which helps to reduce GHG emissions and environmental pollution (Cho, 2008).

One of the first national government references to a 'low carbon economy' was the UK's 2003 White Paper on Energy (Department of Trade and Industry, 2003). Here, a LCE was seen as a development path where 'higher resource productivity, producing more with fewer natural resources and less pollution, will contribute to higher living standards and a better quality of life', which was subsequently linked to the commitment to reduce carbon emissions by 80% by 2050.

Other countries such as Japan have also adopted similar plans for a low carbon economy (Fujino, 2008, Strachan et al., 2008). In these and other LCDP/LCE/LCS ambitions, energy is strongly centre stage with commitments to (King, 2009):

- Reduce energy demand
- Move away from carbon-intensive fossil fuels
- Continue to meet the development needs of all within society
- Ensure energy security and
- Adopt appropriate technologies and policies.

Mulugetta and Urban (2010) and Urban and Sumner (2009) offer a helpful conceptualisation of low carbon development, which can be mapped by axes that represent changes in production and growth. As Figure 1.1 shows, there are four broad categories of LCD, which are also outlined in Table 1.2.



Source: Mulugetta and Urban, 2010

Table 1.2 Types of LCD

Types of Low Carbon Development	Focus and approach
<p>Low Carbon Growth ('Green Economy'): Focuses on the production side of an economy and on how goods and services can be produced with lower emissions. It aims at decoupling economic growth from carbon emissions (e.g. halving emissions, but doubling GDP).</p>	<p>Focus mainly on mitigation, though adaptation also plays a role. Approach: Technological change, sectoral change.</p>
<p>Low Carbon Lifestyle ('Green lifestyles'): Focuses on the consumption side of a growing economy and on the consumer's ability to reduce emissions by consuming climate-friendly products. It implies lifestyle changes and behavioural changes, and also leads to a decoupling of carbon emissions (e.g. halving emissions, but doubling GDP).</p>	<p>Focus equally on mitigation and adaptation. Approach: Behavioural changes, sectoral change, technological change</p>
<p>Equilibrium economy: Focuses on the production side of an economy and aims at development rather than growth. No decoupling is necessary as growth is neutral (e.g. halving emissions, but keeping GDP stable).</p>	<p>Focus mainly on mitigation, though adaptation also plays a role. Approach: Technological change, sectoral change</p>
<p>Coexistence with nature: Focuses on the consumption side of an economy and aims at development rather than growth. No decoupling is necessary as growth is neutral (e.g. halving emissions, but keeping GDP stable).</p>	<p>Focus equally on mitigation and adaptation. Approach: Behavioural change, sectoral change, technological change</p>

Source: Mulugetta and Urban, 2010; Urban and Sumner, 2009

The first two types of LCD (lifestyle and growth) assume that economic growth is compatible with significant carbon reductions, whereas the co-existence and economy paths do not. The growth and equilibrium economy approaches put an emphasis on reducing carbon production through technological change whilst the lifestyle and co-existence approaches focus on reducing demand through lifestyle and behavioural choices.

Despite these attempts to define low carbon society, low carbon development and low carbon economy, there has been little progress in defining what is meant by a 'low carbon city'. A low carbon city (and its related definitions in terms of 'economy' and 'society') is essentially a normative concept, implying that a city has achieved an acceptable state in terms of reducing carbon emissions. However, as ASSAF (2011) points out, many cities in developing countries are already 'low carbon'. Furthermore, the climate change action plans of many cities focus solely on carbon emissions and often overlook the impact of 'carbon sinks' and also the need to plan for adaptation to climate change. ASSAF (2011) therefore define a truly low carbon city as one:

'...that strives to reduce its GHG emissions and increase its carbon sinks, while simultaneously adapting to anticipated climate change impacts.' (p.40)

Cities across the world have also been adopting low carbon plans and strategies and moving towards a low carbon city. Low carbon (and zero carbon) cities therefore aim to re-configure existing cities in ways which are significantly different (Hodson and Marvin, 2010b), and attempt to make better use of resources and become 'self-sustaining'.

For example, the Chinese Low Carbon Cities Initiative (LCCI) is designed to explore 'low carbon development models' in different cities, working to improve energy efficiency in industry, construction and transportation sectors. It will also address the development of renewable energy and ensure that other cities in China can learn from successful experiences and replicate them and initial pilot projects are based in Shanghai and Boading (WWF China, 2011). Sceptics have argued that China's low carbon cities are in reality 'high carbon' but nonetheless, this represents an example of how national and city level interest are being mobilised and deployed to tackle climate change and related issues (Jianquiang, 2010).

1.6 Policy responses from cities to climate change and low carbon agendas

Cities' interest and focus on climate change and low carbon agendas has been exemplified by the plethora of local climate plans, strategies and policies over recent years. Many cities within the OECD for example, have identified plans for mitigation and adaptation, and many cities are now reporting their plans and disclosing their carbon reduction commitments much more transparently than before (OECD, 2010b; UN Habitat, 2011).

Complex, multiple arrangements for governance are often needed to implement policy and programmes at this level and cities often collaborate vertically (between local, regional and national governments) or horizontally with partners (such as other cities or local authorities in a region) with spatial planning playing a key role (Bulkeley and Betshill, 2005; Wilson and Piper, 2010).

Some cities have taken action themselves either alone or within a regional government partnership. Others have benefited from international, national or regional networks. In Japan, the national government mandate on Promotion of Global Warming Countermeasures requires local governments to formulate climate change action plans (OECD, 2010b).

Four generic modes of governance through which climate change can be tackled may also be identified (OECD, 2010b):

- Self-governing: the municipality as consumer, where sub-national governments can limit their consumption and ecological footprints through such efforts as promoting energy efficiency and green transport systems.
- Governing by provision: the municipality as provider, where infrastructure development, programme administration and service delivery are key.
- Governing by authority: the municipality as regulator, where local governments acts to curb CO₂ emissions, or introduce mitigation and climate change policies, if they have relevant jurisdiction through such measures as building codes or wetlands/parklands management.
- Governing through enabling: the municipality as a facilitator, where the municipality facilitates co-ordination with private and community actors, such as private-public partnerships for service provision or infrastructure.

However, there has frequently been a failure to develop systems and regimes which can apply at a city scale and which can be adaptive and flexible enough to cope with disruptions and uncertainty over what is a relatively long time scale to 2050 (Dixon, 2011). Frequently, governance and planning systems have been beset by expediency issues and have failed to address longer term systemic problems.

Climate change action at an urban level happens through a combination of local regulations, urban services, programme administration, city purchasing, property management and consultation and dialogue with local stakeholders (Lamia and Robert, 2009). For example, activities involving government-owned property or operations are common in part because cities have direct control over them: examples here include many cities' purchase of hybrid or alternative fuel vehicles and improving the energy efficiency of street and traffic lights (Lamia and Robert, 2009). Similar opportunities exist where cities are service providers (for example, Melbourne's innovative two-tiered water services system providing both drinkable and recycled water, Monterrey and Toronto's capture of methane gas from landfills for energy, and Copenhagen, Stockholm and Mannheim's use of district heating). Cities generally are still reluctant to make full use of their regulatory authority to achieve climate goals. Change may also be relatively easy to instil where the public sector plays an important role in a city. Urban policies also require better 'joining up': for example, spatial planning policies which promote higher densities and better mixing of uses can help create more sustainable transport options (Figure 1.2).

Moreover, as Bai et al. (2010) suggest there is frequently an inherent temporal ('not in my term'), spatial ('not in my patch') and institutional ('not my business') scale mismatch between urban decision-making and global environmental concerns, where urban decision-makers are frequently constrained within short time-scales, their immediate spatial scale of their jurisdictions and within 'nested' governmental hierarchies (Figure 1.3). Despite these tensions, cities can and do address global issues because of the benefits this entails for local populations and cities as a whole through direct economic impacts (Bai, 2007) but also because cities believe they should be addressing them.

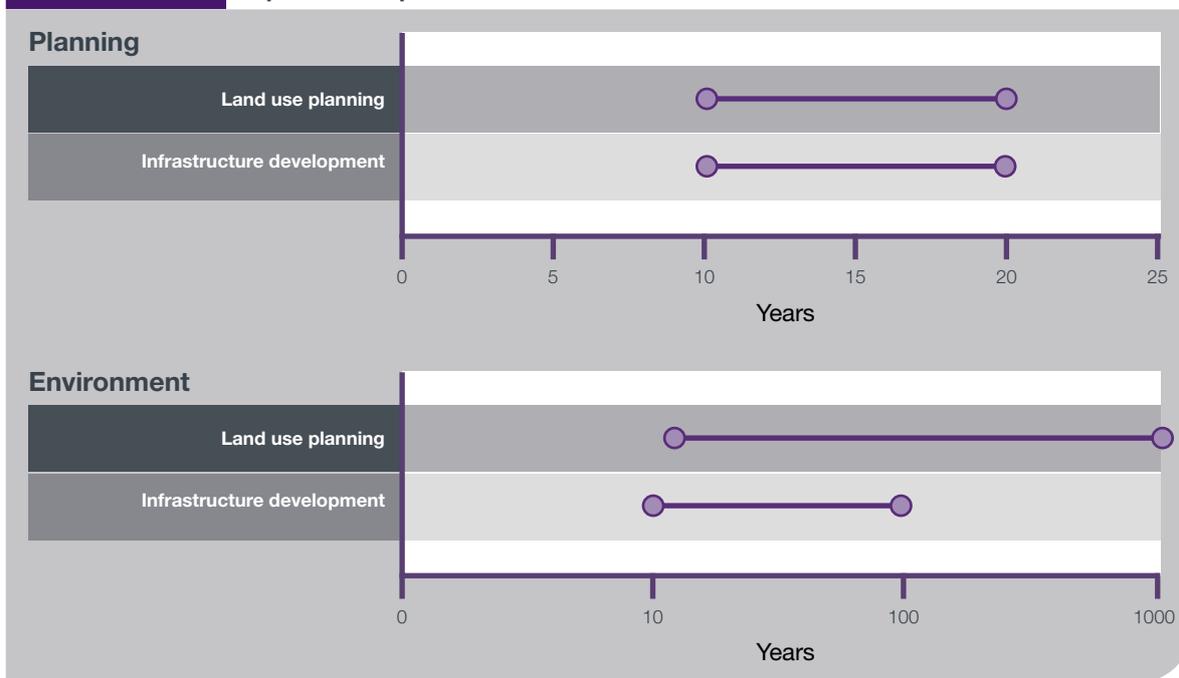
Figure 1.2 Synergy in urban policy

Impact	Transportation	Renewable energy	Waste and water
Land-use Zoning Land-use zoning determines the density, height of buildings, and proportion of undeveloped land on each property	Segregation of land uses impacts travel distances and frequency; transit-oriented development zones encourage use of mass transportation.	Zoning density can constrain on-site renewable energy production but can also increase efficiency of service delivery.	Zoning density can determine the efficacy of delivery of waste, recycling and composting services; and the energy required and efficacy of delivery of water services.
Natural Resources Natural resource policies determine which areas are preserved from development and what uses are acceptable on them.	Natural resource policies affect the placement of road and mass transportation infrastructure.	Natural resources endowment makes certain renewable energies possible.	
Building Building policies, including building codes, affect building materials, construction types, and other physical conditions.		Building codes can require the on-site generation of renewable energy.	Building codes can require design and building materials that produce less construction waste.

Note: Policy sectors with no shading demonstrate highest impact. Policy sectors with shading demonstrate lower impact. Policy sectors with grey shading demonstrate no impact.

Source: OECD, 2010a

Figure 1.3 Variations in temporal scale – (a) temporal scale of planning; (b) temporal scale of potential impacts of decisions



Source: Bai, 2007

In the UK, there have been a number of important sources and prompts for action around cities and the low carbon agenda, including (i) the development of city networks, such as Core Cities, and the role played by NGOs such as the Carbon Trust; and (ii) the important driver of UK legislation at a national level (and related EU policy), and linked to this, local authority policy and actions. This section examines these two main dimensions in more detail.

1.7.1 Core Cities and Low Carbon Cities

As is the case in many other parts of the world, the UK is facing population pressures, albeit on a different scale. Despite the much publicised ‘flight’ of city residents to small towns and rural areas, the UK is a heavily urbanised country with some 90% of its population living in ‘urban areas’ and this is set to increase to 92% by 2030 (Guardian, 2011). A recent report by RCEP (2011) suggested that, based on ONS data, the UK’s population is likely to grow to some 71.6 m by 2033 (from 61.4 m in 2008)³. Similarly, household numbers are expected to increase from 21.5 m in 2006 to 27.8 m by 2031.

Alongside increasing population pressures and the ensuing issues for resource depletion, the need for UK cities to engage in a concerted response and develop low carbon transition plans is being driven by new forms of legislation, pressures to invest in low-carbon infrastructures, the need to manage low carbon budgets, and the opportunities for growth offered by low carbon markets (Bulkeley et al., 2011).

For example, in the UK, the English ‘core cities’ (which comprise Birmingham, Bristol, Liverpool, Leeds, Manchester, Newcastle, Nottingham and Sheffield) have identified four key challenges in returning to sustainable economic growth (Core Cities, 2010):

- Adapting to long term structural economic change: managing the UK’s transition to a more diversified and innovative “knowledge economy”.
- Addressing low skill levels and high unemployment: avoiding the prospects of a decade of “jobless growth”.
- Creating a low carbon society: making essential investments in infrastructure and the built environment to adapt to climate change; and
- Driving efficiency and managing public expenditure constraints: devising new instruments to fund essential investments.

About 60% of total commercial and industrial premises are located in cities (APUDG, 2008), and the UK’s cities are responsible for about 45% of total carbon emissions (with 30% of this overall total from the English Core cities and London alone) (Centre for Cities, 2009; APUDG, 2008).

The Low Carbon Cities programme⁴, supported by the Carbon Trust, which is focused on Bristol, Leeds and Manchester, and which is closely linked with the Core Cities programme has also been important in prompting action. Under the new scheme, the Carbon Trust and the Energy Saving Trust will work with Bristol, Leeds and Manchester to develop individual city-wide action plans to achieve low carbon economies which are both prosperous and sustainable. New measures and initiatives will be introduced and could include renewable energy and tri-generation (creating power, heat and cooling from a single source) along with energy saving measures such as insulation and promoting cycling to work. Key public service bodies, businesses and community leaders in each of the cities will contribute to the strategy and its implementation. Manchester has been leading with several new initiatives (Box 1.1).

Box 1.1

Manchester’s Low Carbon Economic Area

Greater Manchester was designated the UK’s first Low Carbon Economic Area (LCEA) for the Built Environment in 2009. Under the banner of ‘From Red Brick to Green Brick’, the LCEA brings together the ten Greater Manchester local authorities under the leadership of the Greater Manchester Environment Commission to develop a combined programme that aims to accelerate the pace at which the existing buildings of Greater Manchester can be retrofitted so as to create jobs, business growth and productivity improvements (AGMA, 2010). The Greater Manchester Strategy is that by 2015, “Greater Manchester has established itself as a world leader in the transformation to a low carbon economy”, and analysis indicates that by 2015 Greater Manchester Low Carbon Economic Area for the built environment could:

- Deliver up to £650 million additional to the Gross Value Added of the economy;
- Support 34,800 jobs, including 18,000 in the supply chain;
- Benefit the UK through developing and sharing best practice, as well as economic spill-over benefits; and,
- Save 6 million tonnes of carbon from existing buildings.

Amongst its ambitions, the LCEA aims by 2015 to have retrofitted 75% of homes and to have strengthened the spatial planning framework so that by 2016 all new developments will be zero carbon. Government funding will not be forthcoming for the programme and so delivery will be dependent on private capital, including the European Investment Bank.

Source: AGMA, 2010

³ This was recently revised upwards by ONS to 70 mn by mid 2035 (ONS, 2011a) ⁴ See <http://www.lowcarboncities.co.uk/cms/>



1.7.2 UK policy frameworks: national and local authority action

The UK Climate Change Programme, (UKCCP), which was published in 2000 (HM Government, 2000), laid out for the first time, a suite of policies designed to deliver the UK's international and national commitments to reducing greenhouse gases. The stated strategies of the 2000 programme were to improve business' use of energy, stimulate investment and cut costs; stimulate new, more efficient sources of power generation; cut emissions from the transport sector; promote better energy efficiency in the domestic sector, saving householders money; improve the energy efficiency requirements of the building regulations; continue cutting emissions from agriculture; and ensure the public sector took a leading role. This was revised in 2006 to link with the changing requirements nationally and internationally of emissions targets at that time (HM Government, 2006).

As Roberts (2010) points out, the UKCCP is important because it laid out the UK's international and national commitments to reducing greenhouse gases for the first time, and this also expressly focused on the 'unique and critical role' that local authorities can play in delivering national policies to reduce carbon emissions locally. It is

this interweaving of national and sub-national policies that has been at the heart of tackling climate change in the UK.

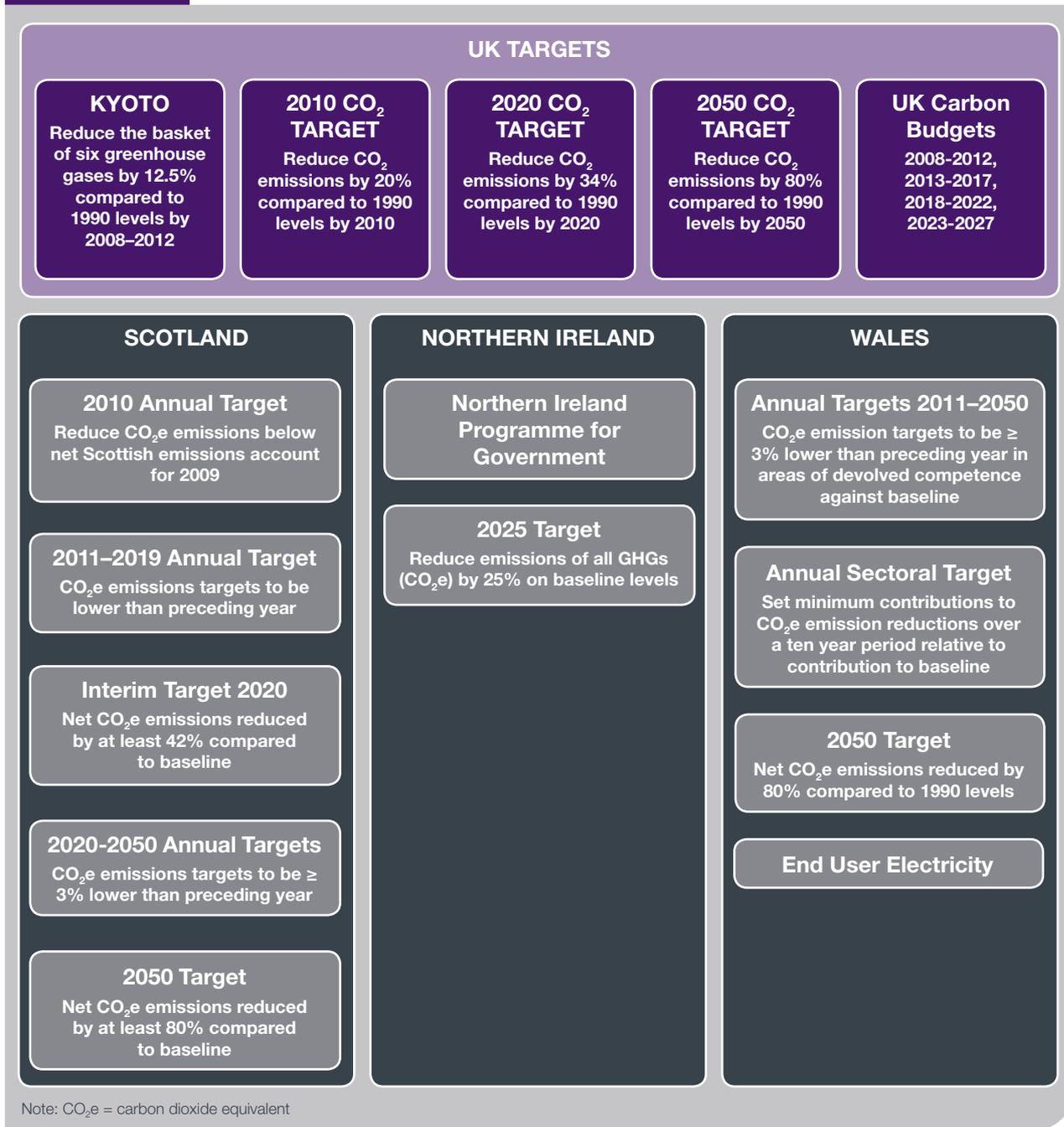
In fact in England, at sub-national level, local authority action in relation to climate change and wider environmental issues has its roots in the 1995 Home Energy Conservation Act and the LA21 and Sustainable Community Strategies (Schreurs, 2008, Shaw and Theobald, 2011). Often, however, barriers such as lack of funding, political resistance and lack of skills hampered progress (Shaw and Theobald, 2011; Roberts, 2010).

Moreover, the Nottingham Declaration of 2000, which committed local authorities to developing plans with other local partners to address climate change, has also had a considerable impact on local authority action, and by 2011, more than 90% of local authorities in England and Wales had signed up (Friends of the Earth, 2011)⁵. These initiatives have also been mirrored in the EU through initiatives such as the Covenant of Mayors, which requires an ambitious target of 20% reduction by 2020 in local authorities through the production of a Sustainable Energy Action Plan (Shaw and Theobald, 2011).

⁵ A new Nottingham Declaration (2010+) is currently being developed as a result of a Memorandum of Understanding between the Department of Energy and Climate Change (DECC) and the Local Government Group (LG Group) (Friends of the Earth, 2011)

Figure 1.4

GHG Emission Reduction Targets: UK, Scotland, Northern Ireland and Wales



Source: AEA, 2011

In the UK, strong government intervention has built on the UKCCP and provided a national framework within which the UK local government has been asked to develop a range of initiatives to tackle climate change. These national initiatives included the following measures:

- The 2008 Climate Change Act set legally binding targets CO₂ emissions of 34% by 2020 and 80% by 2050 compared to 1990 levels, and the 2009 Climate Change (Scotland) Act set even higher targets with a 42% reduction in emissions by 2020 and an 80% reduction by 2050. These targets are also underpinned by overall '20-20-20' EU targets which are designed to achieve:
 - A reduction in EU greenhouse gas emissions of at least 20% below 1990 levels.
 - 20% of EU energy consumption to come from renewable resources.
 - A 20% reduction in primary energy use compared with projected levels, to be achieved by improving energy efficiency.

Carbon emission targets also vary between the devolved constituents of the UK (see Figure 1.4).

- The 2009 Low Carbon Transition Plan (LCTP) (HM Government, 2009) was also introduced to help detail the actions required to achieve the targets set out in the Climate Change Act. Local authorities were also seen in the LCTP as the vanguard of local and community action with local authorities, not only providing established services, but also co-ordinating, tailoring and driving the development of a low carbon economy in their area (Roberts, 2010).
- Energy-efficiency programmes and measures, including Carbon Emissions Reduction Target (CERT); Community Energy Savings Programme (CESP), and Warm Front. For example, the Carbon Emissions Reduction Target (CERT) is an obligation which is currently placed on suppliers with more than 50,000 domestic customers. Participating suppliers are allocated a proportion of the total target based on their market share of the domestic energy market. They are required to meet these targets through the promotion of energy efficiency measures to households, for example by establishing schemes to encourage (usually with subsidy) the installation of loft or cavity wall insulation. The Community Energy Saving Programme (CESP) currently applies to suppliers with more than 50,000 domestic customers and also to generators producing over 10 TWh/year on average. These businesses are required to deliver energy saving measures to domestic consumers in specified low income areas. Warm Front provides assistance to more than 90,000 of the poorest households over the next two years, helping householders to install heating measures and insulate their homes.

- Climate change national performance indicators were embedded in a local performance framework in 2008 for local authorities working within their Local Strategic Partnerships (LSPs) to produce Local Area Agreements (LAAs) in England. These included (Roberts, 2010; Cooper and Pearce, 2011):
 - CO₂ reductions from local authority operations (NI185)
 - Per capita CO₂ emissions reductions in local authority areas, but excluding commercial and industrial sites taking part in the EU Emissions Trading Scheme and also motorways, rail, air and waterborne transport (NI186)
 - Planning to adapt to climate change, based upon five levels of performance (NI188)

The indicators were designed to introduce a top down monitoring system for local authority performance set against locally-set targets. Some 90% of local authorities have included targets relating to NI186 in their local area agreement.

- Low Carbon Framework Pilots were introduced in January 2010 with £3m from DECC to support carbon reduction programmes in 9 local authority areas in England (Manchester, Leeds, Bristol, Nottingham, Plymouth and Oxford city councils, Haringey LBC, Northumberland Council, and the Bournemouth BC, Poole BC and Dorset CC Multiple Area Agreement).

However, the UK coalition government, which came to power in June 2010, has made a number of changes to policy which will impact substantially on cities and local authorities, and the way in which they tackle climate change and carbon reduction. These include:

- Revocation of s109 of the Local Government and Public Involvement in Health Act 2007 meant that local authorities took full control of local agreements and allowed them to drop any targets that they wished, prompting a major shift in policy and performance appraisal in this area. Effectively DCLG will no longer monitor any targets that local authorities decide to retain. The national indicator set which included NI 185, 186 and 188 is replaced with a 'single data requirement list'.
- The Energy Act 2011, which has been designed to provide for a step change in the provision of energy efficiency measures to homes and businesses, and make improvements to our framework to enable and secure, low-carbon energy supplies and fair competition in the energy markets (DECC, 2011a). During the course of the passage of the bill through Parliament, some groups (including Friends of the Earth, and a number of politicians) argued strongly for the Bill to incorporate the concept of 'local carbon budgets', which would mean government and local authorities working together to set local targets, and for the Committee on Climate Change to advise local authorities on the targets set. However, the Bill as it currently stands does not incorporate this measure.

- The Green Deal, which forms part of the Energy Act, is due to be implemented from 2012, and will enable people to pay back the upfront costs of energy efficiency measures through the lower bills that will result. Under the new Energy Company Obligation (ECO), energy companies will be required to focus their assistance on low income and vulnerable households as well as those in hard to treat properties which cannot achieve financial savings without a measure of support, helping them manage their bills for the long term and heat their homes more affordably. The ECO will replace CERT and CESP when the Green Deal becomes available. CERT and CESP will run until the end of 2012 (DECC, 2011b). Following a recent consultation, the scope of Warm Front has also been revised to better focus support on low income, fuel poor households. Eligibility will now be based on a combination of income related benefits, mirroring those used to identify Cold Weather Payment recipients (DECC, 2011b).
- The Carbon Plan, first published in March 2011⁶, is a Government-wide plan of action on climate change, including domestic and international activity. It sets out department by department, actions and deadlines for the next five years. The plan presents ongoing and planned cross-Government action on climate change with specific deadlines providing for both internal accountability and public transparency (DECC, 2011c). This is designed to support the Low Carbon Transition Plan which continues to form the basis for national carbon emission reductions to 2020.
- The Localism Act, which was given Royal Assent in November 2011, is designed to be the first in a wave of measures to localise and decentralise power to local government and across housing and planning policies in England. The Bill is designed to initiate six actions which the government considers are required to drive its decentralisation agenda forwards:
 - Lifting the burden of bureaucracy
 - Empowering communities
 - Increasing control of public finance
 - Diversifying public services
 - Opening government to public scrutiny
 - Strengthening accountability to local people.

The Bill, however, makes no reference to the low carbon agenda, although there clearly are potential impacts through, for example, the planning and siting of local renewable energy projects, which is a sector where local authorities are seen as playing a very important role.

- The establishment of 37 Local Enterprise Partnerships (LEPs) in England, which are designed to bring local authority and other public sector partners together with private sector partners in order to create local economic growth. In addition, 24 enterprise zones have been established which have rate reductions and simplified planning in order to promote growth. Some 29 of the LEPs refer to the ‘low carbon economy’ or ‘climate change’, and 4 enterprise zones have a strong renewable energy focus, with 7 intending to attract low carbon business and 3 making reference to ‘sustainable development’ (Green Alliance, 2011).

⁶ An updated Carbon Plan was also published in December 2011 (DECC, 2011) sets out the Government’s plans for achieving the emissions reductions committed to in the first four carbon budgets, on a pathway consistent with meeting the 2050 target. The plan brings together the Government’s strategy to curb greenhouse gas emissions and deliver climate change targets, as well as the updated version of the actions and milestones for the next five years; replacing the draft Carbon Plan published in March 2011

1.8 How are cities and local authorities performing in tackling climate change and low carbon issues?

Local authorities have a vital role to play in helping tackle climate change and carbon emissions. As Roberts (2010) points out, this is because implementation of carbon emissions reduction is highly diffused, requiring systemic and sectoral change; action by individuals and groups can only have a limited impact; and the tools and technologies to tackle such changes often are best used locally. It is partly for these reasons, for example, that the Transition Town movement has gained traction in the UK although this is generally independent of local authority activities (Lockyer, 2010).

Nonetheless, as Roberts (2010) points out, local authorities have a major role to play in influencing climate change policy through the services they deliver; the strategic roles they play; their regulatory influence and the relationships they have with key stakeholders. In practical terms, local authorities can play a leading role through such actions as (Roberts, 2010: 80):

- Management of property portfolio and public procurement;
- Delivery of services such as housing, education, waste and social services;
- Control over local planning policy;
- Co-ordinating local regeneration and economic activity;
- Public investment in infrastructure;
- Building regulations and trading standards;
- Civic leadership within communities through for example, Local Strategic Partnerships and Local Area Agreements;
- Creating and maintaining partnerships; and,
- Showcasing good practice.

In practice, many of these actions have been incorporated in the low carbon or climate change plans that local authorities have developed. Indeed, it is often the successes of 'wilful individuals' working within local authorities that have been key to success (CSE, 2005; Roberts, 2010), alongside strategic prioritisation for climate change, senior management support, resource prioritisation and a clear delegation of responsibilities (between local authority departments and other partners) within an agreed timetable (ICLEI, 2002; Roberts, 2010).

But how have local authorities reacted locally and what progress is being made? There have been a number of empirical studies of English (and Welsh) local authorities and their progress in tackling climate change and carbon emissions (see for example, Allman et al., 2004; Local Government Group, 2010; Cooper and Pearce, 2011). Generally speaking these have shown an increasing commitment by local authorities to tackle the issues with strategies and action plans in place, but a landscape that is still relatively 'patchy', with 'best practice' an exception rather than a rule (Roberts, 2010). Work by CSE (2007), for example, found that local authority influence on national carbon emissions reductions was often relatively limited because of:

- Limited influence of local authorities over carbon emissions in key sectors.
- Local authority influence depended on the quality of relationship it has with its local community.
- Reluctance of government to commit to pro-active measures which relied on good local authority performance.

However, Allman et al. (2004), in research based on English and Welsh local authorities, found that most local authorities were not making progress on climate change, although at the time of the study some had prepared GHG inventories, development strategies and implemented a variety of reduction measures. Those that were successful were characterised by the fact that they recognised the benefits of tackling climate change, that they had strong leadership in place and that they had strong partnerships locally. Of course, this study pre-dates the introduction of National Performance Indicator targets, but it does show the potential cultural and institutional barriers that some local authorities have faced. Moreover, a similar survey by Local Government Group (2010) found that more progress had been made with a strategy or action plan for climate change in place in 65% of local authorities in England and Wales, although funding constraints were an issue.

However, in the changed political landscape and in the wake of public sector cuts, a recent report by Green Alliance (2011) found that 37% of English local authorities are de-prioritising climate change or stated that it was never a priority, with 35% still committed and 28% narrowing their ambitions to focus on reducing carbon emissions from their estate. Clearly, there is emerging evidence that the changing political landscape is already starting to have an impact on local authorities.

In the USA, several studies have assessed and measured the response of US cities to climate change (see for example, Dolan et al. (2010); Boswell et al. (2010); Tang et al., 2010). For example Dolan et al. (2010) found that although many US cities have adapted formal climate change plans, with energy efficiency for buildings a primary focus, these efforts were (Dolan et al., 2010)

‘...promissory rather than compulsory and more visionary than executable, and thus raise serious questions about their ability to produce significant GHG emission reductions without additional incentives or mandates from state and federal governments.’ (p.161)

Another study of 40 recently adopted local climate change action plans in the USA (Tang et al., 2010) used the ‘AAA’ (Awareness, Analysis and Action) framework (see for example, UKCIP, 2003; California Climate Change Centre, 2006) and found that whilst such plans had a high degree of ‘awareness’, the ‘analysis capabilities’ were moderate, and ‘action approaches’ were relatively limited. State mandates and transportation-related issues (such as vehicle emissions and average commuting time) were particularly important in influencing the quality of climate change response. Further, related research by Portney and Berry (2010) found that US cities which are most committed to pursuing sustainability programmes tended to be more participatory places with good community relations.

In the EU, research by ICLEI (2010) of international city-based and local authority responses (both inside and outside the EU) to climate change found that whilst many cities are responding to climate change through innovative adaptation and mitigation responses, there is often a communication and information shortage about relevant international financing options to fund such plans⁷.

Recent research of global best practice by Climate Group (2011) suggested cities should pursue a five stage framework for policy-making and implementation to move to a low carbon future based on a framework originally developed through ICLEI (2002) (Figure 1.5). This involves:

- Setting carbon reduction targets and visions through scenario planning.
- Defining the issues and assessing the options for feasible city-wide carbon reduction plans in a participatory manner.
- Co-ordinating city-wide carbon reduction planning in a way that links and leverages with existing environment and climate change plans already in existence.
- Rolling out city carbon reduction action plans.
- Developing monitoring mechanisms to assess progress towards meeting the targets.

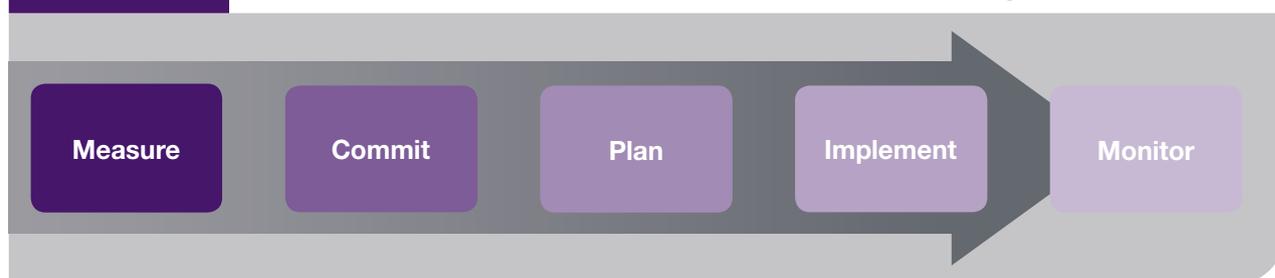
Finally, the growth of interest in cities and the climate change agenda has spawned a number of indices and city-focused benchmarking reports. In the UK these include:

- IPPR Centre for Cities: Cities Outlook (Centre for Cities, 2011). This compares, amongst other key variables, carbon emissions and progress in reduction across primary urban areas in the UK.
- Forum for the Future’s Annual Sustainable Cities Index (Forum for the Future, 2011). This tracks progress on sustainability in Britain’s 20 largest cities: highlighting their environmental performance, quality of life and their readiness for the challenges of the future.
- GVA Grimley Research on UK Core Cities (GVA Grimley, 2010). This measures and monitors the UK’s core cities responses to the low carbon agenda and analyses the contribution of the built environment to carbon emissions in those cities.

International indices and benchmarking studies include:

- Siemens Green Cities Index (Siemens, 2011). The European Green City Index measures and rates the environmental performance of 30 leading European cities from 30 European countries. It takes into account 30 individual indicators per city, touching on a wide range of environmental areas, from environmental governance and water consumption to waste management and greenhouse gas emissions. Similar indices are available for other parts the globe.
- C40 Cities Baseline (Arup/C40, 2011). C40 partnered with Arup to produce a baseline study of the 58 C40 cities in the world and their actions to address climate change.
- Climate Disclosure Project, Global report on C40 cities (KPMG, 2011). The complements the C40 baseline study by addressing detailed analyses of governance structures, GHG emissions, adaptation measures and overall strategy.

Figure 1.5 ICLEI’s Five Milestone Framework to Local Climate Action Planning



Source: ICLEI, 2002

⁷ The concept of ‘Smart Cities’ in the EU has also been promoted as the ‘lens’ through which cities should focus on the low carbon agenda (THINK, 2011) using ICT for city management and achieving a transition towards sustainable development

1.9 Summary and Research Gap

Despite the importance of city-level action in the UK, we still know very little about the bigger picture of how cities across the UK are responding to the low carbon and climate change agendas, particularly during a period which has seen political changes which could have a substantial impact on local authorities in the UK.

Previous research has suggested that cities and their constituent local authorities in the UK are facing a number of potential challenges in a changed political landscape. The key drivers for the low carbon agenda seem to revolve around climate change, energy security and an economic or green jobs agenda, whilst barriers such as political uncertainty and funding constraints are posing challenges for UK cities. In summary therefore, there is a need for research in the UK which scopes out and examines the city level plans and actions in place to move to a low carbon future. The overall aim of the research is to scope and analyse the low carbon transition plans of UK cities, in order to provide a critical review of how well-prepared cities are for future climate change and its associated environmental impacts.

The key objectives of the research are to:

- Examine the background and legislative context for low carbon cities in the UK.
- Draw comparisons between UK approaches and international approaches (for example, the EU and Canada) where appropriate.
- Critically review and compare low carbon plans (including climate action plans) in UK cities, in terms of their timeframes, targets, and pathways to the future.
- Identify the drivers and barriers to implementing such plans.
- Highlight best practice and promote learning within the relevant 'communities of practice'.



2.1 Introduction

This chapter of the report summarises the methodology, including the conceptual framework and research questions. The primary focus in this research is mitigation but there is also a related focus on adaptation through the lens of climate change plans.

2.2 Conceptual framework

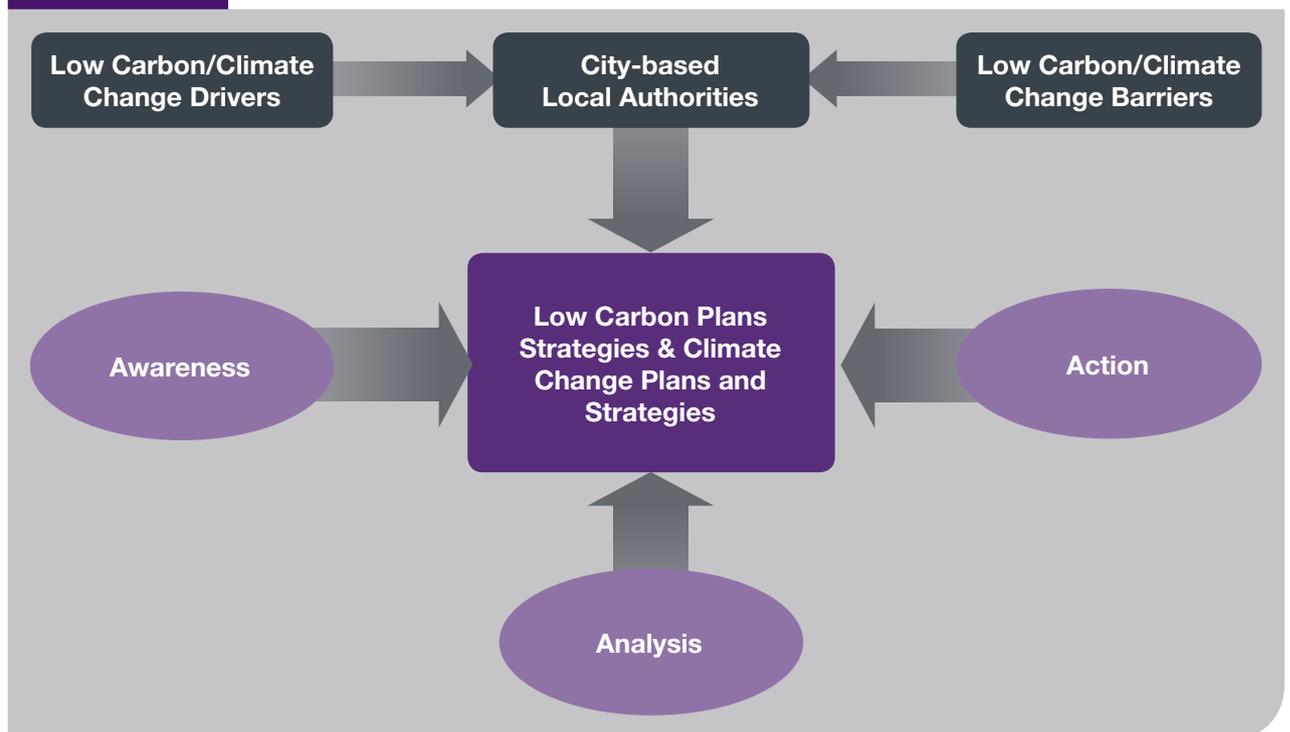
Building on the work of UKCIP (2003), and Tang et al. (2010) a conceptual framework was developed (Figure 2.1). This conceptualises local authorities as agents responding to ‘drivers’ and ‘barriers’ and examines the relationship between these counteracting forces in the overall context of shaping plans and strategies to tackle the climate change and low carbon agendas. Similarly, the conceptual framework assesses the extent to which the plans in place may or may not match three main characteristics of ‘success’ (Tang et al., 2010):

- ‘Awareness’, or the degree to which city-based local authorities understand climate change and the low carbon agenda, through such measures as carbon emissions targets.
- ‘Analysis’, or the extent to which emissions inventories are covered and forecasts and related projections incorporated.
- ‘Actions’, or the measures in place which identify and quantify appropriate targets, policies, tools and other strategies.

The framework builds on that developed by Dixon (2007) and Dixon et al. (2011) to investigate which ‘critical success factors’ (CSFs) need to be in place for cities to develop successful low carbon plans. We therefore need to briefly focus on business management to aid our understanding of the concept of CSFs. CSF analysis was used initially in data analysis and business analysis (Daniel, 1961) and is defined by Boynton and Zmud (1984) as: *‘Those few things which must go well to ensure success for a manager or organisation, and therefore they represent those managerial or enterprise areas that must be given special and continual attention to bring about high performance.’ (p.17)*

By studying CSFs in the context of an agency-based framework, it is potentially easier to draw comparisons between different environments and set this analysis within the context of drivers, barriers and uncertainties (see section 1). It should be noted that ‘success’ in this sense is very much a perceived or qualitative assessment, and so the case studies in our research were not analysed in detail to quantify success, but rather to help highlight the factors that could lead to potential success for cities developing low carbon plans.

Figure 2.1 Conceptual framework for the research



2.3.1 Defining a 'city'

A city has been defined as a 'large town, a place with a cathedral or a place with a city charter' (Cowan, 2005:60). There is no agreed definition of a city and many cities have a particular status based on local administrative, legal or historical status. Indeed other varying definitions have been applied such as a 'complex of buildings', or a 'distinct urban area', or 'an urban settlement' and these vary between countries (Cowan, 2005:63).

In the UK, city status is officially conferred by the ruling monarch and this is based on a number of criteria, including population size. Moreover in the UK, there are a number of 'large towns' or 'urban areas' which do not have 'official' city status but are often treated synonymously with 'cities'. In the UK, there are currently 66 cities with official status. In contrast, the Census definition of urban area in the UK is an area of at least 20 hectares and at least 1,500 census residents (ONS, 2011b), and in the UK, there are currently five 'urban areas' with a population over a million and a further 69 with a population over 100,000. This group of urban areas therefore includes official cities, but also substantial areas of population which may not have official city status.

Given the importance of population in defining 'urban area' and in contributing to 'city' status, this report, in relation to its empirical work, uses a fairly broad definition of 'city', to include the top 60 UK cities in terms of population size, and focuses on the main city council for each of these cities, with the exception of London, where the focus is the Greater London Authority. The term 'city-based local authority' in Figure 2.1 above therefore refers to the main city council in each city. A list of city respondent councils is provided in Appendix 1 (see Volume 2 of this report).

2.3.2 Research design

The research encompassed the following stages:

- Detailed analysis of DECC carbon emissions (NI186) data and energy consumption for the UK's Top 20 cities by population size. This is based around an analysis of 2005-2009 data.
- Further analysis of the potential relationship between carbon emissions (NI186 data), energy consumption and other factors, such as waste per capita, population, density, geographic area and GDP per capita of the Top 50 cities. This is based around an analysis of 2008 data.
- An online survey of the Top 60 UK cities by population size (where respondents were senior climate change or sustainability officers) and which examined such questions as:
 - To what extent are agreed low carbon /climate action plans and strategies in place?
 - What are the key drivers and barriers to successful action?
 - What are the key issues in developing such plans/strategies?
 - What carbon emissions targets are in place for which sectors?
 - What are the attitudes towards new initiatives such as the Green Deal, the Localism Bill and renewable energy targets?
 - How can we learn from best practice and best ideas in the field?
 - What needs to be done to enable cities to play a bigger role in developing a national low carbon plan?
 - What are the key constraints in devising such plans?
- A further desktop-based study of exemplar low carbon plans and strategies in the UK (Top 20 cities) and overseas was carried out, supported by interviews and follow-up email surveys.

3.0 Analysis of Carbon Emissions and Energy Consumption in UK Cities

3.1 Introduction

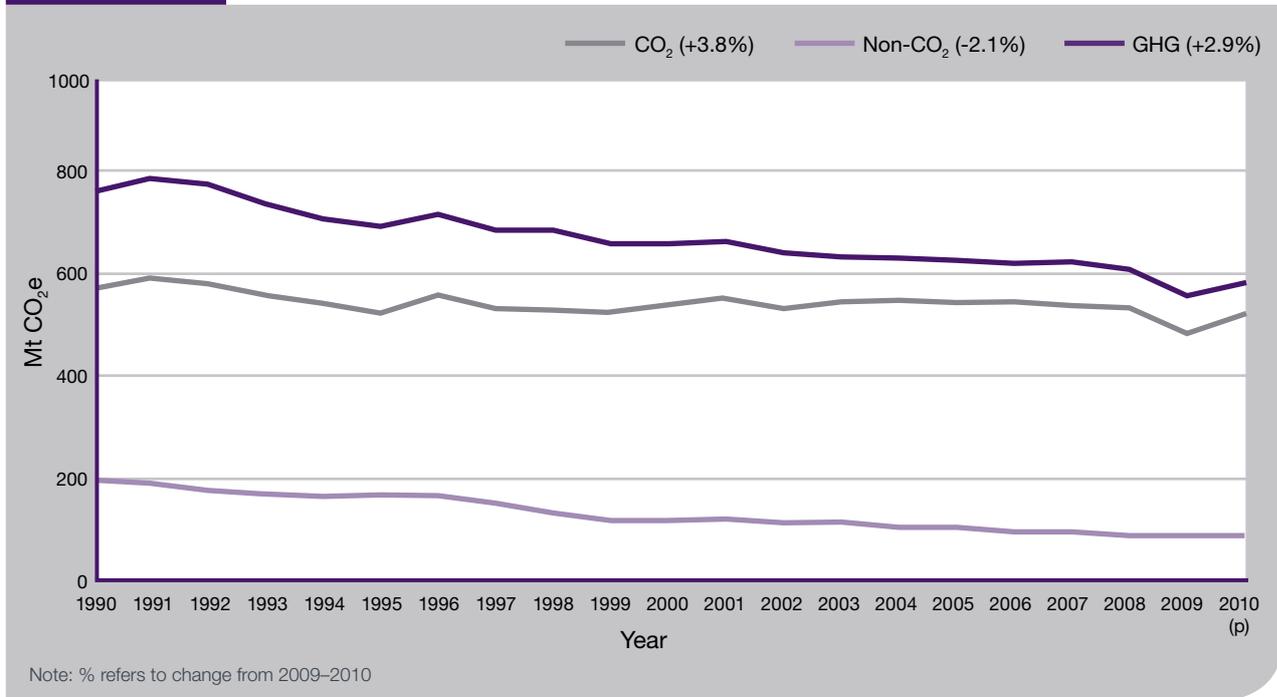
This chapter uses DECC data and other data to describe the picture of carbon emissions and energy consumption at national and city levels. This is carried out for the Top 20 and Top 50 UK cities (in terms of population size), based on analysis for the main city council within each city (see section 2.3.1). The analysis also shows the relationship between carbon emissions and energy consumption in cities and their relationship with population size, geographic area, population density for each main city council.



3.2.1 National Trends

Under the Climate Change Act, 2008, the UK has a legally binding target in place to reduce greenhouse gas, or carbon, emissions by at least 34% from their 1990 level by 2020 and by 80% from the same level by 2050. Nearly 90% of greenhouse gas emissions are accounted for from CO₂ emissions with the balance being from methane, nitrous oxide and other gases. The long term trend in GHG emissions is shown in Figure 3.1, where it is clear that the recent recession has had a substantial impact, although last year's colder winter has increased emissions because of increased energy demand (Climate Change Committee, 2011).

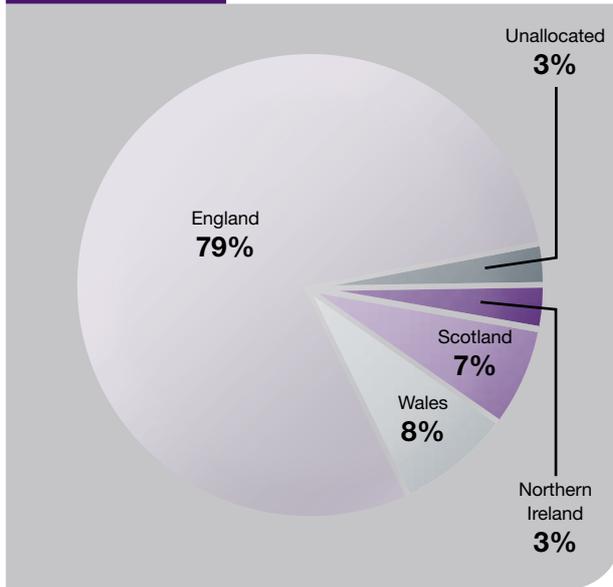
Figure 3.1 UK GHG Emissions: 1990-2010



Source: Committee on Climate Change

Within the UK, the bulk of emissions come from England (79%) with smaller totals from Wales, Scotland and Northern Ireland (Figure 3.2). Scotland has reduced its carbon emissions by 27% since 1990, which represents the biggest reduction ahead of England, 19.8%; Wales, 19.3%; and Northern Ireland, 18.0%.

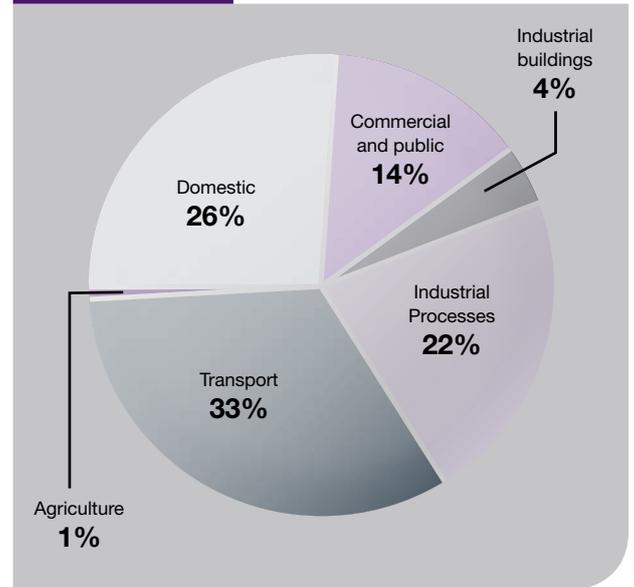
Figure 3.2 CO₂ Emissions: UK and devolved constituents, 2009



Source: AEA, 2009

Emissions from buildings and industry account for more than two thirds of the total GHG emissions in the UK, with the residential sector responsible for 26%, the non-residential sector 18%, and industry 22% (Figure 3.3). In addition, it is estimated that around 16% of the entire carbon footprint of the UK construction industry is related to design, manufacture, distribution and on-site operations activities, with 84% accounted for by energy use for electricity, water and space heating within homes and businesses (and the construction process itself is a carbon intensive activity (Scottish Government, 2010).

Figure 3.3 Breakdown of UK carbon emissions by sector



Source: Carbon Trust, 2009

The previous Labour Government's Low Carbon Transition Plan (HM Government, 2009) set out the steps needed to meet the 34% cut in emissions on 1990 levels by 2020. The new Coalition Government subsequently produced its Carbon Plan (DECC, 2011c) in March 2011 which sets out its thinking on economy-wide reductions across government departments, including the commencement of activity by the Green Investment Bank by September 2012, further details on the Green Deal, and further reference to planning reforms to underpin the Carbon Plan, although this has not yet superseded the sectorally-focused Low Carbon Transition Plan of the previous administration.

3.3.1 Introduction

The Department of Energy and Climate Change (DECC) publish annual statistics on carbon emissions at regional and local authority levels. There are two datasets used for reporting local authority emissions: the first dataset includes all emissions for each local authority. The second set reports on data used for the National Indicator N186, which is based on a subset of indicators excluding those emissions which local authorities have no influence over, such as motorways, diesel railways, land use, land use change and forestry (LULUCF) and some EU Emissions Trading Scheme installations (DECC, 2011d). Both datasets are available for 2005 to 2009. DECC has also developed final energy consumption data to regional and local authority levels covering the same period, and with experimental data for the two previous years.

Two recent reports have used this data to compare cities in the UK. The GVA Grimley report, 'Emission Impossible' (GVA Grimley, 2011), for example, examines the UK's 'core cities' in terms of their property and carbon emission levels, using the NI 186 dataset. The report focuses particularly on commercial property and its emissions in these 11 cities. The IPPR's report, 'Cities Outlook' (Centre for Cities, 2011), also compared carbon emissions across 64 UK cities using the full NI 186 dataset.

This part of the report therefore builds on this work, using NI 186 data (with exclusions) and other related data, to:

- Examine both emissions and energy consumption patterns in the UK's Top 20 cities (by population size) over the period, 2005-2009 for carbon emissions and for 2005-2008 for energy consumption using, at the time of writing, the most up to date DECC data and which are the best data currently available; and,
- Examine the relationships between the population size, geographic area, population density, GDP of UK's largest (or 'Top') 50 cities (by population size) and carbon emissions and energy consumption patterns. This analysis used the most up to date 2008 data for all variables to ensure consistency of dates.

The analysis has been carried out at a city-based local authority level for each of the cities selected. To ensure consistency with other data, there is no attempt made therefore to use 'primary urban areas'; rather, the analysis includes the information and data relating to a single local authority for each city. A variety of data sources were used for sourcing the relevant information including:

- GVA Nuts level data, and
- Audit Commission Household Waste data (which also included area and population density figures).

Carbon emissions have been analysed on the basis of the NI 186 dataset (with exclusions), which has been the 'preferred' indicator set of the majority of local authorities.



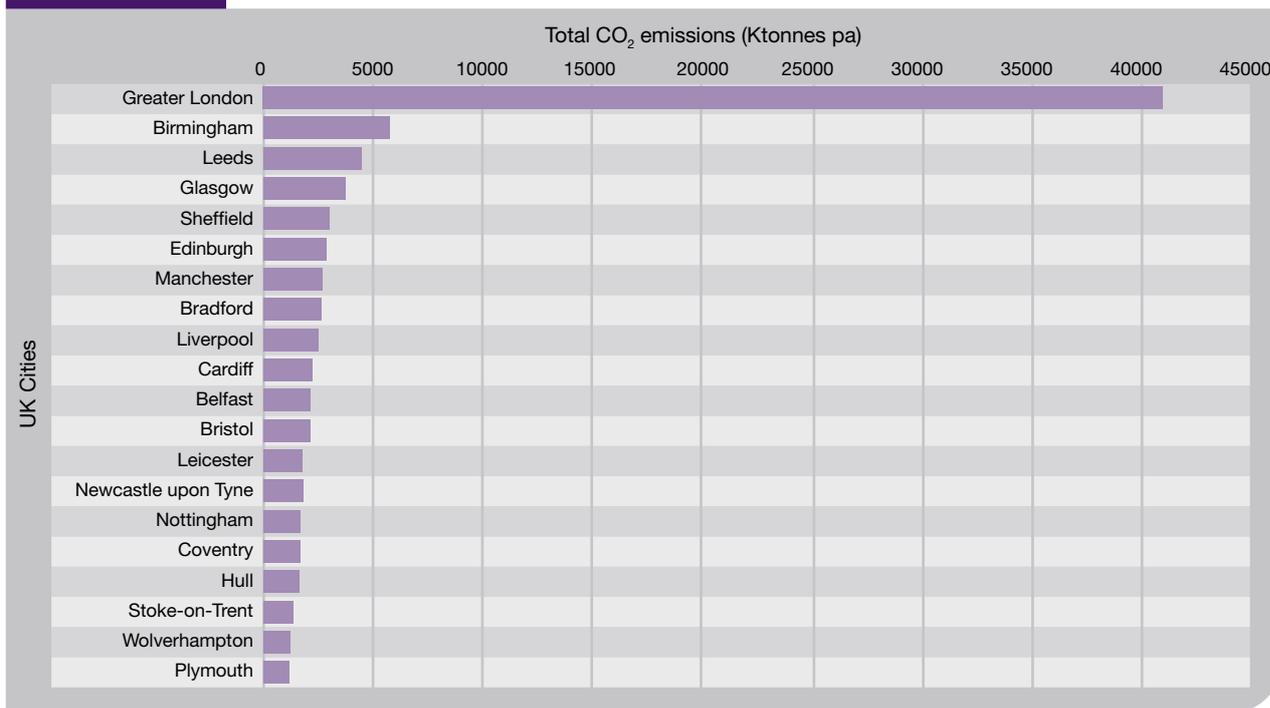
3.3.2 UK cities: total and per capita emissions

Key messages:

- Greater London has the highest total CO₂ emissions in the Top 20 UK cities. The highest per capita emissions in England were in Newcastle, followed by Hull, Stoke and Leicester.
- Per capita emissions in Cardiff, Edinburgh and Belfast were higher than their English counterparts. Cities in each country have lower per capita emissions than the country in which they are located.
- Differences in emissions reflect such factors as travel patterns, industrial and business composition of cities and the age and relative energy efficiency of housing stock.
- The Top 20 UK cities are responsible for 22% of the UK's carbon emissions in 2009, which is approximately the same proportion as 2005.
- Between 2005 and 2009, the Top 20 cities reduced their total emissions by about 12.5% overall, which compares very closely with the UK average.

Figure 3.4 shows the relative pattern of CO₂ emissions from the top 20 UK cities, with Greater London the highest emitter at some 42 million tonnes of carbon in 2009.

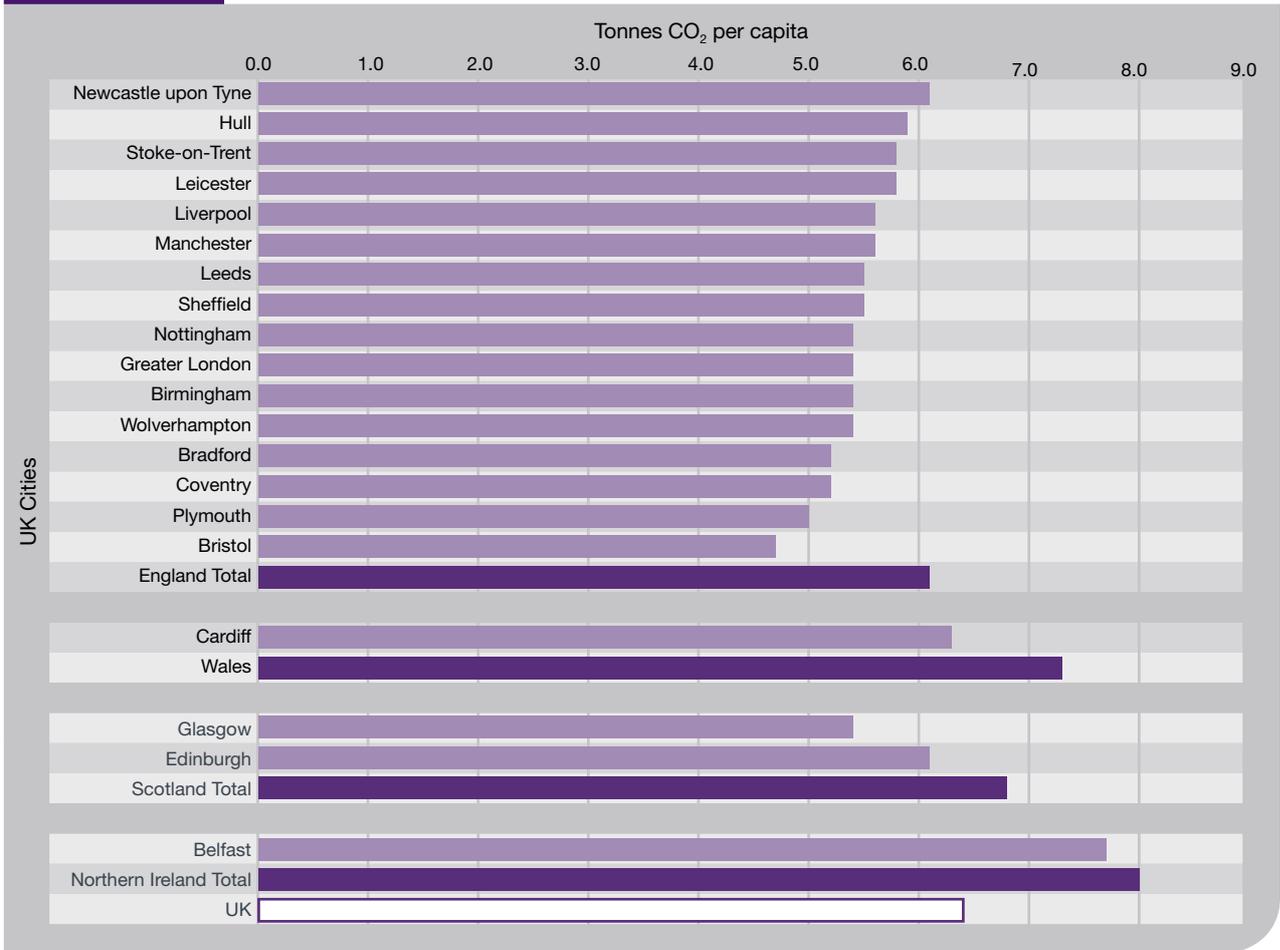
Figure 3.4 Total CO₂ emissions, 2009: Top 20 UK Cities



Source: DECC, 2011e

In 2009, the highest per capita emissions in England were in Newcastle, followed by Hull, Stoke and Leicester (Figure 3.5). Per capita emissions in Cardiff, Edinburgh and Belfast were higher than their English counterparts. All top 20 cities, however, had smaller per capita emissions figures than the overall national figure, and supports the view that cities are more 'carbon efficient' than other locations.

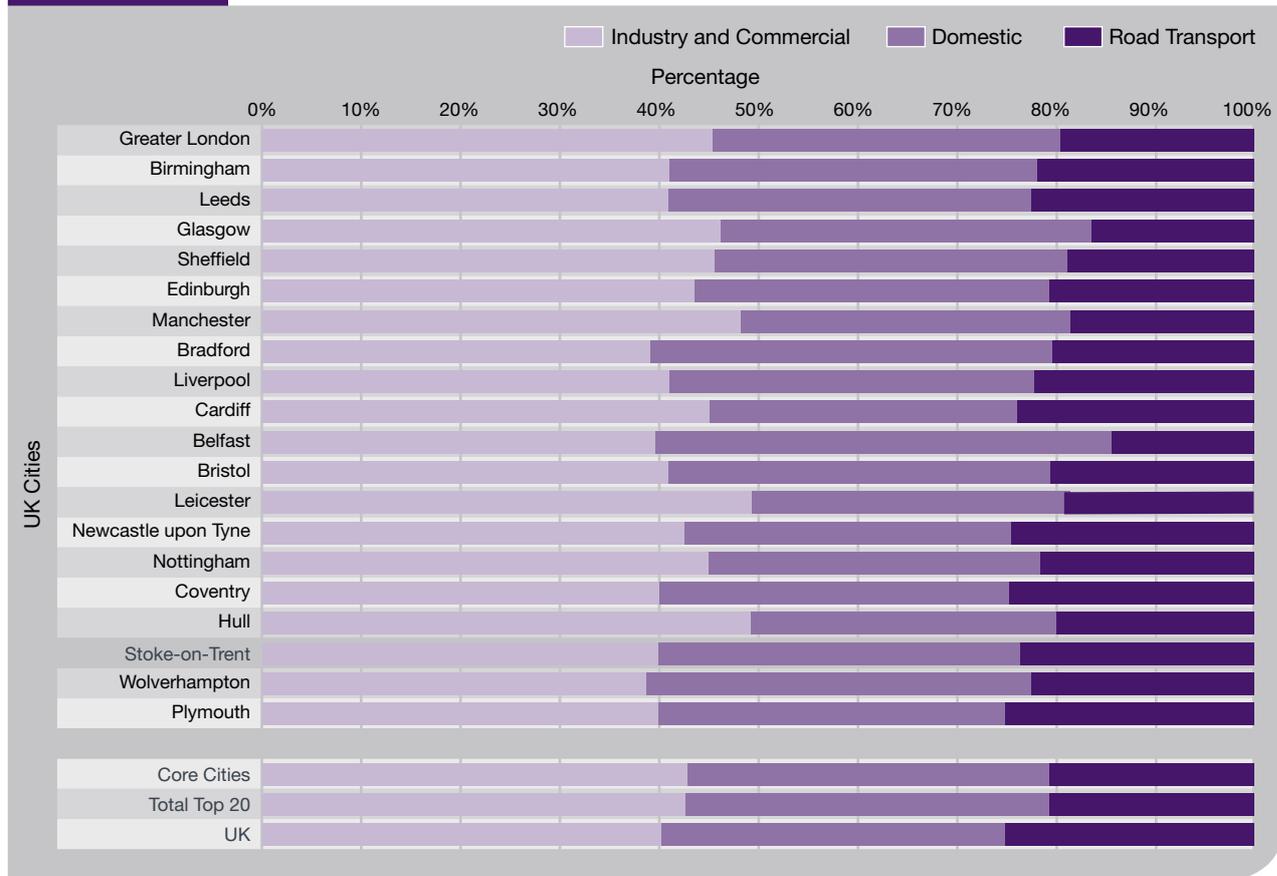
Figure 3.5 Per capita CO₂ emissions, 2009: Top 20 UK Cities



Source: DECC, 2011e

Cities also vary in their emissions pattern by sector. As Figure 3.6 shows, some cities such as Leicester, Manchester and Hull have a relatively greater proportion of industrial and commercial emissions and others, such as Cardiff and Newcastle, a relatively greater proportion of transport emissions. In contrast, 47% of Belfast's emissions are from the domestic sector, which is the highest in the top 20 cities. These differences reflect such factors as travel patterns, industrial and business composition of cities and the age and relative energy efficiency of housing stock, and possibly also other factors such as area, population density and wealth (see section 3.5).

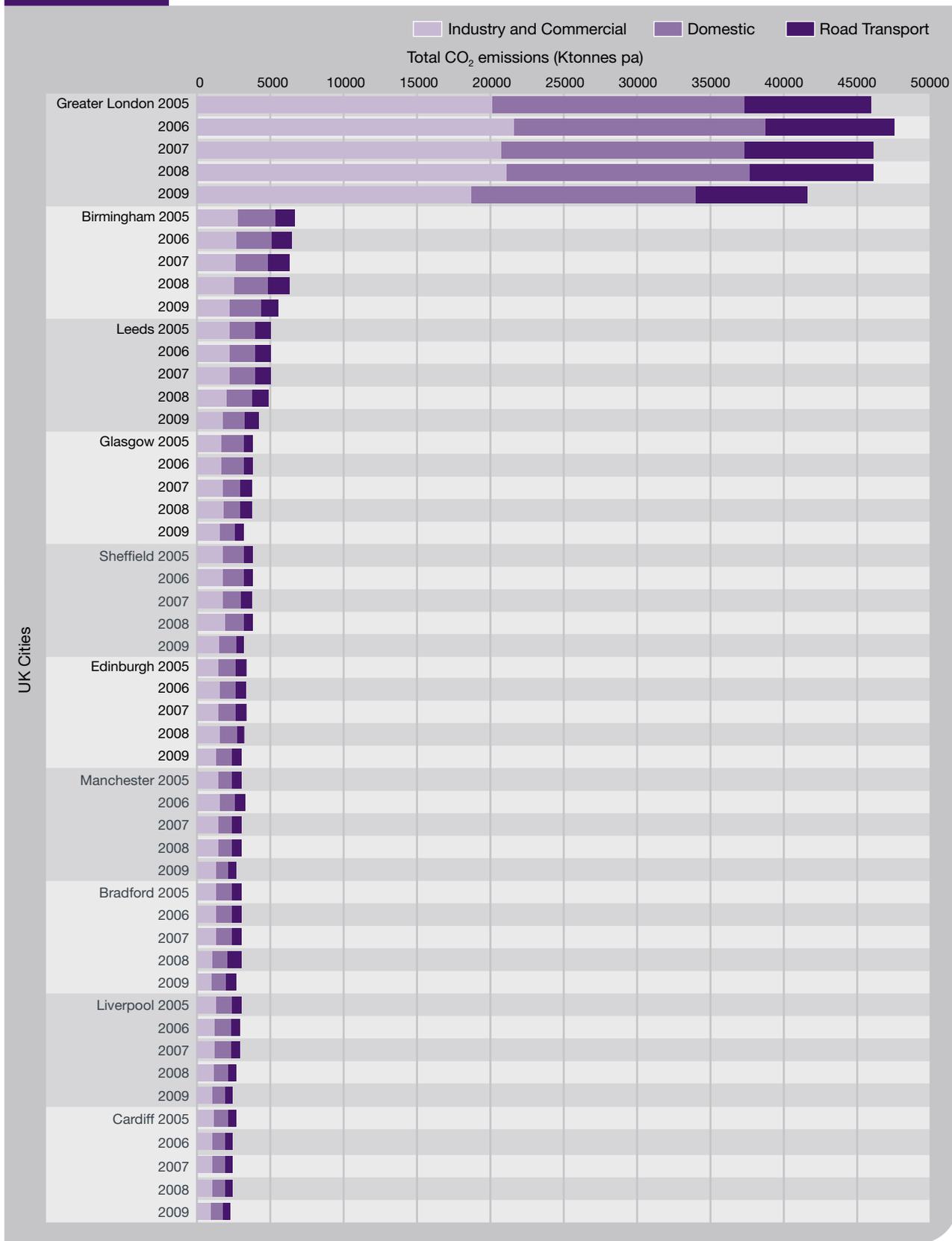
Figure 3.6 Total emissions, by sector 2009: Top 20 UK Cities



Source: DECC, 2011e

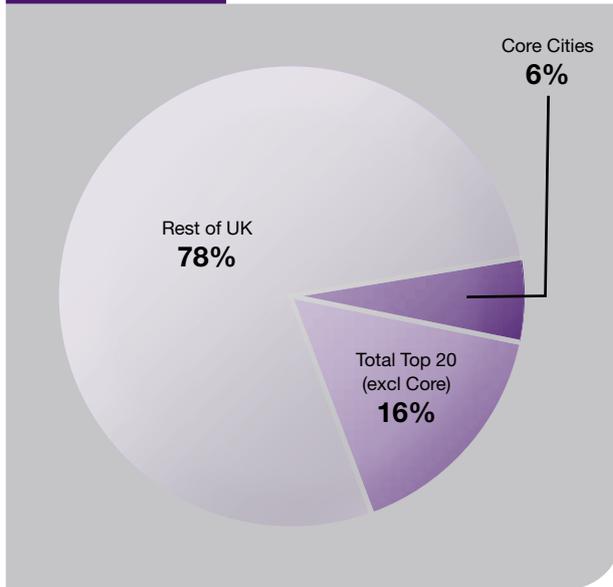
Cities have also been reducing emissions over time. Figure 3.7, for example, shows how this pattern has played out by sector between 2005 and 2009. It also shows how Greater London continues to be the main city carbon emitter in the UK. In overall terms the 20 cities shown were responsible for 22 % of the UK’s carbon emissions in 2009, which is approximately the same proportion as 2005 (Figure 3.8).

Figure 3.7 Total emissions, by sector: 2005-2009: Top 10 UK Cities



Source: DECC, 2011e

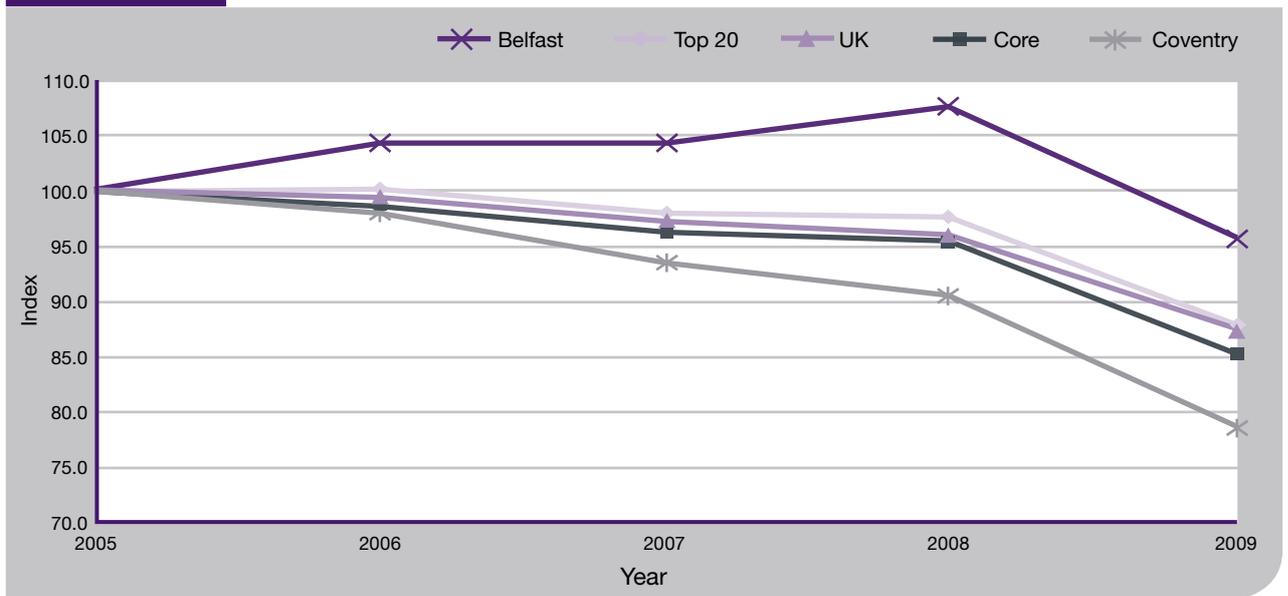
Figure 3.8 Total emissions, by city type: 2009



Cities have made some progress in reducing emissions. Clearly, the recession has played a part in reducing energy demand and consumption and therefore emissions, but changes to the composition of primary energy consumption and sectoral changes in final use have also been important. Between 2005 and 2009, the Top 20 cities reduced their total emissions by about 12.5% overall which compares very closely with the UK average (Figure 3.9).

Source: DECC, 2011e

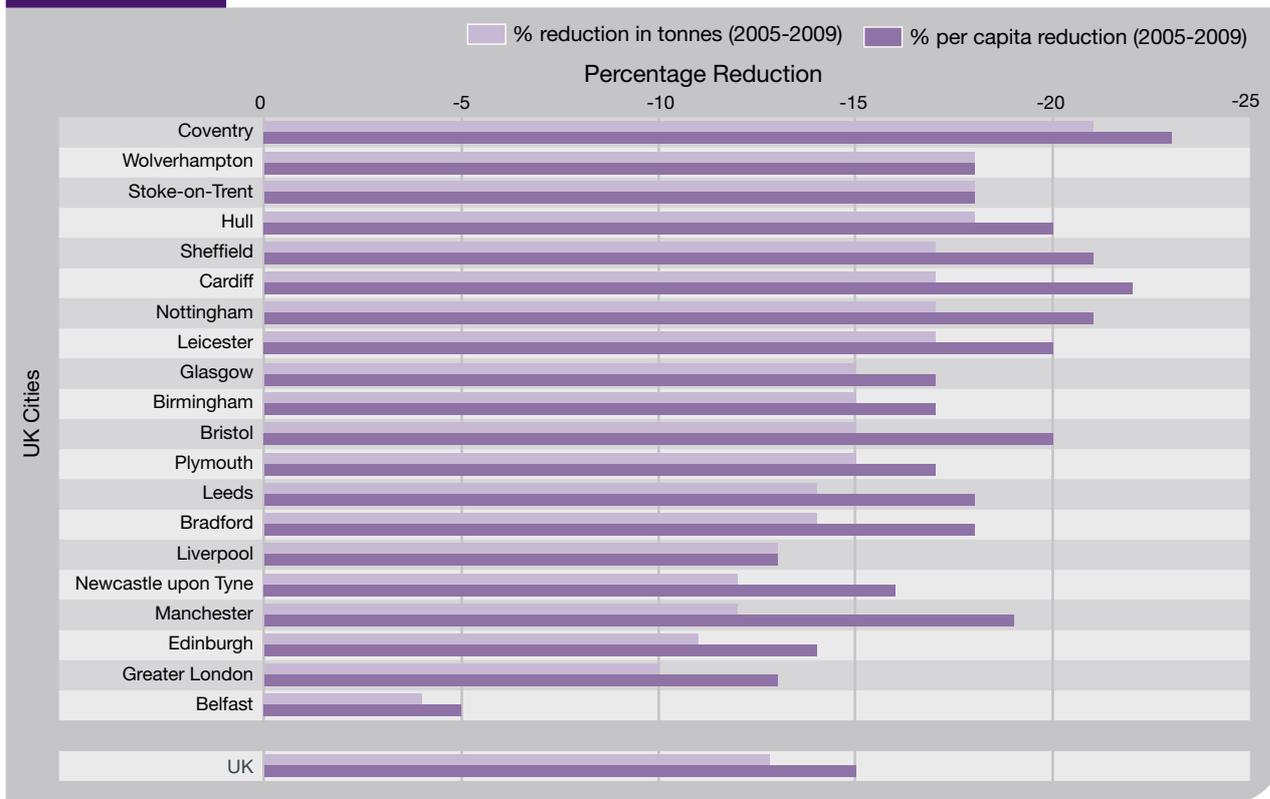
Figure 3.9 Overall reductions in emissions (Index, base: 2005), 2005-2009



Source: DECC, 2011e

The best performing cities in terms of overall reductions and per capita reductions were Coventry and Wolverhampton. The poorest performers in terms of total emissions reductions were Newcastle, Manchester, Edinburgh, London and Belfast, with Belfast actually increasing its emissions over the period 2007-2008 (Figure 3.10). However, there are variations between per capita and overall reductions. For example, Manchester's per capita reduction over the period, which takes into account changing population, is larger than its overall reduction.

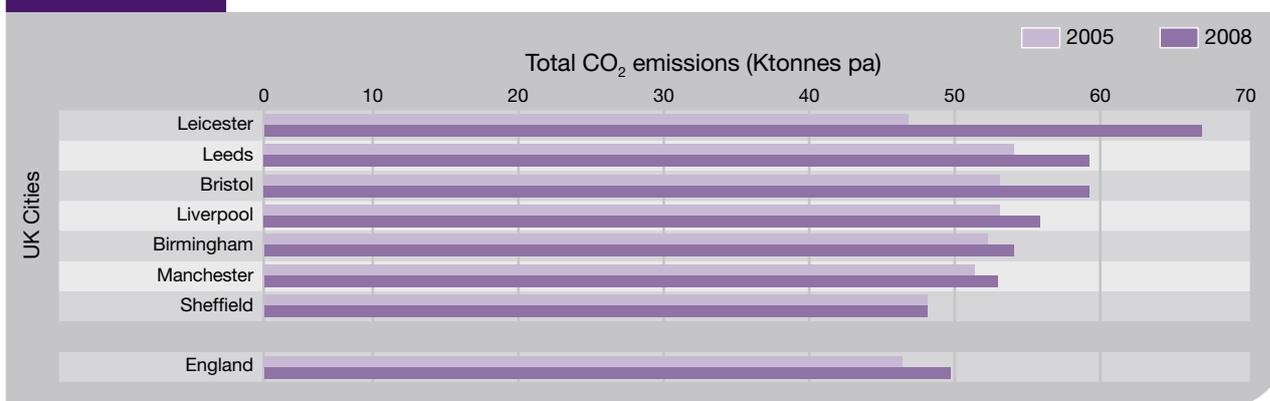
Figure 3.10 Reductions in emissions (total and per capita), 2005-2009: Top 20 UK Cities



Source: DECC, 2011e

The improvements in carbon emissions are also borne out by the increase in the government's Standard Assessment Rating Procedure (SAP) energy efficiency ratings for private dwellings in English cities where data is available (Figure 3.11).

Figure 3.11 SAP Ratings: 2005 and 2008 – sample of UK cities

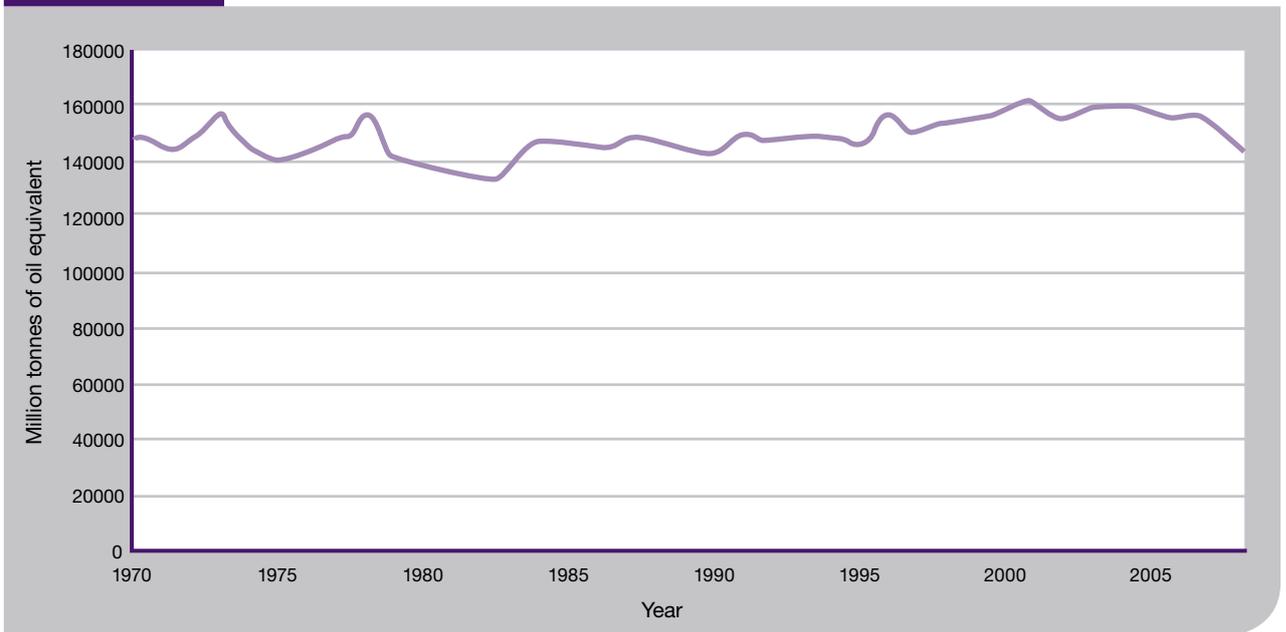


Source: ONS, 2011a

3.4.1 National Trends

Final energy consumption peaked in the UK in 2001 at 160.9 m tonnes of oil equivalent. Between 1970 and 2001, final energy consumption increased by 10% but between 2001 and 2009, it fell by 11% (Figure 3.12). The overall fuel mix has changed substantially since 1970 as natural gas replaced oil. The recent recession reduced overall energy consumption by some 7% between 2008 and 2009. The majority of energy in the UK is used for heat (i.e. some 77% of all non-transport energy consumption in 2008 although this varied from 84% in the domestic sector to 73% in the industrial sector and 67% in the services sector).

Figure 3.12 UK final energy consumption: 1970-2009



Source: DECC, 2011f

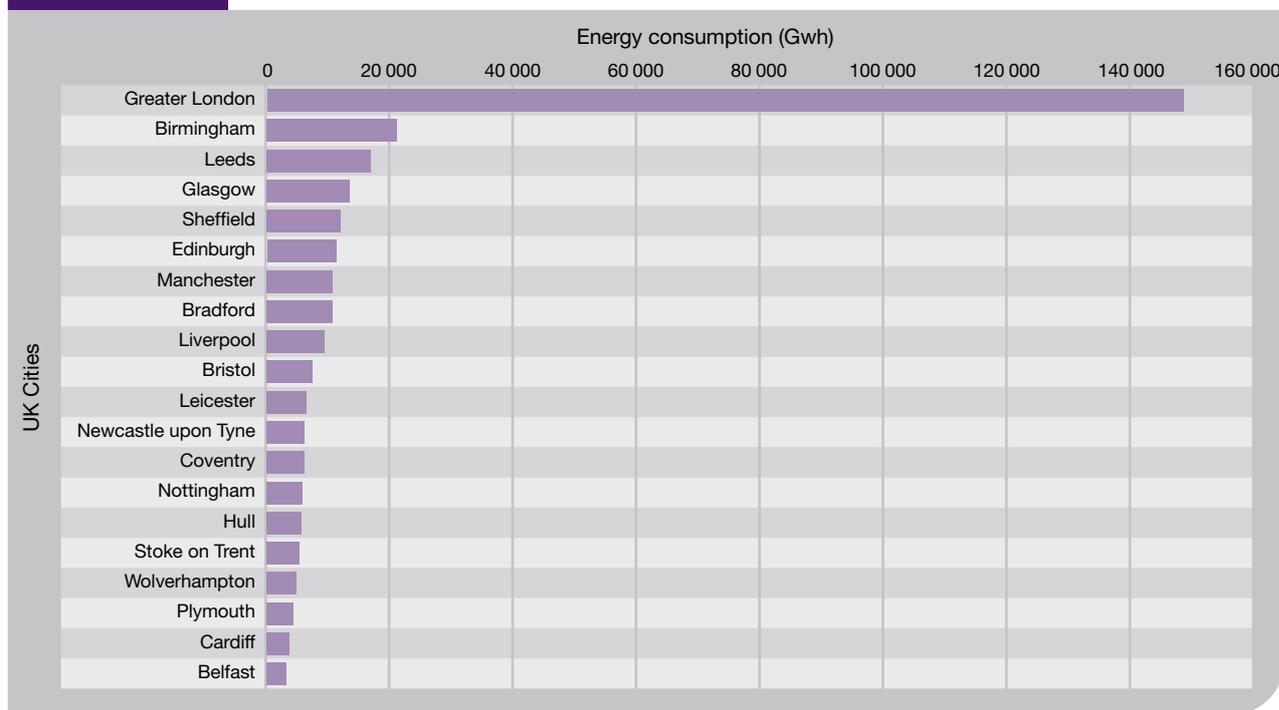
3.4.2 UK city analysis

Key messages:

- Greater London is the highest consumer of energy in the Top 20 UK cities.
- The highest per capita consumption in the UK was in Cardiff, Edinburgh, Glasgow and Leeds, but all 20 cities had smaller per capita energy consumption figures than the overall national figures.
- In overall terms, the Top 20 UK cities shown were responsible for 20% of the UK's primary energy consumption in 2008, which is approximately the same proportion as 2005.
- Between 2005 and 2008, the Top 20 UK cities reduced consumption by about 7.5% compared with 7.7% for the UK as a whole.

Figure 3.13 shows the relative pattern of primary energy consumption from the top 20 cities, with Greater London the highest consumer at some 148,000 Gwh in 2008.

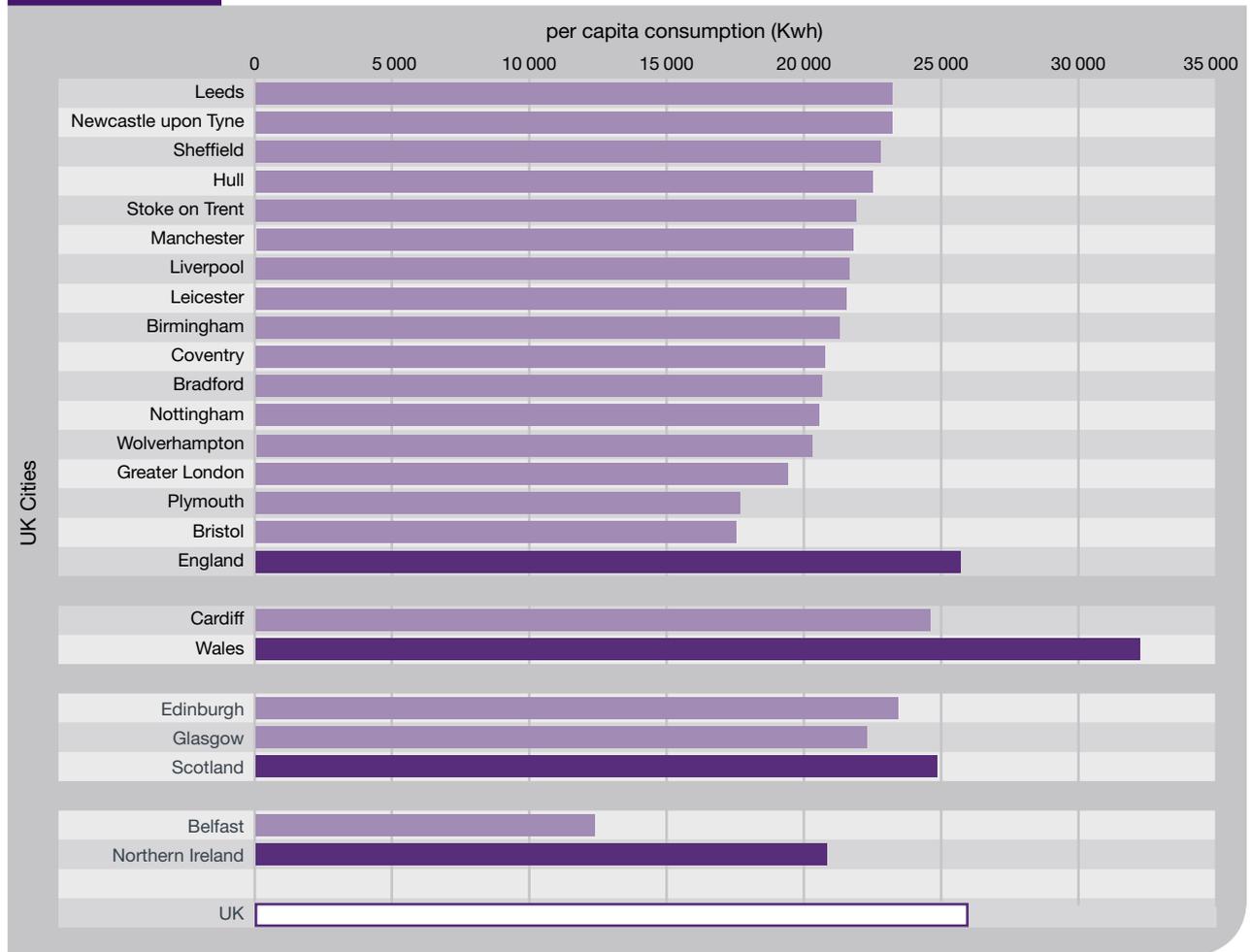
Figure 3.13 Total energy consumption, 2008: Top 20 UK cities



Source: DECC, 2011e

In 2008, the highest per capita consumption in the UK was from Cardiff, Edinburgh, Glasgow and Leeds (Figure 3.14). As with carbon emissions, however, all 20 cities had smaller per capita energy consumption figures than the overall national figures.

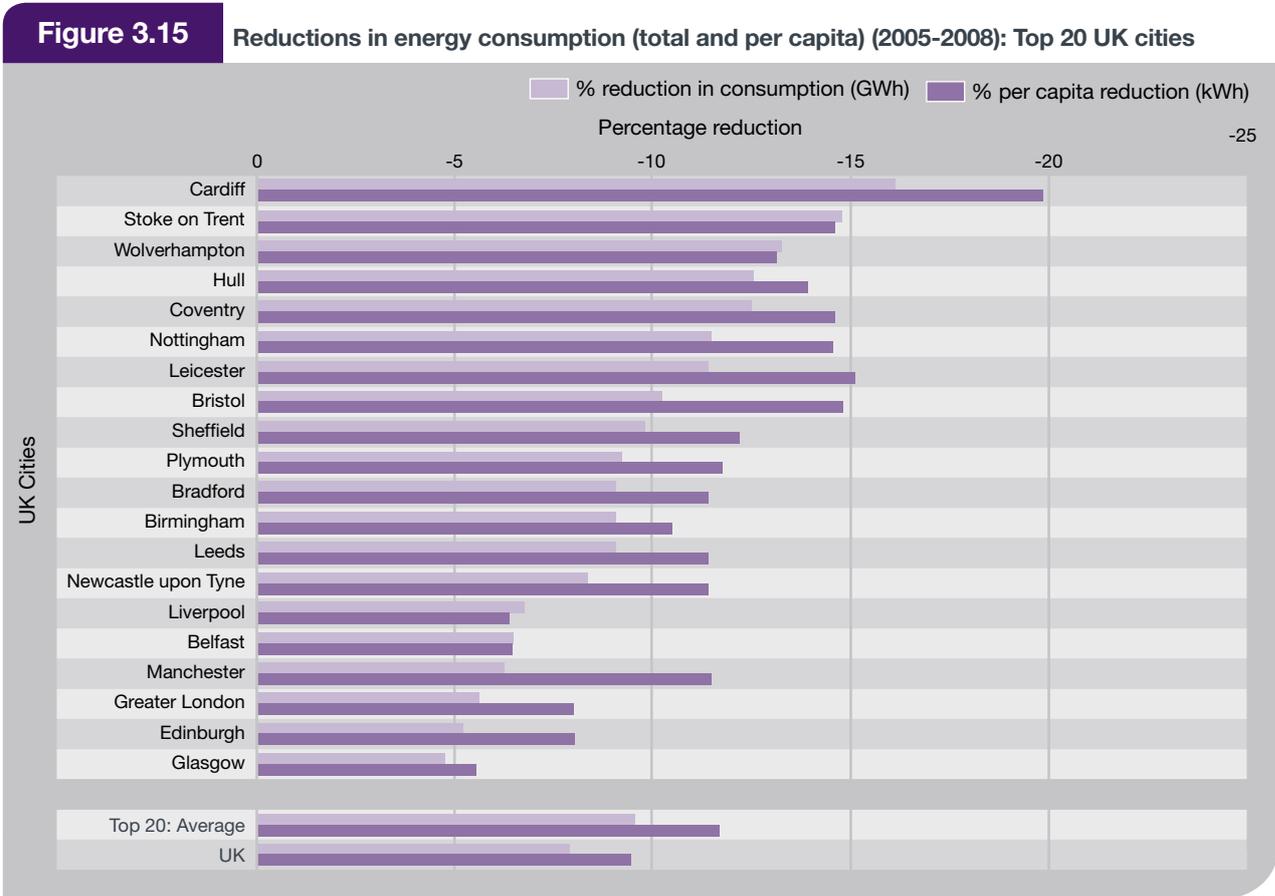
Figure 3.14 Per capita energy consumption, 2008: Top 20 UK Cities



Source: DECC, 2011e

Cities have been reducing their energy consumption over time. Figure 3.15 shows the pattern for 2005-2008, with Greater London the major consumer of energy. In overall terms, the 20 cities shown were responsible for 20% of the UK’s primary energy consumption in 2008, which is approximately the same proportion as 2005.

As with emissions, cities have also made some progress in reducing energy consumption. Between 2005 and 2008, the Top 20 cities reduced consumption by about 7.5% compared with 7.7% for the UK as a whole. The best performing cities in terms of overall reduction and per capita reductions were Cardiff, Stoke, Wolverhampton and Hull (see Figure 3.15). The worst performing cities were Glasgow, Edinburgh, London, Manchester and Belfast. Again, a combination of the recent economic recession, changes in sectoral demand and consumption have played their part in bringing about reductions.



Source: DECC, 2011e

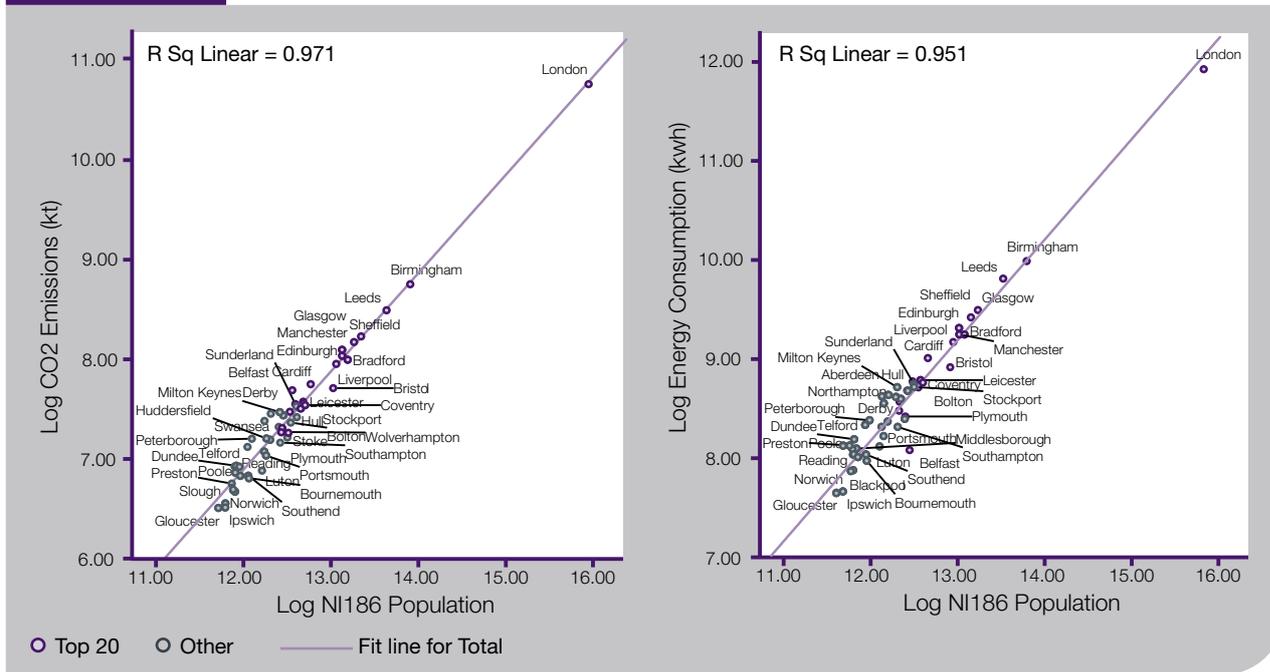
3.5 An analysis of carbon emissions and energy consumption in UK cities

Key messages:

- Larger, more populated UK cities create more emissions and consume more energy than smaller cities (overall terms).
- UK cities which occupy larger geographic areas create more emissions and consume more energy than smaller cities (overall terms).
- Densely populated UK cities are associated with lower emissions and lower energy consumption than less dense cities (per capita terms).
- There is weaker evidence to suggest that wealthier UK cities create more emissions and consume more energy than less wealthy cities.
- UK cities which produce high per capita emissions also tend to produce high per capita waste. Cities which produce lower per capita carbon emissions tend also to produce lower amounts of per capita waste.

It is clear from the previous sections that there is a strong relationship between carbon emissions and energy consumption in UK cities. Moreover larger, more populated cities have more emissions and consume more energy than smaller cities in overall terms (Figure 3.16).

Figure 3.16 Top 50 UK Cities: Carbon Emissions, Energy Consumption and Population, 2008



In other words, those cities that consume more energy are also likely to produce more carbon emissions.

Cities which occupy a larger geographic area also create more carbon emissions and consume more energy in overall terms (Figure 3.17).

Cities which have higher population densities (and which may be more 'compact') tend to have lower per capita emissions and per capita energy consumption (Figure 3.18).

Figure 3.17 Top 50 UK Cities: Carbon Emissions, Energy Consumption and Geographic Area, 2008

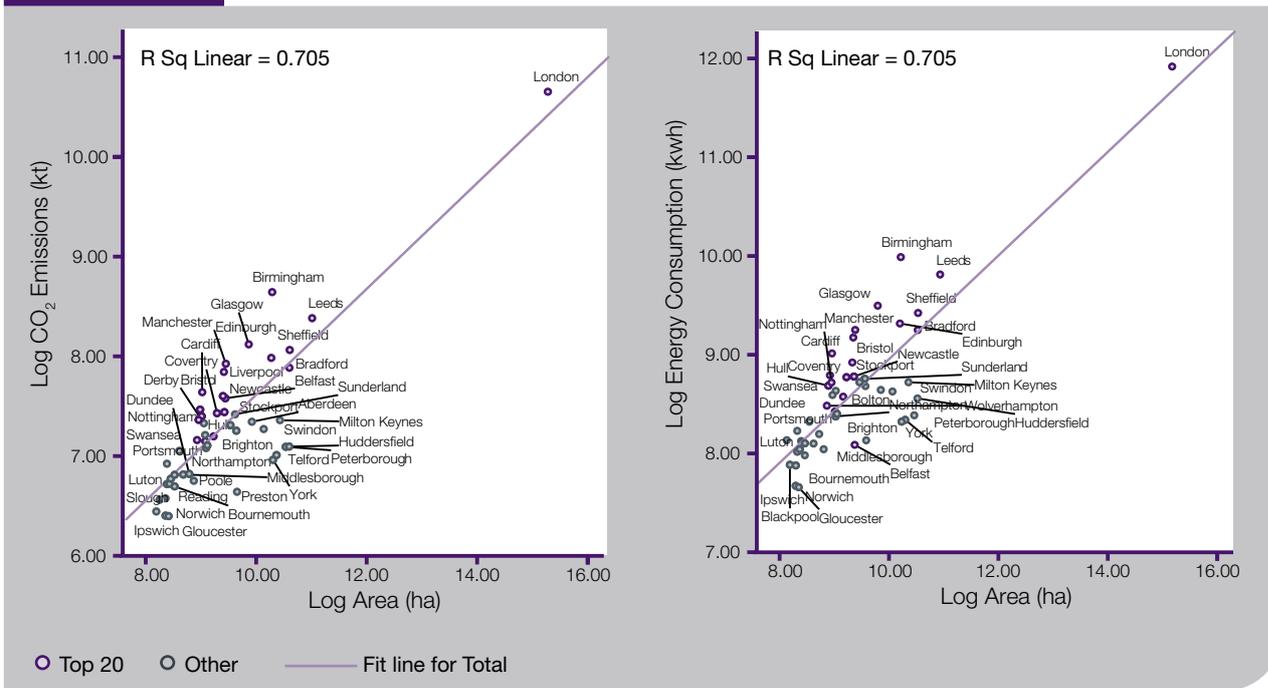
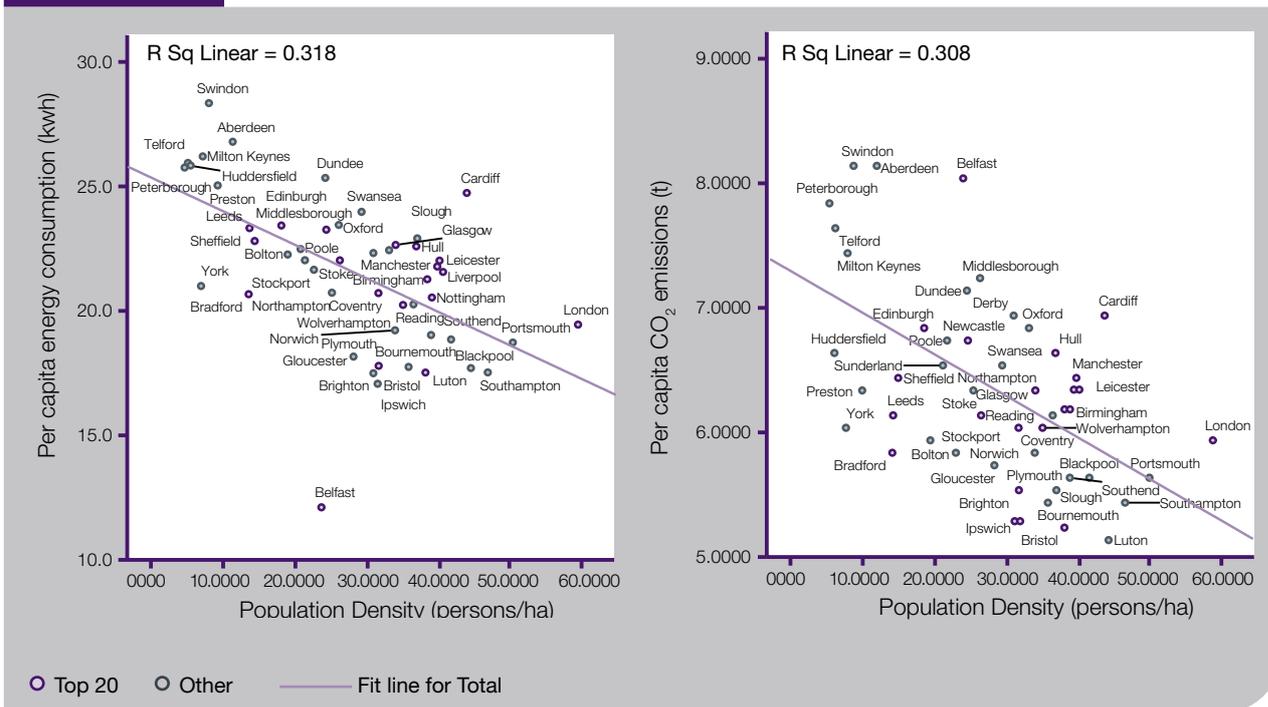
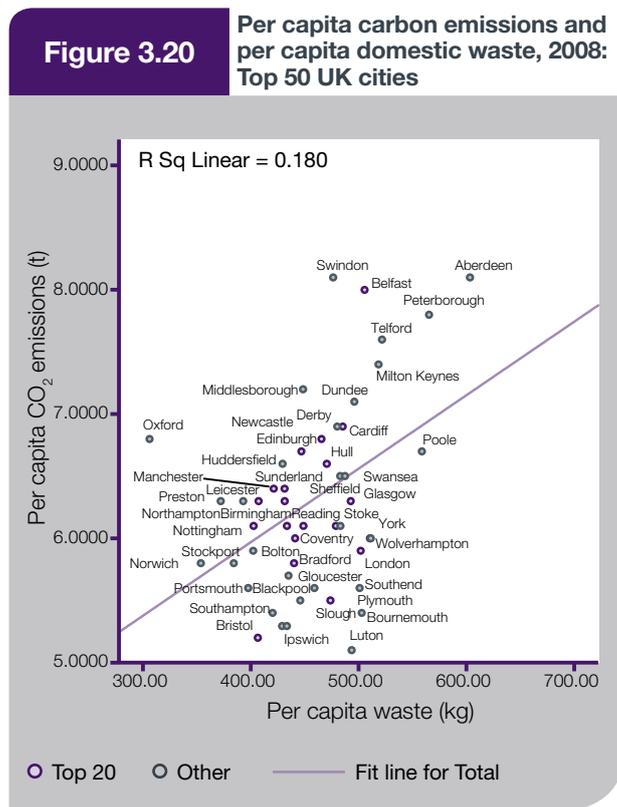
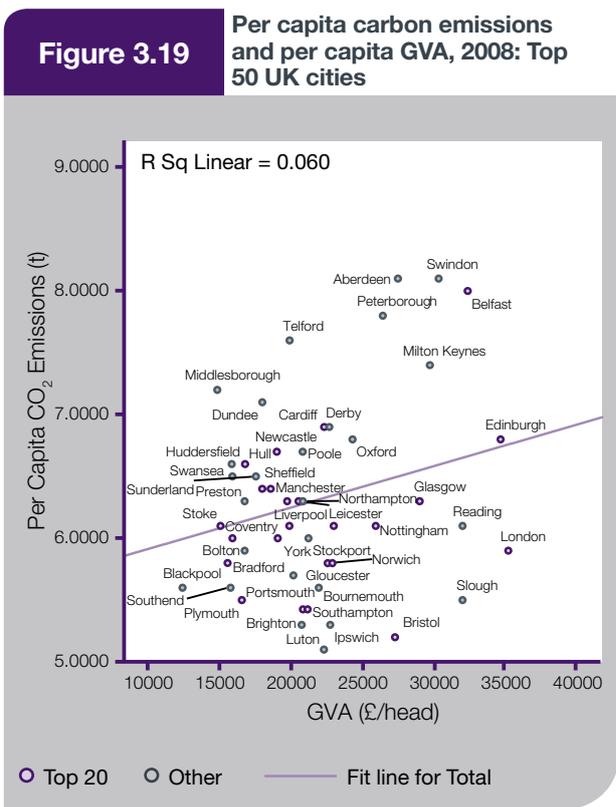


Figure 3.18 Top 50 UK cities: carbon emissions, energy consumption and population density, 2008



The relationship between emissions and wealth is less clear, with some evidence of higher carbon emissions being associated with higher wealth in cities. There is also evidence, however, that some cities have relatively lower per capita emissions associated with higher wealth (for example, London, Slough, Bristol and Reading) (Figure 3.19).

Finally, as Figure 3.20 shows, cities which produce high per capita emissions also tend to produce high per capita household domestic waste. Cities which produce lower per capita carbon emissions tend also to produce lower amounts of per capita household domestic waste.



4.1 Introduction

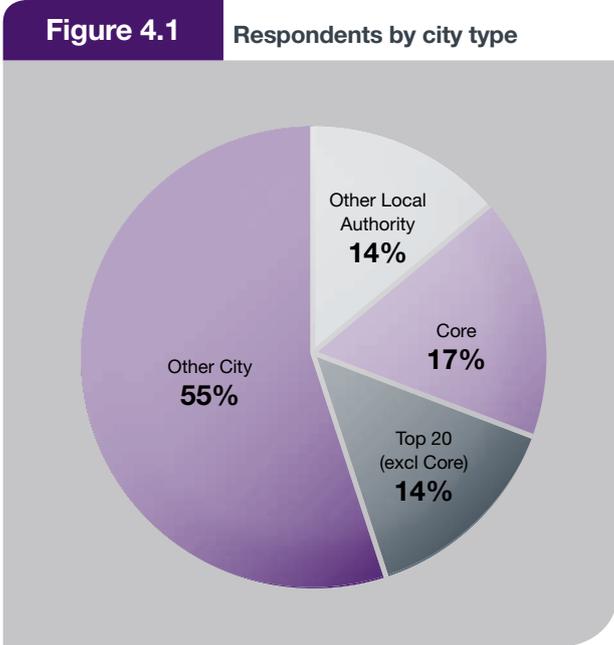
This chapter of the report reviews the results of the online survey to the UK’s Top 60 cities (by population size). The results are summarised in terms of:

- Respondent profile;
- Agreed low carbon action plans and strategies;
- Overall and sectoral carbon emission targets and timeframes;
- Mitigation and adaptation plans;
- Partnership agreements;
- Low carbon ambitions and drivers and barriers for low carbon cities;
- Impact of the Green Deal and localism;
- Likelihood of achieving renewables target;
- Best practice for a low carbon future; and,
- Moving to a low carbon future by 2050.

4.2 Respondents

Some 52 full responses were received for the survey, which represents an 86% response rate¹⁰. These included full responses from 5 of the 8 English UK ‘core’ cities (Birmingham, Bristol, Liverpool, Manchester, and Nottingham) together with other UK ‘core’ cities (Cardiff, Edinburgh and Glasgow), London, and the other 9 ‘top 20’ cities (by population size)¹¹ (Figure 4.1). Other local authorities included county councils, partnership authorities and several other smaller local authorities.

A full list of respondent cities and local authorities is included in Appendix 1 (see Volume 2 of this report).



Source: DECC, 2011e

Respondents were senior sustainability officers or climate change officers within their respective local authorities.

¹⁰ Based on contact with ‘Top 60’ UK cities, and ‘open source’ contact through the Local Government Association newsletter. In the case of two responses for the same city these were included only where questions were ‘attitudinal’ in nature. Throughout the analysis the categories are ‘Top 20’ and ‘other’, which includes all cities and other local authorities outside the Top 20.

¹¹ Newcastle, Sheffield and Leeds respondents partially completed the survey.

4.3 Agreed low carbon action plans and strategies

Key messages:

- The majority of UK cities have agreed action plans and strategies in place.
- Climate change plans are in place at a city level (65% of cases) or a low carbon plan for the local authority as an organisation is in place (63%). Fewer cities have an explicit 'low carbon' plan or strategy for the city as a whole (24%).
- The Top 20 UK cities tend to have an integrated climate change action plan, which covers low carbon, rather than an explicit low carbon action plan.

In the survey, we defined both low carbon plan and climate change action plan. A low carbon plan is a specific plan or strategy which is developed to formalise the way in which a city (or local authority, as an organisation) moves to a low carbon future, for example, by reducing carbon emissions (and/or reducing energy consumption) in key areas of activity. In contrast a climate change action plan is defined as a plan or strategy which sets out the way in which climate change is being tackled by a local authority at a city level through various mitigation and adaptation strategies, and which will also include key carbon reduction targets and other aspects of a low carbon agenda.

From Figure 4.2, it is clear that the majority of plans in place were climate change plans at a city level (65% of cases: multiple response) followed by specific low carbon plans for the local authority (63% of cases), with fewer cities (24% of cases) employing specific low carbon plans for the city itself (i.e. as a geographic area). 'Other' plans (42%) included those relating to 'sustainable energy' or 'sustainable development'.

Where cities had no low carbon action plans in operation, this was because they were either currently working on such a plan, or they had no resources to develop one, or the low carbon agenda was considered to be more appropriate within a climate change plan. For example, no low carbon plans were present at all in Belfast or Calderdale (Huddersfield)¹². Worcester and Worcestershire County Council, Edinburgh and Newport had neither low carbon nor climate change plans at city or local authority level but were planning, or had some other kind of plan in operation: for example, in Edinburgh, a High Level Framework (Sustainable Edinburgh 2020) was due to be published with high level climate change targets, a Carbon Management Plan was being finalised, and a city-wide Sustainable Energy Action Plan was anticipated for September 2011.

The Top 20 cities were more likely to have an integrated climate change action plan for the city, which also covers low carbon, rather than an explicit low carbon action plan (for either the local authority or the city as a whole), but the opposite was true of other cities and local authorities outside the Top 20 (Figure 4.3).

Figure 4.2 Agreed action plans and strategies

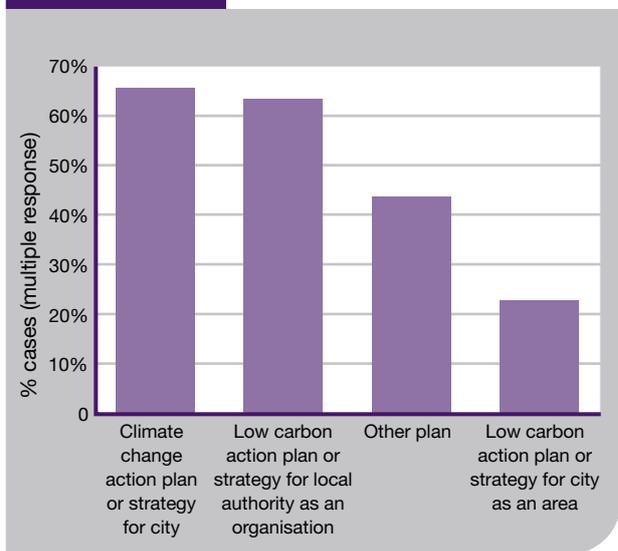
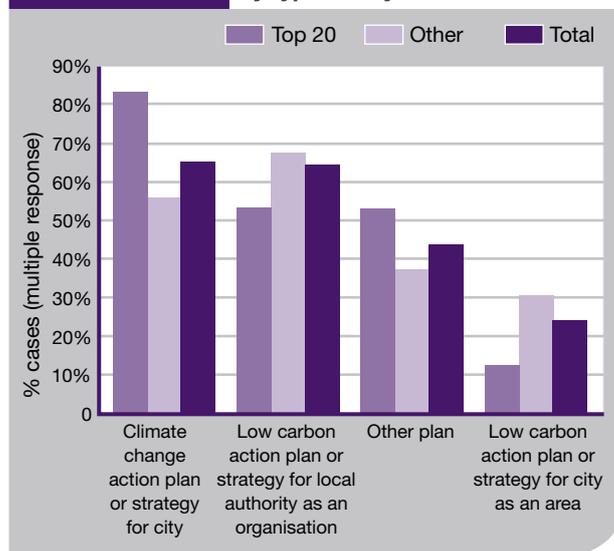


Figure 4.3 Agreed action plans and strategies by type of city



12 Responses were checked against website information where this was possible.

4.4 Action plans and strategies: overall carbon emission targets

Key messages:

- A majority of UK cities have overall carbon emission targets in place. These relate either to the geographic city and/or to the local authority itself.
- Some 59% of UK cities have these targets in low carbon action plans/strategies and 53% have them in their climate change action plan/strategies.
- Top 20 UK cities were more likely to have targets embedded in their climate change action plans than in low carbon action plans. This is related to the fact that 'low carbon' plans tend to be integrated within climate change action plans for the top 20 cities.

Respondents were asked if their plans or strategies contained specific targets. As far as carbon/energy reduction targets are concerned, some 59% of cases (multiple response) included targets in their low carbon action plans or strategies (either at a city level or within the local authority as an organisation), with some 53% of cases reporting such targets in their climate change action plan or strategy. In 24% of cases, such targets were included in 'other plans' (Figure 4.4) which might include sustainable development frameworks or sustainable energy action plans.

Top 20 cities were more likely to have targets embedded in their climate change action plans than in low carbon action plans which is related to the fact that 'low carbon' plans tend to be integrated within climate change action plans for the top 20 cities (Figure 4.5). Cities outside the top 20 were more likely to have targets embedded in low carbon action plans (whether those were city-specific or were those for the local authority as a whole).

Figure 4.4

Action plans and strategies: extent to which overall carbon/energy reduction targets are included

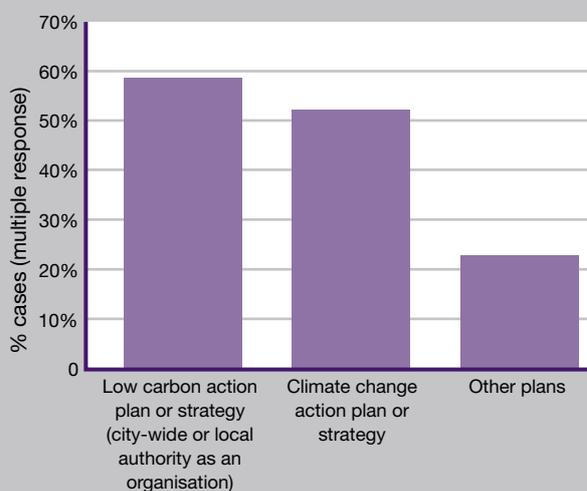
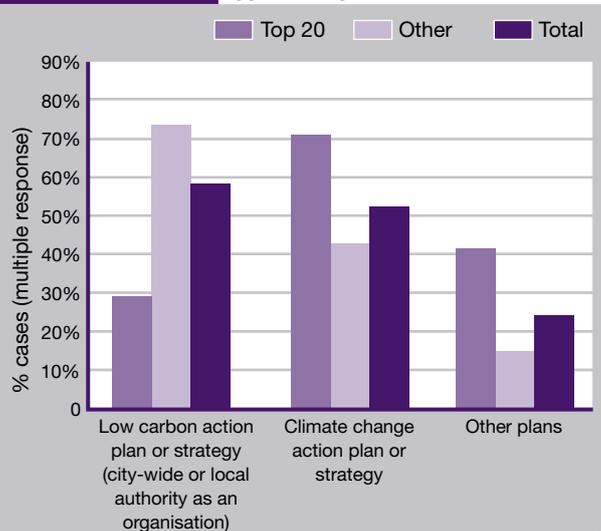


Figure 4.5

Action plans and strategies: extent to which overall carbon/energy reduction targets are included by type of city



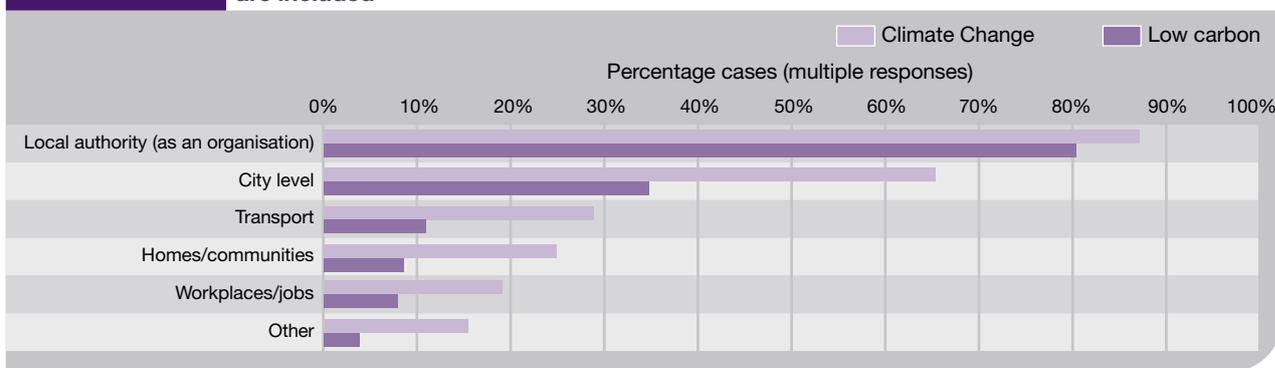
4.5 Climate change/low carbon action plans and strategies: extent to which sectoral carbon emissions targets are included

Key messages:

- UK cities are more likely to have ‘overall’ targets in their plans or strategies than targets for specific sectors such as transport, homes/communities and workplaces/jobs.
- Top 20 UK cities were more likely to have targets embedded for specific sectors than other cities/local authorities.

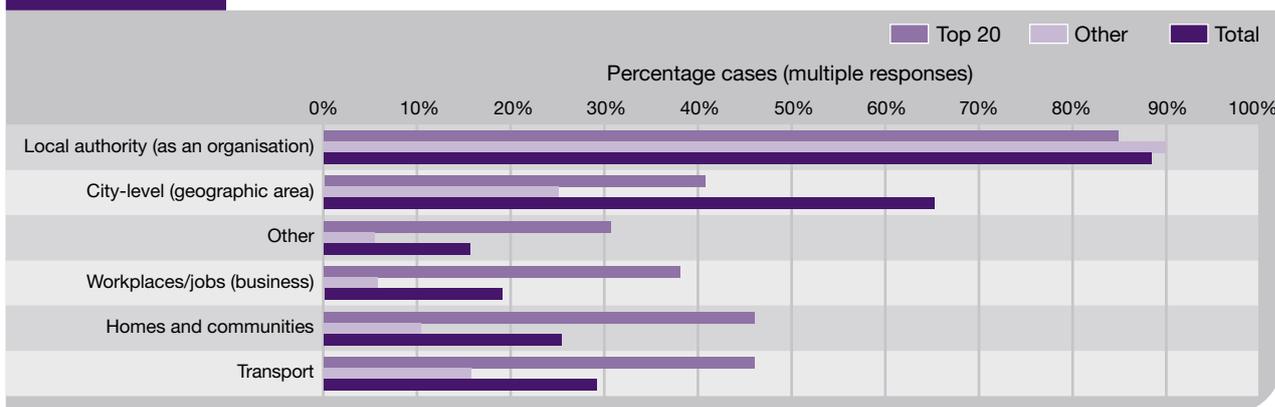
Cities were more likely to have ‘overall’ targets for their local authorities as organisations and cities as geographic areas in both climate change and low carbon plans than targets for transport, homes/communities and workplaces/jobs sectors (Figure 4.6). For example, in some 87% of cases, respondents suggested they had targets in place within their climate change action plans, with 80% in low carbon plans, in contrast to sector specific responses in each group of less than 30%. This confirms the findings in section 4.3 which suggested that climate change plans per se are relatively more common, but also that setting overall targets is more common than sector-specific targets. The ‘other sectors’ category included waste, for example, but is relatively infrequent.

Figure 4.6 Climate change and low carbon plans and strategies: extent to which sectoral targets are included



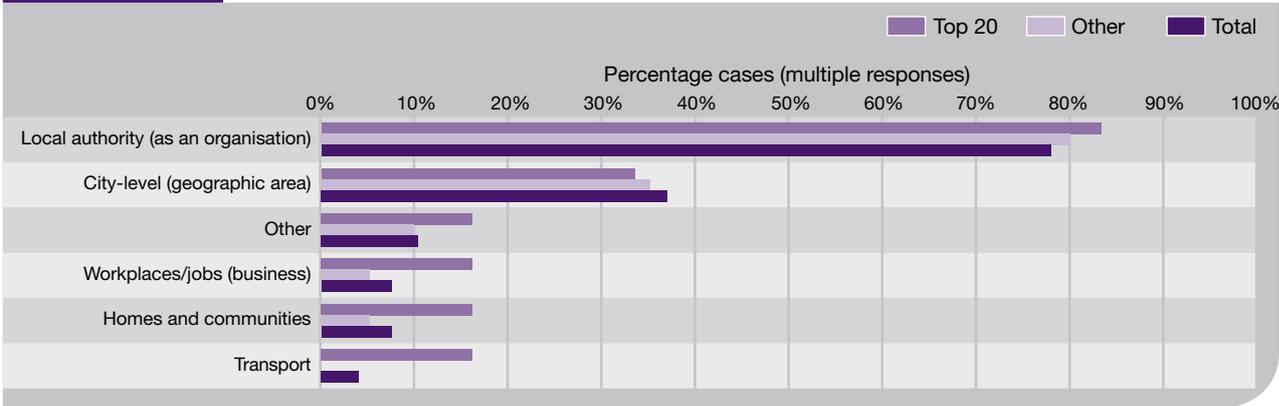
However in **climate change action plans and strategies**, Top 20 cities were more likely to have targets embedded for specific sectors than other cities/local authorities (Figure 4.7). However, overall targets for local authorities (as organisations), and at a geographic city level, were correspondingly also more common than sector-specific targets, such as transport, homes/communities and workplaces/jobs in both Top 20 cities and other cities.

Figure 4.7 Climate change action plans and strategies: sectoral targets by type of city.



Similarly, Top 20 cities were more likely to have set sectoral targets across workplaces, homes and transport in their low carbon plans than other cities (Figure 4.8).

Figure 4.8 Low carbon action plans and strategies: sectoral targets by type of city



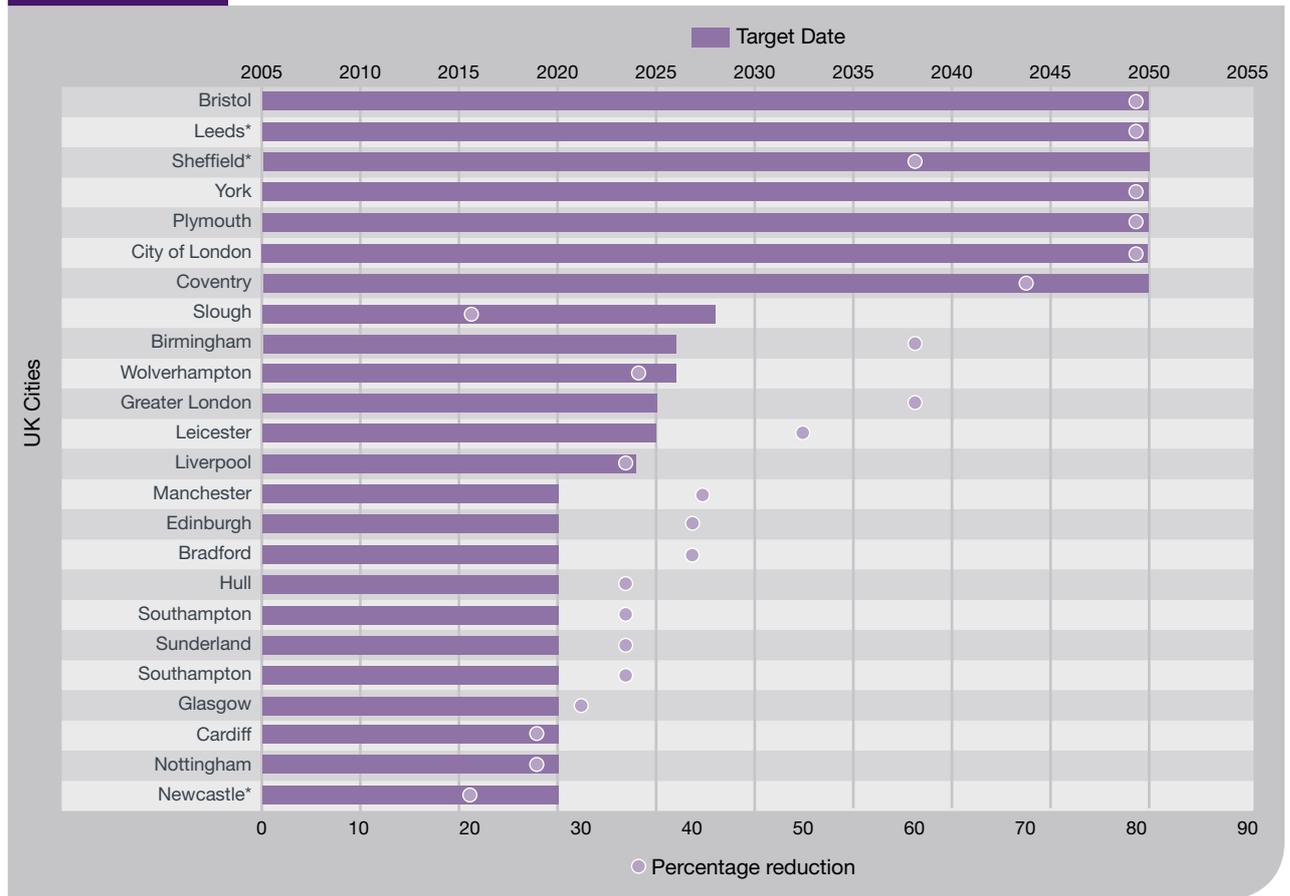
4.6 Action plans and strategies: carbon reduction targets and timeframes

Key messages:

- UK cities have set a wide range of targets within their geographic areas and within their local authorities as an organisation.
- Only seven respondent UK cities had 2050 targets in place, four of which are in the Top 20 cities.
- In Top 20 UK cities where a plan and target were both present, the overall reduction in carbon emissions between 2005 and 2009 was higher than where such plans and targets were absent.
- Top 20 UK cities tend to have longer timescales for their plans in comparison with other cities, which tended to have medium term plans.

Respondents were also asked about their medium and long term targets and timescales for carbon reduction at both a city level and also local authority as an organisation. Not surprisingly there was a wide range of targets¹³. Full details of these are shown in Appendix 2 (see Volume 2 of this report). Figure 4.9 and Figure 4.10 show the targets as summary graphs. Only seven respondent cities had 2050 targets in place, four of which are in the Top 20 cities¹⁴.

Figure 4.9 City level targets



Source: DECC, 2011e

13 Targets are given in percentage terms, but will vary as between absolute and per capita reductions. The majority are per capita reductions with a few such as Bristol employing absolute reduction targets. 14 Three Top 20 cities provided only partial responses. However, for the purpose of comparison, Leeds has a 40% reduction target by 2020 and 80% by 2050. Sheffield, 30% by 2020 and 60% by 2050; and Newcastle, 20% by 2020.

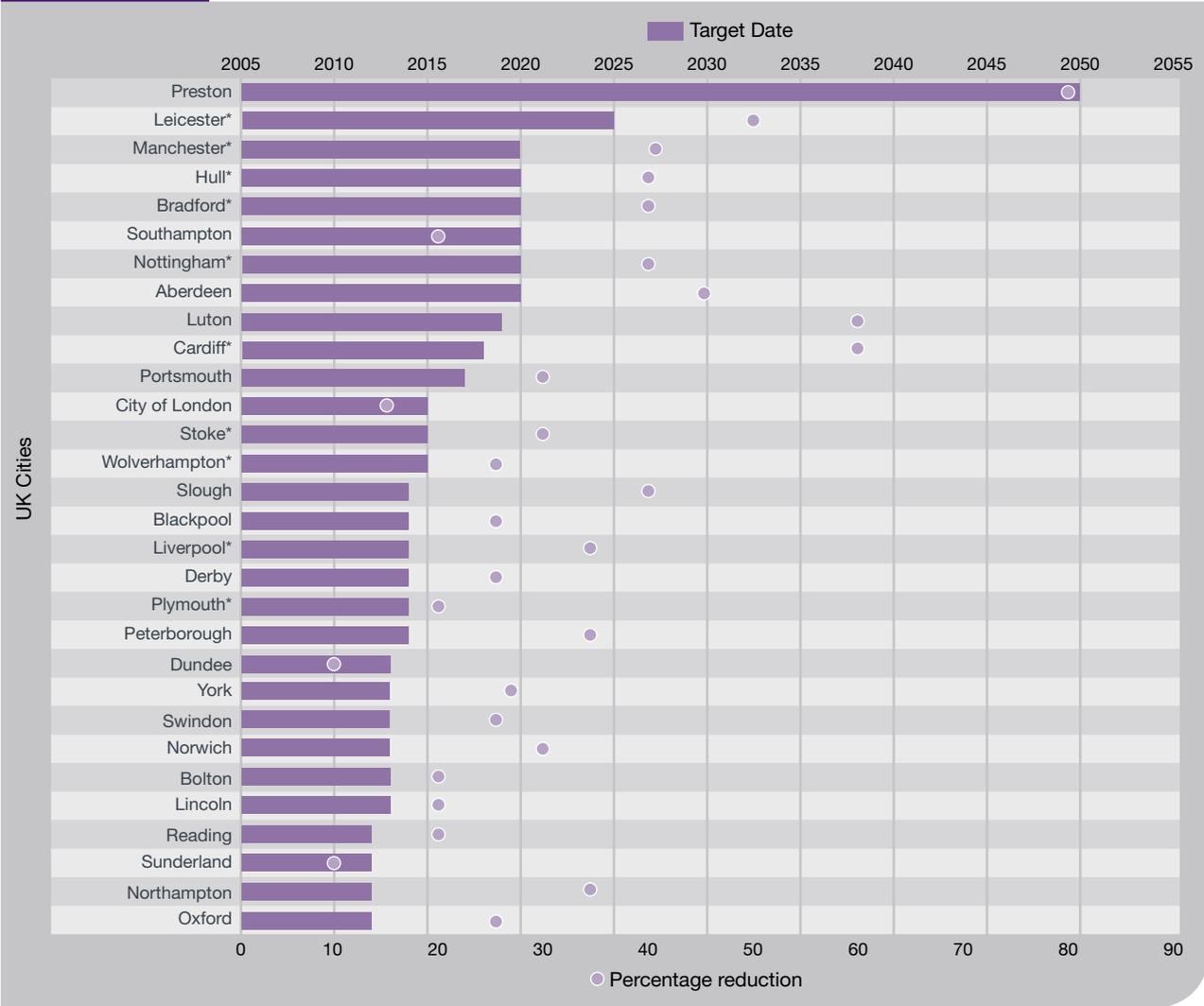
Further details of the type of plan in operation and examples of other plans in operation are shown in Table 4.1.

Table 4.1

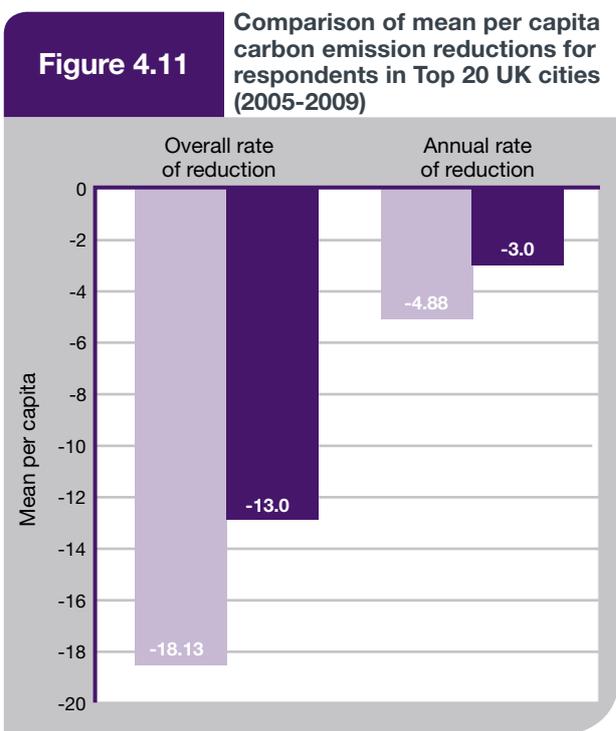
Detailed breakdown of type of action plan/strategy by city, where specific city-level targets are present

City	Top 20 city?	Climate Change Action Plan-City	Low Carbon Action Plan-City	Action Plan for Local Authority	Other plan
Greater London	X	X			
Birmingham	X	X			
Glasgow	X				X
Liverpool	X	X	X	X	X
Edinburgh	X				X
Bristol	X	X			
Manchester	X	X		X	
Leicester	X	X			
Coventry	X	X		X	
Hull	X	X			X
Bradford	X	X			X
Cardiff	X	X		X	
Nottingham	X	X	X	X	
Wolverhampton	X	X			
Plymouth	X	X		X	X
Southampton		X	X		
Milton Keynes			X		
Swansea			X	X	
Sunderland		X		X	
Oxford			X	X	
York		X		X	X
Slough		X		X	

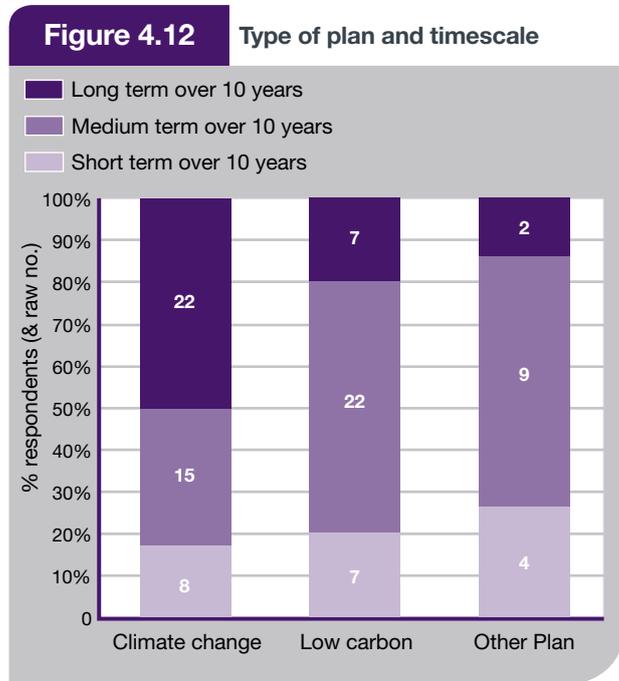
Figure 4.10 Local authority-level targets



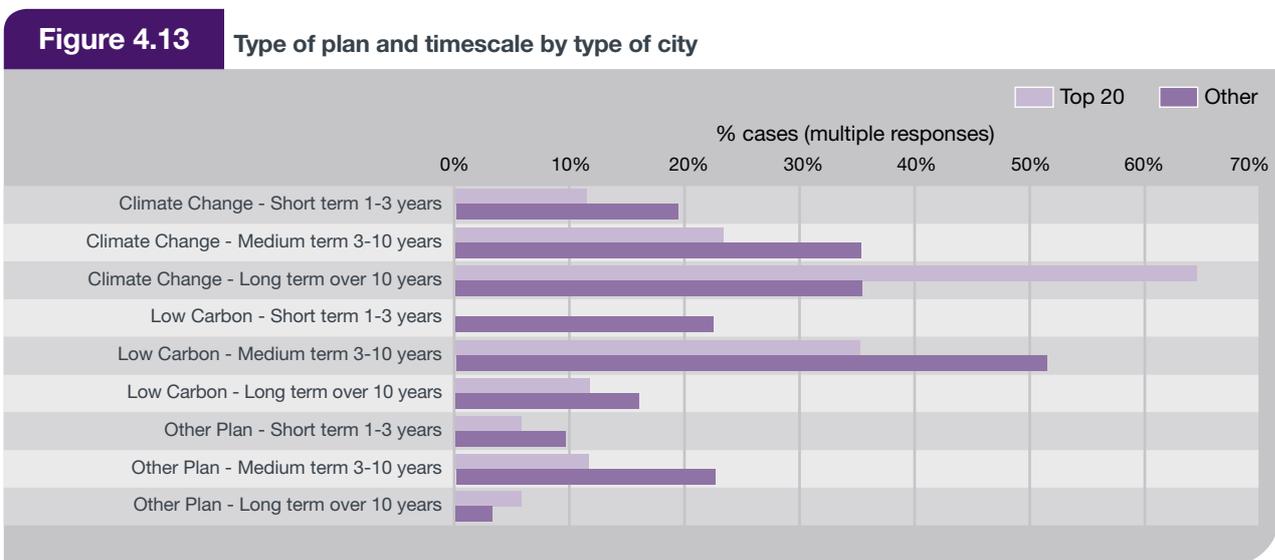
Taking this analysis further, the per capita carbon emissions figures for respondents in the Top 20 cities were analysed and cross-tabulated with whether an action plan and target for the city as a whole was present or not. The results show that in cities where a plan and target were both present, the overall reduction in carbon emissions between 2005 and 2009 was higher than where such plans and targets were not present (Figure 4.11). This difference was significant at the 5% level ($F=5.386, 1df$) although only two cities in our response set in the Top 20 had no formal target/plan in place for the city as a whole.



Longer time scales of up to 10 years are more common in climate change action plans and strategies than they are in low carbon plans (Figure 4.12).



Top 20 cities tended to have longer timescales for their climate change plans in comparison with other cities which tended to have medium term low carbon strategies (Figure 4.13).

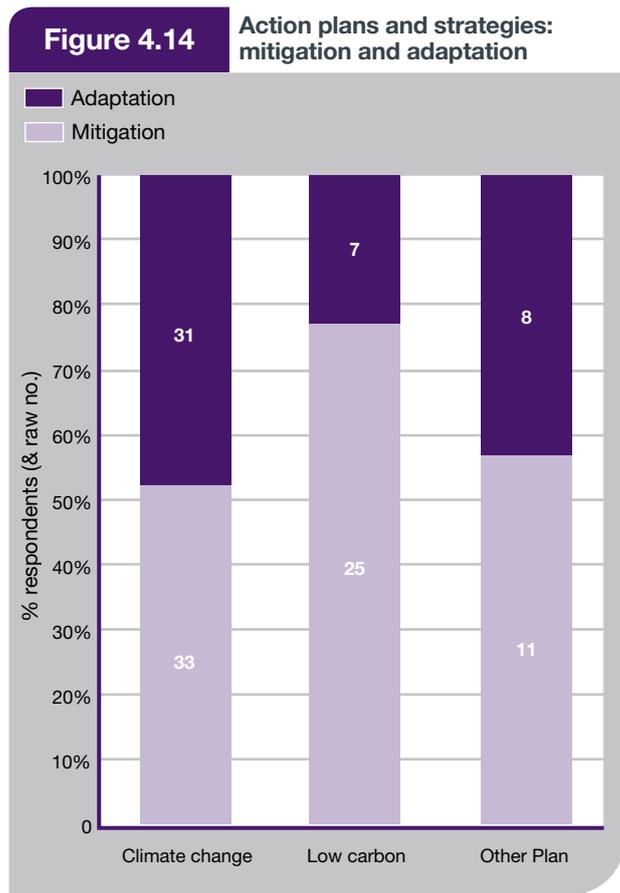


4.7 Mitigation, adaptation plans and partnership arrangements

Key messages:

- The partnership arrangements described within and between city-based local authorities and other local authorities are diverse. These include both public sector and NGO arrangements (including local strategic partnerships) and also private sector collaborations.
- Adaptation measures are fairly evenly split with mitigation measures in climate change plans but in low carbon plans the emphasis tends to be more on mitigation.

Within a climate change plan, context adaptation measures are fairly evenly split with mitigation measures but in low carbon plans the primary emphasis tends to be more on mitigation, and similarly in the 'other plans' category (Figure 4.14). This reflects the different emphasis provided at city level in the various plans that have been implemented and that the primary focus of the low carbon agenda tends to be mitigation.



The partnership arrangements described within and between city-based local authorities and other local authorities are diverse. These include both public sector and NGO arrangements and also private sector collaborations (see Appendix 3 -in Volume 2 of this report). They can relate to exchanging information and ideas on good and best practice; high level agreements to support a strategy or explicit commitment of resources to support a strategy. Partnerships are discussed in more detail in Section 5.5.3.

4.8 Ambitions in cities' low carbon agenda

Key messages:

- The top three most important ambitions for UK cities in their low carbon agendas were energy efficiency in residential buildings, waste management and the jobs agenda/skills/economic growth.
- Retrofitting of the wider built environment, behavioural change and low carbon transport were relatively less important overall.
- Retrofitting, energy supply and waste management are the most important ambitions for Top 20 UK cities.

Figure 4.15 Ambitions in low carbon agenda



As Figure 4.15 shows, the top three most important ambitions for UK cities in their low carbon agendas were energy efficiency, waste management and jobs agenda/skills/economic growth. Retrofitting of the wider built environment (including infrastructure), behavioural change and low carbon transport were relatively less important overall.

However, there are differences between the Top 20 cities and other cities. For example, as Figure 4.16 shows, retrofitting, energy supply and waste management are the most important ambitions for Top 20 cities, and for other cities, jobs, energy efficiency and waste. It should be noted, however, that the differences between these ratings are relatively small.

Figure 4.16 Ambitions in low carbon agenda by city type

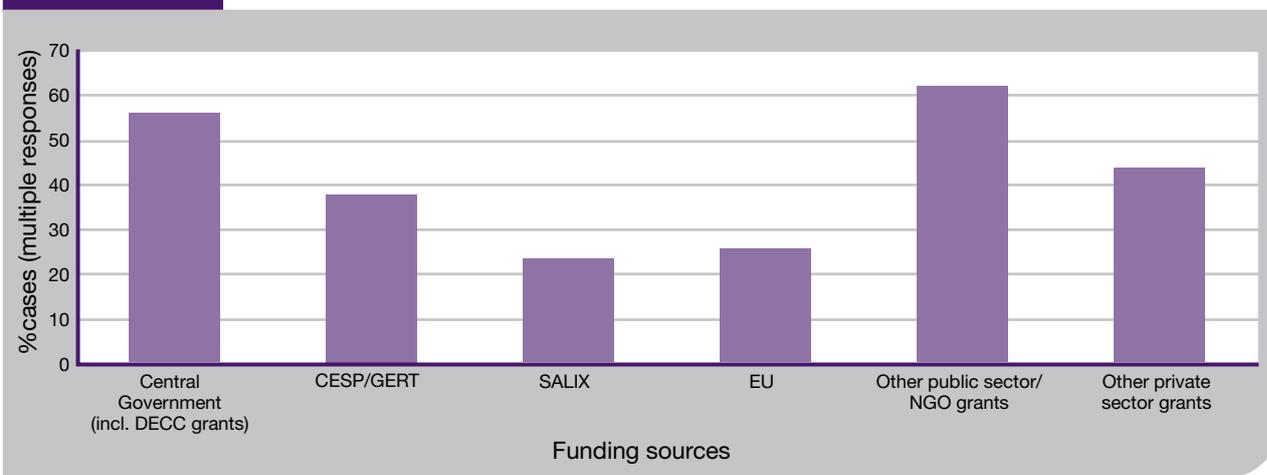


Key messages:

- Central government grants (including recent DECC grants for low carbon frameworks) and EU funding, Carbon Emissions Reduction Target (CERT) and Community Energy Savings Programme (CESP) together with SALIX are very important as funding sources for UK cities.
- CESP and CERT was relatively more important for Top 20 cities than for other cities in comparison with SALIX and EU funding.

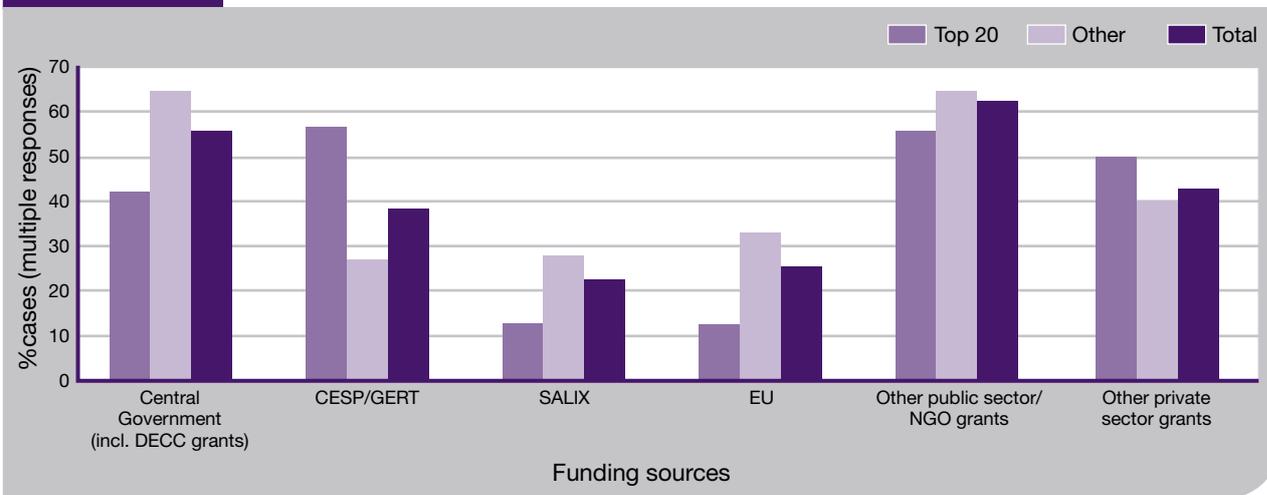
Figure 4.17 shows that central government grants (including recent DECC grants for low carbon frameworks) alongside EU funding and Carbon Emissions Reduction Target (CERT) and Community Energy Savings Programme (CESP) together with SALIX are very important. Also important were other sources in the public and private sectors, such as Carbon Trust grants, the Welsh Assembly ARBED scheme in Wales, funding partnerships with utility companies, and Homes and Communities Agency and former Regional Development Agency-based schemes. Other respondents pointed to the impact of feed-in tariffs and the renewable heat incentive.

Figure 4.17 Top sources of funding for reducing carbon emissions



As Figure 4.18 shows, CESP and CERT was relatively more important for Top 20 cities than for other cities in comparison with SALIX and EU funding.

Figure 4.18 Top sources of funding for reducing carbon emissions by city type



4.10 Drivers and barriers for the low carbon agenda in UK cities

Key messages:

- The three most important drivers for UK cities wanting to develop successful low carbon action plans and strategies are reducing energy costs, green jobs and economic growth and tackling fuel poverty.
- The green jobs agenda was relatively more important for the Top 20 UK cities than other cities and in the former group this was the most important driver overall.
- The top three barriers for UK cities developing low carbon plans and strategies were lack of funding, short-termism, and lack of leadership internally.

The three most important drivers for UK cities wanting to develop successful low carbon action plans and strategies were seen as being reducing energy costs, green jobs and economic growth and tackling fuel poverty (Figure 4.19).

Figure 4.19 Drivers for UK cities developing low carbon plans for strategies



Sectoral differences are highlighted in Figure 4.20, which shows that the green jobs agenda was relatively more important for the Top 20 cities than other cities and in the former group the most important driver overall.

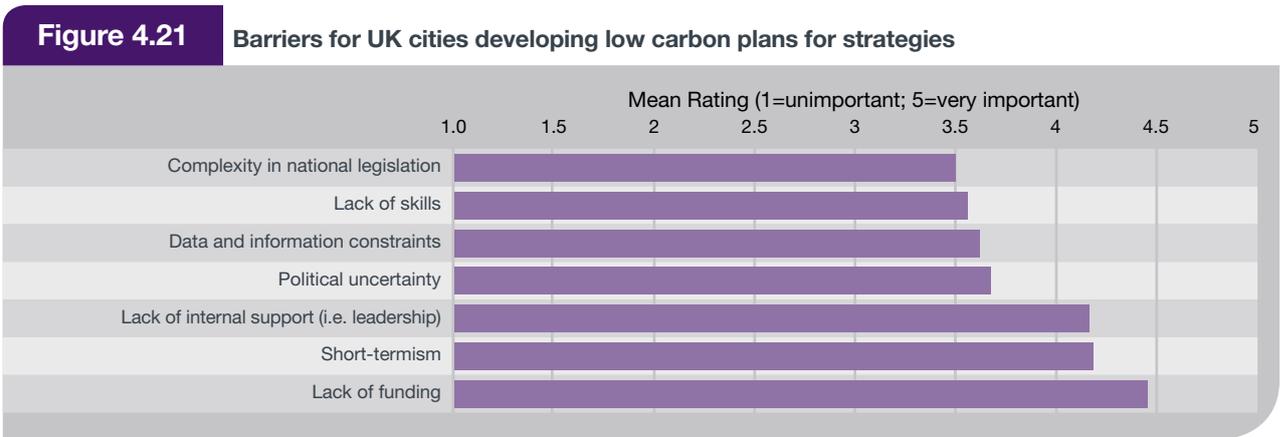
Figure 4.20 Drivers for UK cities developing low carbon plans for strategies by city type



Respondents suggested that the top three barriers for UK cities developing low carbon plans and strategies were lack of funding, short-termism, and lack of leadership internally (Figure 4.21). These barriers were fairly consistent across both city type groups (Figure 4.22).

As one respondent suggested: *“Guidance, communication and leadership together with the behavioural change needed to make it happen”*.

Several other respondents also pointed out that health and well-being were also becoming important as key drivers.



4.11 Localism

Key messages:

- A majority of UK city respondents (48%) did not know what the impact of the localism agenda will be. Only 10% felt it would have a positive impact, with 42% suggesting it would be neutral or negative.
- The removal of NI186 targets was also seen as adding to what was an increasingly uncertain picture.

Figure 4.23 Impact of localism on low carbon agenda

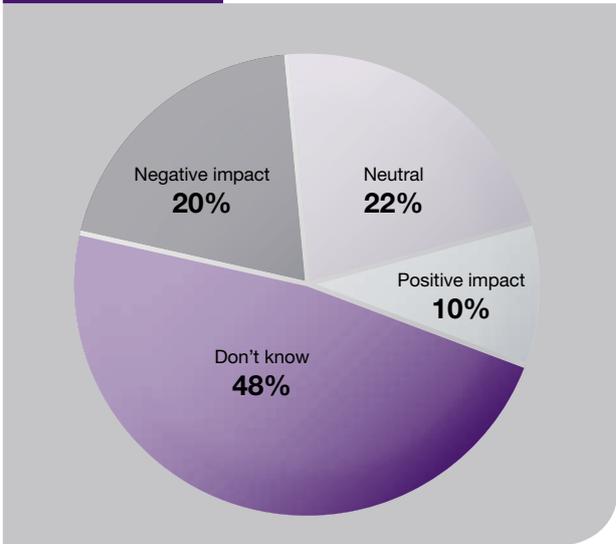
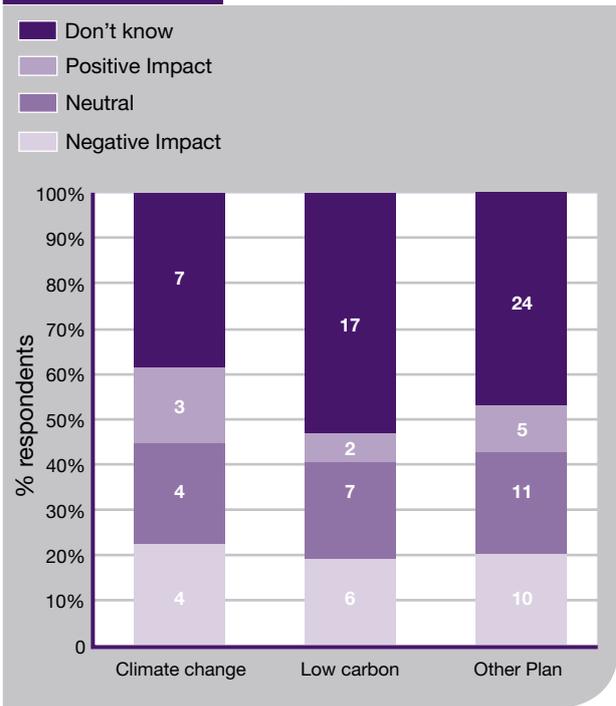


Figure 4.24 Impact of localism on low carbon agenda by city type



Perhaps not surprisingly a majority of respondents (48%) did not know what the impact of the localism agenda will be. Of those that did, only 10% felt it would have a positive impact, with 42% suggesting it would be neutral or negative (Figure 4.23).

When the results are compared by city type, Top 20 cities seem relatively more optimistic about positive impact (17% compared with 6% of respondents for other cities), but there is still uncertainty and scepticism across both groups (Figure 4.24).

A full list of respondents' comments on localism is included in Appendix 4 in Volume 2 of this report. Some respondents saw pros and cons to localism: *'I feel Localism will impact on climate change agenda and initiatives, in some cases it could have positive impacts as some local communities could be engaged with climate change mitigation work and want to support mitigation measures and support community energy projects. On the other hand, local communities that are vocal against renewable energy schemes could hinder developments'*.

However, others were more sceptical. As one respondent suggested: *'Localism focuses mainly on outcomes and best use of funding in the short term. Therefore (there is) no long term planning, (and) this will result in no ownership of the climate change agenda at a local level'*.

Another respondent suggested: *'I very much doubt that the localism agenda will result in greater financial support and increased resource for the delivery of our low carbon city strategy. Even if we are able to encourage increased participation in local sustainable initiatives from active and socially conscious local residents, we still require strong central leadership and financial support to put in place the major schemes that the country requires to see a dramatic shift towards a low carbon economy'*.

The removal of NI186 targets was also seen as adding to what was an increasingly uncertain picture: *'Not sure at the moment: a wait and see approach. We have no clear view from government as to how the localism agenda is going to be delivered in terms of carbon reduction. No local level carbon reduction target in place anymore (no NI186) so (there is) no requirement to work towards any sort of reduction'*.

Cities in Wales, Scotland and Northern Ireland are currently 'immune' to the impact of localism which will only apply in England, and this was a point noted by respondents in cities located in the devolved constituents.

4.12 Impact of the Green Deal on the low carbon agenda

Key messages:

- No UK city respondents felt the Green Deal would have a negative impact.
- A large majority (60%) of respondents felt the Green Deal would have a positive impact on the low carbon agenda.
- A larger proportion of respondents in Top 20 cities thought that the Green Deal would have a positive impact than other cities (72% compared with 65%).

A large majority (60%) of respondents felt the Green Deal would have a positive impact on the low carbon agenda (Figure 4.25)¹⁵. No respondents felt it would have a negative impact.

Figure 4.26 shows that a larger proportion of respondents in Top 20 cities thought that the Green Deal would have a positive impact than other cities (72% compared with 65%).

Again, however, there was uncertainty expressed over the impact of the Green Deal (a full list of comments from respondents is provided in Appendix 5 in Volume 2 of this report), although the potential benefits for retrofit programmes were recognised. A summary of the key words from additional comments is provided in Figure 4.27, which shows particular concerns over mechanisms and processes and the overall impact of the scheme on households.

Figure 4.25 Impact of Green Deal on low carbon agenda

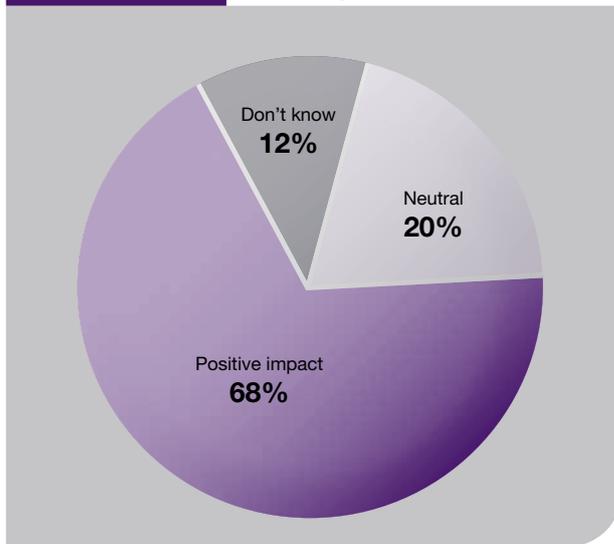
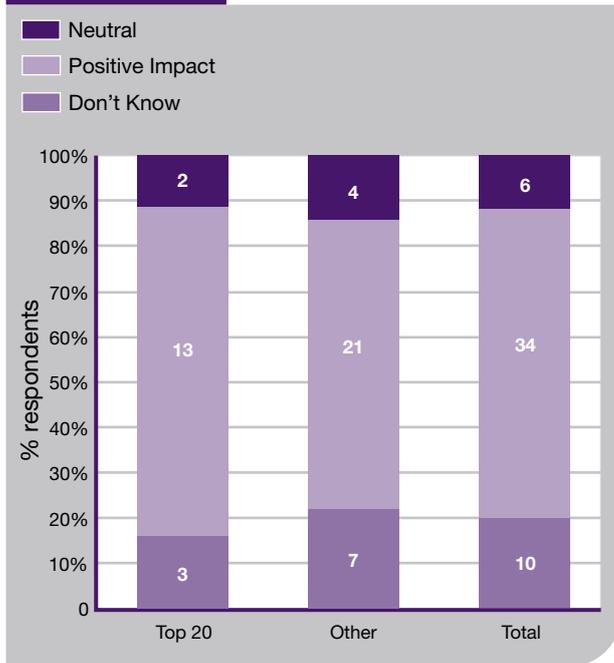


Figure 4.26 Impact of green deal on low carbon agenda by city type



15 This supports the findings of a survey conducted as part of the EPSRC Retrofit 2050 project (Britnell and Dixon, 2011), which found that although the Green Deal is seen as relatively less important currently as a driver for retrofitting cities, public sector respondents perceived this factor as more important than other groups (which included private sector and academics). See also www.retrofit2050.org.uk

4.13 Likelihood of UK renewables target being met by 2020

Key messages:

- Only half of UK city respondents thought that achieving the UK renewables target was unlikely, with only 6% thinking this was very likely or certain.
- A higher proportion of Top 20 UK cities than other cities thought achieving the target was unlikely (56% and 47% respectively).

Half of the respondents thought that achieving the UK renewables target was unlikely, with only 6% thinking this was very likely or certain (Figure 4.28).

When respondents are broken down by city type, a higher proportion of Top 20 cities than other cities thought achieving the target was unlikely (56% and 47% respectively) (Figure 4.29).

Appendix 6 in Volume 2 of this report provides further examples on respondents, and their views on FITs for example. Whilst there are innovative examples of funding (respondents were asked for additional comments) in a number of cities such as York, Aberdeen, Oxford and Southampton, several respondents remarked how uncertainty had been increased by the recent review of FITs and RHI.

Figure 4.28 Likelihood of UK achieving renewables target by 2020

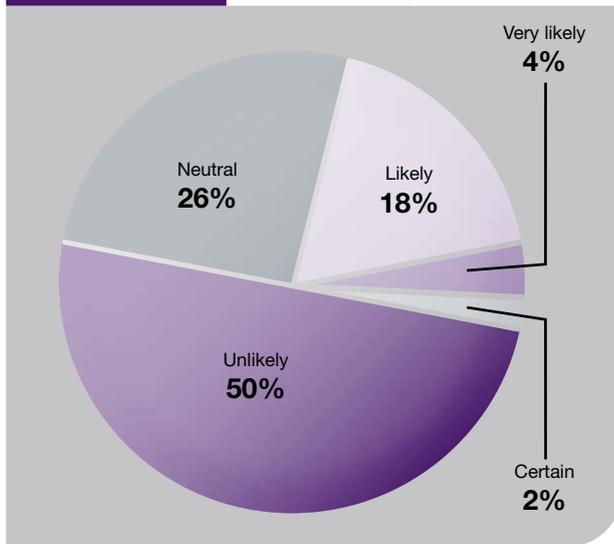
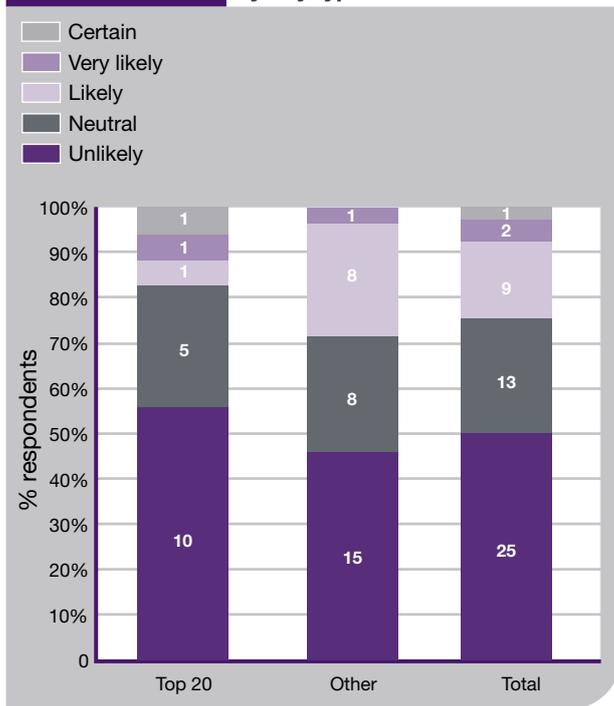


Figure 4.29 Likelihood of UK achieving renewables target by 2020 by city type



16 The 2009 Renewable Energy Directive sets a target for the UK to achieve 15% of its energy consumption from renewable sources by 2020. It is widely accepted the UK will have to generate between 30 and 35 per cent of its electricity from renewable sources by 2020 if it is to meet its legally binding EU target of generating 15 per cent of energy from renewables.

Key messages:

- Many UK cities are developing innovative programmes to help underpin their move to a low carbon future.
- These include sustainable transport initiatives, such as schemes to promote electric vehicles; smart metering projects within neighbourhood projects or within local authorities themselves (as an organisation); community low carbon or retrofit programmes; and major renewable energy projects.

Respondents were asked to highlight five ‘exemplar’, best practice measures that their city is undertaking to achieve a low carbon future. The results show that cities across the UK are using a range of programmes and measures to achieve a low carbon future. Full details of these innovative schemes are provided in Appendix 7 in Volume 2 of this report. Generically these examples include:

- Procurement: local food and renewable energy sourcing;
- Regulation: for example going beyond regulatory standards;
- Services and property ownership: retrofitting housing stock and local authority buildings or installing district heating networks;
- Awareness and expertise: energy centres and relationships with R & D and local universities; and,
- Leadership, including low carbon R & D, energy mapping and plans.

These have also been underpinned by cross-cutting projects and innovations which include:

- Sustainable transport initiatives, including schemes to promote electric vehicles;
- Smart metering projects within neighbourhood projects or within local authorities themselves (as an organisation);
- Community low carbon or retrofit programmes; and
- Major renewable energy projects.

Several innovative financing schemes are highlighted in Appendix 7 (in Volume 2 of this report) : for example, the RE:FIT scheme in London (Box 4.1) and Birmingham Energy Savers scheme (Box 4.2). For further information on financing see section 5.5.

Box 4.1

London - RE: FIT



The purpose of RE:FIT, which is currently run by the Greater London Authority, is to assist public bodies in London to significantly reduce carbon emissions from their buildings which will help London achieve its overall target of cutting carbon emissions by

60% by 2025 (as set out in the Mayor’s draft Climate Change Mitigation and Energy Strategy). Public bodies use a framework of pre-selected energy service companies (ESCo) to retrofit energy efficiency measures in buildings. The ESCo guarantees a set level of energy and cost savings over an agreed payback period, thus providing a net saving longer term, and this produces cost and carbon savings. Funding is through a combination of existing funding and the London Green Fund (further information, see: <http://www.lda.gov.uk/projects/refit/>)

Box 4.2

Birmingham Energy Savers



Birmingham Energy Savers (BES) is a non-profit organisation launched by Birmingham City Council. The scheme hopes to create around 270 new jobs and help reduce carbon dioxide emissions by 60% by 2026. BES is a Birmingham City Council and Birmingham

Environmental Partnership project working with organisations across the city, aiming to help the people of Birmingham save money on their fuel bills, become more energy efficient and help protect the environment with no upfront costs. This can involve fitting photovoltaic panels to a roof, or helping to generate electricity from sunlight. This is achieved by BES paying for the panels upfront, and then earning back the money over time through government Feed In Tariff (further information, see: <http://www.birminghamenergysavers.org.uk/index.html>)

5.1 Introduction

This chapter of the report firstly provides an overview and evaluation of the low carbon plans and strategies of the Top 20 UK cities responding to the online survey. Secondly, the chapter provides an overview of the best practice and best ideas emerging from UK cities and cities in Europe and North America. These cities are for the UK: Bristol, Coventry, Plymouth, Cardiff, Glasgow, and for overseas, Vancouver, Copenhagen, Stockholm, Oslo, Hamburg. They have been selected on the basis of:

- 1 UK cities** – An assessment of their low carbon plans and strategies based on responses to the online survey and on an independent assessment by the research team of their plans.
- 2 Europe and North America cities** – An assessment based on international literature.

The analysis then uses these examples to highlight four critical success factors (see section 3) for developing low carbon plans and strategies for cities.

5.2 Best practice

Using the framework adopted by Tang et al. (2010), the awareness, analysis and actions of respondents from the UK's top 20 cities were evaluated on the basis of survey responses and website checks. A summary is provided in Table 5.1

Table 5.1 Low carbon plans and strategies: an evaluation of Top 20 UK city survey respondents

- Deep green performance – well-developed strategies and plans with long term targets
- Light green performance – developing strategies and plans with medium term targets
- Currently deficient in some aspects of strategies and plans and some aspects of medium/long term target-setting.

City-Level	Awareness Concepts Context	Analysis Drivers Trends Impacts	Actions Strategy Plans Targets Powers	Carbon emissions targets for city
London				60% reduction in CO ₂ (of 1990 levels) by 2025
Birmingham				60% by 2026
Glasgow				Launch of Sustainable Glasgow. 30% by 2020.
Liverpool				34 % by 2024
Edinburgh				Launch of Sustainable Edinburgh. 40% by 2020.
Bristol				25% by 2015, 40% by 2020, 80% by 2050
Manchester				41%, 2005 to 2020
Leicester				50% reduction on 1990 levels by 2025
Coventry				40% by 2025 and 70% by 2050
Hull				34-40% by 2020
Bradford				40% reduction by 2020
Cardiff				26% by 2020
Belfast				Currently lacks city-level targets although city council targets are in place
Stoke				Currently lacks city-level targets although city council targets are in place
Wolverhampton				12% by 2012 and 35% by 2026 (on 2005 levels).
Nottingham				26% by 2020
Plymouth				20% by 2013, 60% by 2020 and 80% by 2050

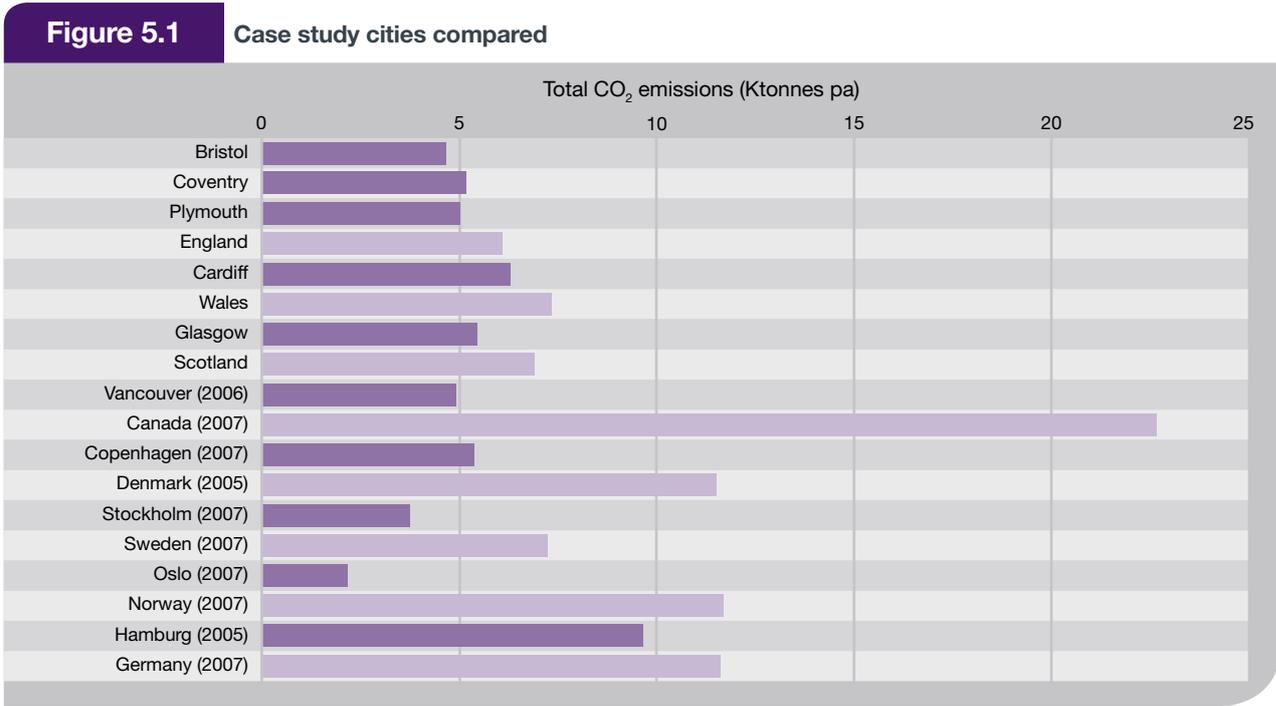
Note: Partial responses were obtained from Leeds, Sheffield and Newcastle so these are not included in this analysis (see section 4.6).

As Table 5.1 shows, respondent cities have performed reasonably well in terms of the three assessed criteria. Bristol, Coventry and Plymouth all have long term 2050 targets in place and have robust awareness and analysis plans in place. Several other cities are lagging (Belfast and Stoke). In the case of Belfast, although the city is still grappling with the details of a low carbon agenda, the council does have a Sustainable Development Action Plan in place, which focuses on how the council will manage its resources more efficiently, while continuing to minimise its impact on the environment. Belfast’s BITES programme, which was introduced in 2009, is a business development initiative designed to help businesses reduce waste and energy, boost profits and help the environment. At the time of writing, however, there are no city-level emissions targets in place, although the NI ‘Greenhouse Gas Reduction Action Plan’ was recently launched and brings together a number of departments (Cross – Departmental Working Group on Greenhouse Gas Emissions, 2011).

Based on this analysis of the top 20 UK cities and a review of international literature (see chapter 1 of this report)¹⁷, the following case studies are included in summary form as ‘best practice’ examples¹⁸. These comprise:

- | | |
|--|--|
| <p>UK</p> <ul style="list-style-type: none"> • Bristol • Coventry • Plymouth • Cardiff • Glasgow | <p>International</p> <ul style="list-style-type: none"> • Vancouver • Copenhagen • Stockholm • Oslo • Hamburg. |
|--|--|

Figure 5.1 shows the relative per capita footprints for each city in comparison with the respective national average.



Source: Hoornweg et al. (2011), Siemens (2011) and DECC data

17 Additional references included: ICLEI website, Sustainability West Midlands (2010), Siemens Green City Index (Siemens, 2011), and North and Barker (2011). 18 Telephone interviews with online survey respondents (five) and linked email surveys were also used to support each of the five UK case studies and verify and cross-check information.

5.3 UK Case Studies



Bristol, UK ¹⁹	
Population	426,100 (N186 local authority, 2009)
City Carbon Target	25% reduction by 2015, 40% by 2020, 80% by 2050 (overall) ²⁰
Current performance (per capita reduction, 2005–09) ²¹	-20% (-5.4%pa)
Main achievements	A leading UK green capital - shortlisted for EU Green Capital Award in 2009. Carbon strategy in place since 2003 titled Climate Protection and Sustainable Energy Strategy 2003 - 2010 and Climate Change and Energy Security Framework from 2010 onwards. Peak Oil Report published in 2009 and Who Feeds Bristol Report published in 2011.
Actions	Planning policy framework for new developments; West of England Joint Local Transport Plan, city-wide electric vehicle charging points scheme, proactive programme to engage with energy utilities to lever in investment in private housing, energy and resource efficiency programmes for business, supporting eco-innovation, green skills development, comprehensive programme of investment in council housing, municipal buildings (including schools), street lighting, contracts, fleet management (thermal) strategy for council owned housing. Newly commissioned work includes Hydrogen Strategy development and Smart City project bids. Pilot study with DECC on Low Carbon Framework (see Plymouth) including City-wide roof assessment for solar arrays, linked to publicly accessible solar map (to be launched).
Challenges and strategies	Addressing the combined drivers of climate change, peak oil and the recession. City-level 'Climate Change and Energy Security Framework' in place (2010).



Coventry, UK²²

Population	310,500 (NI86 local authority, 2008)
City Carbon Target	40% by 2025 and 70% by 2050 (overall target)
Current performance (per capita reduction, 2005–09)	-23% (-6.32% pa)
Main achievements	Aerial thermal survey of the city was carried out early 2010. The use of low carbon vehicles has now begun and Coventry now has 18 rechargeable points in 6 locations for electric vehicles. Coventry City Council joined the Energy Saving Trust's one-to-one support programme in 2009.
Actions	Insulation of RSL properties and homes in low income areas. Coventry is the UK's first city with centrally controlled dimming street lighting.
Challenges and strategies	'City Wide Domestic and Behavioural Change Carbon Action Plan' has been produced.

²² http://www.coventry.gov.uk/info/200105/sustainability/177/tackling_climate_change/3



Plymouth, UK²³	
Population	255,600 (NI186 local authority, 2008)
City Carbon Target	20% by 2013, 60% by 2020 and 80% by 2050 (overall target)
Current performance (per capita reduction, 2005–09)	-17% (-4.5% pa)
Main achievements	In 2010 Plymouth was included in a UK DECC pilot project looking at the development of Local Carbon Frameworks. These 'plans' will eventually be produced by every local authority, although currently only nine councils have been tasked with looking at their local areas and deciding how the frameworks might work. Establishment of Plymouth 186 Low Carbon Network, to engage with business, and establishment of Plymouth Climate Change Commission to bring together academic and business expertise.
Actions	Production of Climate Change Framework (2008) and Action Plan (2009) and Strategy (2008) and the development of Low Carbon Framework focusing on the first steps towards a low carbon economy.
Challenges and strategies	Strong emphasis on integrated climate change and carbon agendas and local partnership arrangements with a focus on working with businesses. Establishing the role of the city's low carbon economy and its links with plans for growth and economic development.



Cardiff, UK²⁴

Population	330,500 (NI 186 Local Authority, 2008)
City Carbon Target	26% by 2020 (per capita)
Current performance (per capita reduction, 2005–09)	-22% (-6%pa)
Main achievements	Vision Forum (local strategic partnership) Carbon Lite group to develop joint working Household composting collection to all homes.
Actions	Sustainable Travel City status. Participation in UK adaptation pilot. Changing Climate, Changing Places with WLGA and UKCIP.
Challenges and strategies	Strong emphasis on integrated climate change and carbon agendas and local partnership arrangements. City has signed up to 10:10 campaign and EU Covenant of Mayors.

²⁴ <http://www.cardiff.gov.uk/content.asp?nav=2%2C2870%2C3148%2C6218%2C6229>



Glasgow, UK²⁵	
Population	584,200 (NI 186 Local Authority, 2008)
City Carbon Target	30% by 2020
Current performance (per capita reduction, 2005–09)	-17% (-4.5%pa)
Main achievements	The Council has integrated electric vehicles into its fleet. The Council has installed both electricity and gas smart meters and is about to begin the installation of water smart meters.
Actions	The Council has also taken part in the Governments 'Plugged in Places' scheme which will see 44 charging points installed in the city centre multi storey car parks, museums, and leisure centres. The Council is installing boiler optimisation technology to all suitable boilers which will reduce the overall consumption of gas in these boilers by around 13% without affecting the operation of the boilers.
Challenges and strategies	Through the Sustainable Glasgow plan the Council has setup a consortium of partners from both the public and private sectors to assess the carbon footprint of the City and to devise methods/scenarios/policies to reduce emissions by 30% on 2005/06 levels. The ambition of this plan is to develop district heating networks, smart grids, plus more.

5.4 International Case Studies



Vancouver, Canada ²⁶	
Population	580,000
City Carbon Target	2010 – Reduce municipal operations emissions by 20% (achieved) 2012 – Carbon neutral operations 2012 – Reduce community emissions by 6% (on track to achieving) 2020 – Reduce community emissions by 33% 2030 – All new buildings are carbon neutral 2050 – Reduce community emissions by 80%
Main achievements	Vancouver has the lowest per capita emissions of any major city in North America at 4.6 tonnes per person. City has removed policy barriers to green roofs, solar and passive building design and 94% of electricity comes from renewables.
Actions	Development of strong targets. Formation of Greenest City Action Team and Action Plan for 2020. Strong emphasis on mass transit and renewable energy.
Challenges and strategies	To be Greenest City in World by 2020 and with 100% renewable electricity and heat. Focus on high standard building regulations. Also a strong emphasis on performance measurement of all aspects of sustainability including social dimension.

26 <http://vancouver.ca/greenestcity>, Vancouver City Council, Siemens Green City Index, North and Barker (2011)



Copenhagen, Denmark ²⁷	
Population	1.9m
City Carbon Target	20% absolute reduction by 2015 and carbon neutral by 2025.
Main achievements	Since the 1990s, Copenhagen has reduced its carbon emissions by 20%, and in 2009 the City Council unanimously agreed on the Copenhagen Climate Plan. The Plan will lead the city to further 20% carbon reduction by 2015, and carbon neutrality by 2025. In 2009, the Siemens Green index appointed Copenhagen as 'the greenest major city in Europe'.
Actions	Strong planning and focus on transport. A 'Green Growth' strategy for 2025.
Challenges and strategies	A 'city of cyclists', with an emphasis on a compact city. Copenhagen has adopted a strategy to set up more than 100 wind turbines. 37% of all citizens commute by bicycle and 50% ride their bike every day. In its bid to become carbon neutral, the city is at the planning stage of the new urban district of Nordhavnen. Urban planners are working on implementing an energy infrastructure that provides sufficient sustainable energy to the district, energy such as geothermal energy, solar and wind energy, and sea and ground water for cooling. (source: ICLEI)



Stockholm, Sweden²⁸

Population	830,000
City Carbon Target	To achieve a 3.0 per capita target by 2015 and a fossil-free city by 2050.
Main achievements	Stockholm Environment Programme 2008-2011 introduced and is a city-wide document. A new Action Plan on Climate and Energy was published in 2010. Stockholm is Europe's first Green Capital in 2010, partly thanks to a decade long attention to climate issues with good results, and also due to the targets the City has set for the future. The city is ranked second in Siemens European Green City Index.
Actions	Local Agenda 21: participatory action and dialogue promoted since 1995. Low Emission Zone established in 2008. Action Programme Against Greenhouse Gas Emissions established in 2003 and integrated city authorities, local businesses and residents. Strong focus on transport: city has highest number of clean vehicles in Europe which has helped reduce emissions. Strong emphasis on targets and a new web-based tool to monitor the city's performance. Important role of Stockholm Environmental Technology Centre.
Challenges and strategies	City has based its success on three key actions: energy efficiency, energy conversion (switching to renewable such as bio-fuels) and rationalising systems (using decentralised energy and public transport). Policy framework designed to link cross-departmental action, promote citizen engagement and leverage partnerships with public and private sectors.



Oslo, Norway ²⁹	
Population	560,000
City Carbon Target	50% reduction by 2030.
Main achievements	Current per capita emissions, 2.2t per annum. 60% of city's car fleet has no or low emissions, and there are plans to use biofuels on buses from 2012. Climate and Energy Fund set up from tax on local electricity and provides a grant for conversion from oil to biofuels. The Climate Energy Fund supported 2,400 projects yearly and the total energy savings of the Climate and Energy Fund for the last 10 years is around 1.3 TWh which is nearly 10% of Oslo's total use. Oslo was a finalist in the European Green Capital Award in 2009; the city won the European Sustainable City Award Winner in 2003, and is ranked 3rd in Siemens European Green City Index.
Actions	Strong focus on hydroelectric power. It has promoted district heating, use of which expanded by 36% between 2000 and 2006, and which relies largely on biofuels and the city's carbon-free electricity. Focus on mandatory district heating supplied through municipality for new development, and the public sector is required to convert to district heating. Congestion charge has reduced transport-related emissions. Reducing private road use through good public transport, and encouraging electric vehicles through charge points and waiving parking fees and tolls (the city has a 'toll ring'). Electric cars can use public transport lanes.
Challenges and strategies	A strong focus on 'blue-green' profile, working environment management system and active engagement in improving the city's urban ecology.



Hamburg, Germany³⁰

Population	1.8m
City Carbon Target	40% by 2020 and 80% by 2050..
Main achievements	Designated European Green Capital for 2011. Carbon footprint of average resident reduced by 15% from 1990 levels. HafenCity is Europe's largest urban development, and its residential properties (ultimately 5,500 homes with 40,000 jobs on a 1.5km ² site) will be supplied with district heating linked to fuel cell and PV technologies. The climate protection programme, approved by the local government in summer 2007, identifies 10 areas of action covering over 450 individual measures. The city invests up to €22.5 million a year in these measures. 99% of residents have access to public transport within 300m of their homes. Renewable energy sources amount to 3% of primary energy production. CO2 emissions cut by 158% (1990-2006)
Actions	Primary focus on district heating network which supplies nearly 500,000 households. The operating company is Swedish company Vattenfall but a new municipal company, Hamburg Energie, supplies renewable energy. 'Work and Climate Protection Programme' set up in 1997 has invested heavily in solar thermal and biomass. Strong public transport policy with new rail infrastructure and a new Environmental Zone to reduce pollution. Using heat exchange in sewage system to provide heat to 200 apartments.
Challenges and strategies	Europe's tenth largest city, second largest container port and major industrial sites. Strong relationship with business, including SMEs. 12 largest companies working together to reduce emissions by 5000,000 tonnes by 2012. Green growth agenda based around renewable energy, including wind.

5.5.1 Frameworks for policy-making and implementation

Although there is no single blueprint for a successful low carbon future, it is clear that the most successful cities in the UK, and internationally, use a framework which replicates the key elements of ICLEI's 'measure-commit-plan-measure-monitor' system.

In the UK, as we saw in the results in the previous chapter of this report, the abolition of NI 186 monitoring has led to a policy vacuum. Local authorities are still continuing to monitor, but at the time of writing, it is unclear how the DECC Low Carbon frameworks and the planned autumn consultation by DEFRA on sustainability indicators will transfer nationally to local authorities.

It is also clear that those cities that scope out the policy landscape and make best use of policy leverage across a range of scales are more likely to be successful in developing coherent low carbon action plans. Low carbon plans require timetables, targets and dates for implementation; they require resources and funding and they need to have a clear designation of responsibilities from key stakeholders with an effective monitoring and review system. Local authorities have the potential to influence this agenda through (see section 1.7):

- Management of property portfolio and public procurement;
- Delivery of services such as housing, education, waste and social services;
- Control over local planning policy;
- Co-ordinating local regeneration and economic activity;
- Public investment in infrastructure;
- Building regulations and trading standards;
- Civic leadership within communities through for example, Local Strategic Partnerships and Local Area Agreements;
- Creating and maintaining partnerships; and,
- Showcasing good practice.

Cities, for example, which engage with the national focus on carbon reduction in businesses, can help promote and lead change in their local areas. In Cardiff for example, it is clear that the Carbon Lite programme has been founded on strong partnership working and a strong climate change policy at a Welsh level.

5.5.2 Integrating low carbon and climate change agendas

It was clear from the UK survey, and best practice case studies, that the low carbon agenda is being approached through a number of types of strategic plans. Some cities use an integrated climate change plan or strategy to also help focus on low carbon, whilst others have developed a specific low carbon plan/strategy either in its own right, or perhaps tackle low carbon through sustainable energy or sustainable development plans (Figure 5.2).

In many cities, transport and green growth alongside energy efficiency measures are seen as key in terms of moving to a low carbon future. Cities in the UK which form part of the Core City group have the power and resources to engage with the low carbon agenda. Leadership, enthusiasm, skills and the freedom to operate locally and in partnership with other relevant attributes are all important attributes for successful cities in this arena. In Bristol, for example, the creative tension between local community interests and council members, stretching back to the 1980s, has created a culture of strong environmentalism.

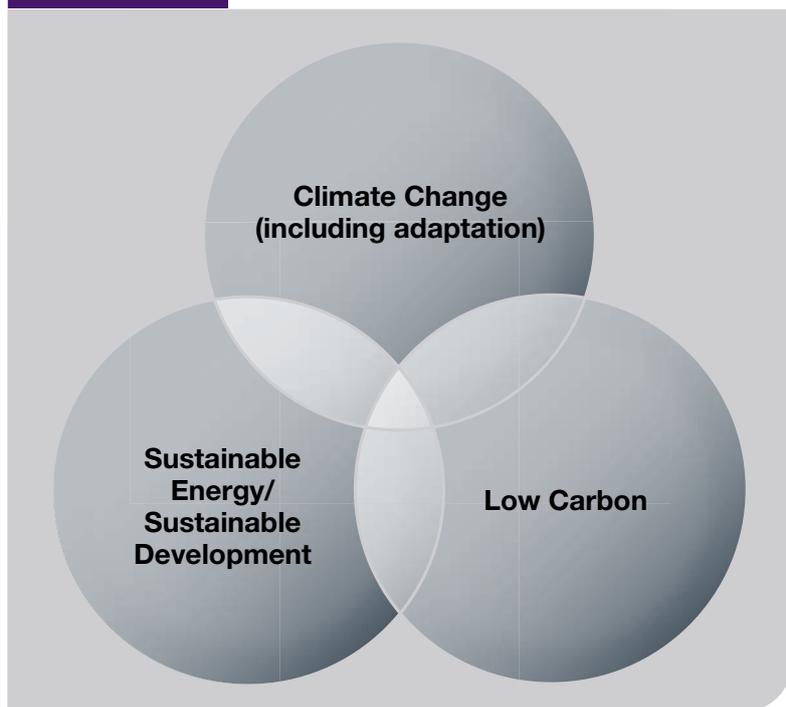
Often the vision is challenging in its own right: Stockholm, for example, has placed the low carbon economy at the heart of the long term vision for the city, including the target of becoming fossil fuel free by 2050, and this has been backed up by shorter term actions, such as integrating the low carbon agenda in new regeneration and development projects. Oslo's vision is ambitious (Oslo City Council, 2011):

“Oslo has a vision that Oslo shall be a capital city in sustainable development, characterised by economic, social and cultural growth according to nature’s ability to sustain that growth ecologically. We shall pass on the city to the next generation in a better environmental condition than we ourselves inherited it. Oslo shall be one of the world’s most environmentally friendly and sustainable capital cities.”

Key to success is also the concept of participatory action, whereby key stakeholder groups are consulted and involved in dialogue. The City of Stockholm, for example, used its historic legacy of Local Agenda 21 to raise awareness and is using its Environmental Program in a similar way. Plymouth in the UK is engaging with the business sector to help lever change to a low carbon economy.

Very often cities also lead by example through setting tough carbon emissions targets for the local authority or cities also learn by sharing, in the sense that they try and promote wider engagement and learn from key stakeholders connected with climate and energy planning (see also Climate Group, 2011). Strong leadership, collaboration and communication are all key to successful implementation of target-based action plans.

Figure 5.2 The Low carbon interface



5.5.3 Partnerships are important

The survey responses and the case studies highlight the importance of partnerships at a variety of levels (see section 4.7). Both in the UK and internationally, partnerships with government, leading not-for-profit, city residents ('community'), and business and industry is a vital ingredient for success.

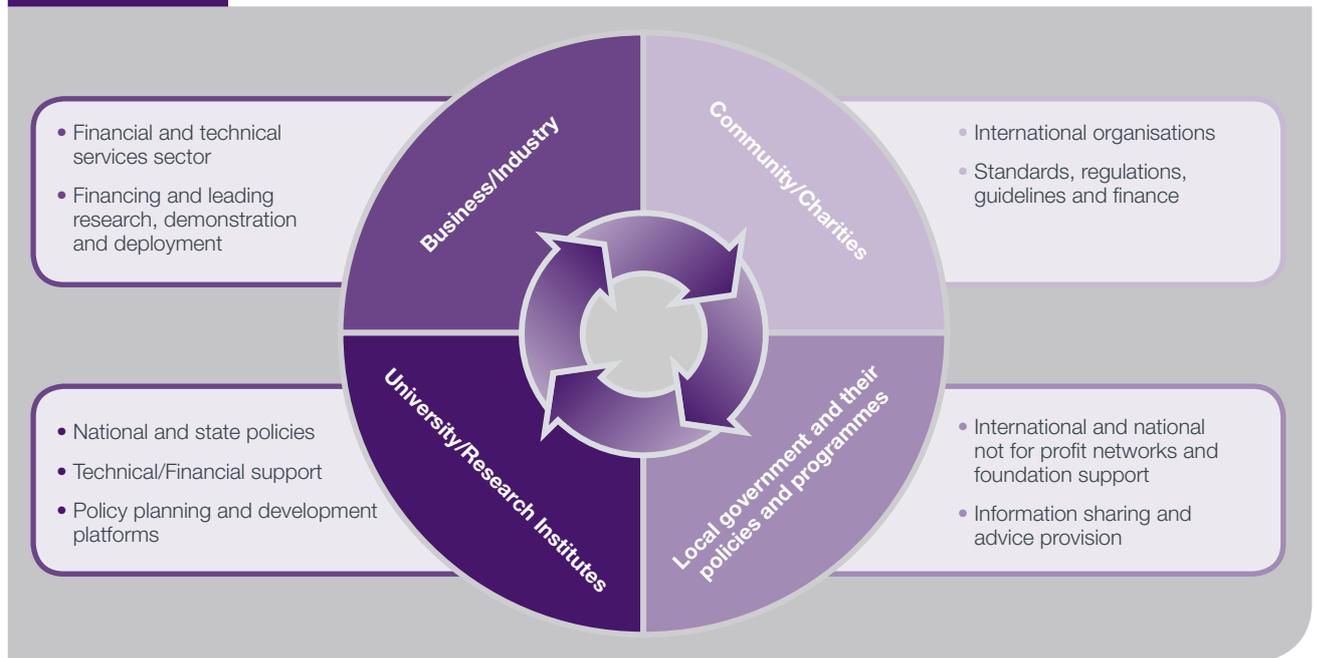
Figure 5.3 shows the variety of institutions and organisations involved in city-wide carbon reduction planning, with the middle part of the diagram representing local players and the outer part of the programme reflecting external partners at state, national supranational or international level. Cities which tap into networks such as C40 Covenant of Mayors group and the EU Climate Alliance of Cities and Municipalities, or those which form part of the English Regional Climate Change Partnerships, for example, are able to raise their profiles internationally and utilise expertise. Moreover, the Nottingham Declaration has also provided the opportunity for cohesion around this agenda in the UK (section 1.6.2).

In the UK, the previous section has highlighted best practice examples of partnership working (see section 4.7 and Appendix 3 in Volume 2 of this report). In the case studies in this section, three examples of good partnership working are Bristol, Plymouth, and Glasgow (see Table 5.2).

Glasgow's focus for example, has been on creating a Sustainable Glasgow initiative which will establish an Energy and Carbon masterplan to identify and deliver investment grade projects, tied into the city-wide carbon reduction 30% target by 2020. This is also linked closely with the Local Development Plan, which builds on the existing city plan strategy of sustained growth, by promoting the future economic and social regeneration of Glasgow, improved health and the maintenance and enhancement of the natural and built environment. In Glasgow, the legacy benefits of the low carbon building design advice given to the various architectural practices during the bidding process for the 2014 Commonwealth Games Athletes Village have also been important in helping build learning and knowledge.

Figure 5.3

Key stakeholder partners in the low carbon agenda



Source: Adapted from the Climate Group, 2011

Despite these successes, there is considerable uncertainty in the way in which Local Enterprise Partnerships (LEP) will work together to take over some of the roles of the now defunct Regional Development Agencies, and also how they will work with existing Local Strategic Partnerships (LSPs). For example, the new West of England LEP is led by Bristol, Bath and NE Somerset, North Somerset and South Gloucestershire Councils. This potential fragmentation could prove dangerous for an integrated approach to mitigation and adaptation within and between cities and their city regions.

In Copenhagen, similar partnerships between private, public and research partners have proved successful, and the low carbon Nordhavnen project, the planned sustainable neighbourhood in the former docklands, is one of the most ambitious urban development projects in Scandinavia, bringing together a range of partners (Sustainability West Midlands, 2010). Similarly, Stockholm's ambition to become fossil fuel free by 2050 is underpinned by dedicated climate change groups which are backed by the public and private sectors.

Table 5.2

Examples of low carbon partnerships in UK cities (based on survey responses, literature and interviews)

Bristol	Informal arrangement through the Bristol Partnership, which is a local strategic partnership. Targets expressed in the Sustainable Community Plan Bristol 20/20 plan, which has four primary objectives of which 'sustainable prosperity' is one, and which is designed to place Bristol in the top 20 European cities within 10 years. Informal arrangement on sub-regional basis, project focused.
Plymouth	Plymouth has a 186 Low Carbon Network of local businesses (190 + members) and a semi-independent Climate Change Commission comprising some of the city's (and UK's) leading climate change academics, decision makers and business leaders. The 186 network is based on knowledge transfer and a bottom up approach to establishing best practice in local carbon management – with a view to the outcomes contributing to Plymouth's future low carbon economy. The Commission supports this and acts as an advisory team for decision makers within the Council and Local Strategic Partnership. Both were deeply involved with establishing the Climate Change Action Plan 2009/11, the Climate Change Framework (2008) and are currently the editorial guide for the Local Carbon Framework 2011/2020 (in development).
Glasgow	Sustainable Glasgow is a city-wide partnership to make Glasgow one of the most liveable and sustainable cities in Europe. It brings together partners from the public and private sectors to work with Citizens, communities and businesses. The City is committed to reducing its carbon emissions by 30% within 10 years and building a greener and more sustainable future for Glaswegians. The Sustainable Glasgow partnership includes Glasgow City Council, the University of Strathclyde, Clyde Gateway, Strathclyde Partnership for Transport, Glasgow Housing Association, Scottish Enterprise, Greater Glasgow and Clyde Health Board, IBM, BT, Honeywell, Scottish Power, Scottish & Southern Energy, Scottish Water and the City of Glasgow College. Sustainable Glasgow is chaired by Councillor Gordon Matheson, Leader of Glasgow City Council.

5.5.4 Dealing with funding constraints

One of the key barriers identified in UK survey for cities moving to a low carbon future was funding of low carbon initiatives. This operates at two levels: (i) in terms of capital finance; and (ii) in terms of providing local authority expertise.

Several examples of best practice for capital projects, such as London’s RE:FIT and Birmingham’s BES, were highlighted in section 4.14. Given the recognition of retrofitting, waste management and energy efficiency as being important drivers for a low carbon future in the UK’s Top 20 cities, it is perhaps not surprising that a range of new funding mechanisms have been developed in response to growing demands to assist local authorities in attracting private sector finance. Some of these include (Aldersgate Group, 2009; Sustainable Development Commission, 2010, Climate Group, 2011, Grant Thornton, 2011) those listed in Table 5.3.

Table 5.3 Examples of low carbon mechanisms for UK cities

Pay as You Save	A way of allowing home owners, local authorities, housing associations, community organisations and SMEs to attract capital. Frequently designed for up –front capital provision and then recoupment of energy savings. Examples, Green Deal and Birmingham’s BES.
Regional JESSICA Funds	Joint Support for Sustainable Investment in City Areas (JESSICA) allows member states to use some of their EU funding to enable repayable investments in projects. Funds can be recycled; there is no public debt and provided there is an integrated plan for sustainable urban development choice can be made as to focus. Examples, JESSICA, London
ELENA Funds	European Local Energy Assistance is used to help fund technical assistance, and can include such items as feasibility and markets studies, business plans, energy audits and preparation for tendering procedures.
Community investment	Often framed around development trusts, co-operatives and mutuals, charities, and community funds. Often institutional finance is hard to generate.
ESCO Delivery Models	Programmes which oblige energy suppliers to reduce carbon emissions in buildings by organising, financing and delivering energy efficiency and supply measures in buildings. Examples, CERT, CESP and London RE:NEW and municipal ESCOs, including Birmingham.
Neighbourhood funds	Public sector revolving fund which supports high risk projects through initial high risks. Example, Salix Finance established through Carbon Trust. Can provide funding of up to £500,000 provided criteria on payback are met.
Non-revenue generating	Local authorities can create local funds to finance schemes through for example, s106 agreements, and revenue from community renewable.
Special purpose vehicles	Local authorities, housing associations and community organisations can take an active role in forming PPPs to unlock private finance. Example, London RE:FIT

More recently a number of other potential sources of finance have been identified which include:

- **Green Investment Bank.** The Coalition Government has committed to the establishment of a Green Investment Bank, which is designed to address 'market failures' and therefore unlock significant new private investment into green infrastructure projects. The Government will enable the Green Investment Bank to have borrowing powers from 2015-16, and once the target for debt to be falling as percentage of GDP has been met.
- **City Investment Funds.** These are funds which are city-based and designed to attract overseas investors, and could use a range of instruments such as 'green city bonds'³¹, 'city futures' or 'green infrastructure investments to attract capital.

But local authorities themselves also face funding issues. It became apparent during the survey that in England, some city local authorities are struggling to cope with a lack of resources to serve their climate change and sustainability teams, a view also confirmed in the recent report by Green Alliance (2011).

When we look at overseas experience, it is clear that cities have developed innovative ways of financing the transition to a low carbon future. For example, Copenhagen has used a 'mixed market' approach to develop its district heating network which supplies 98% of the city's needs. The system is Combined Heat and Power, but in contrast to the UK, dumping heat is forbidden and all of it has to be used. Power stations which generate only electricity are not allowed and transmission companies have to buy heat from the power stations. The Danish government is responsible for overall energy policy, legislation, tax and subsidies and the local municipalities are responsible for heat planning, project implementation and connections to the network (Engineering Times, 2011). The power plants

and networks are in effect municipally owned companies (CTR and VEKS), although the power plants were acquired by Vattenhall and DONG in 2006 (Grant Thornton, 2011). Interestingly, in a UK context, in Glasgow, where possible, there is a requirement that major new development will be designed to connect to existing or planned district heating networks and/or to develop opportunities for decentralised and local renewable or low carbon sources of heat and power to meet their own on-site needs and potentially those of others in a local heat network.

Vancouver is also closely examining the concept of a 'green enterprise zone' which is an area where a diversity of green jobs are created, ranging from low threshold through to high skilled employment opportunities. This area will also have high green standards to make it the "greenest job space in the world", including improved environmental performance for business operations, urban infrastructure, transportation, and district energy. The recent Vancouver Economic Action Strategy (Vancouver City, 2011) builds on work by Peyman (2010) on low carbon economic zones and promotes the idea of a green enterprise zone, possibly in the downtown Eastside and False Creek Flats with a potential partnership with Vancouver Port Authority, and underpinned by innovative financing mechanisms, such as loan funds, tax shifts, permitting and licensing fee rebates, and expedited permit processes.

³¹ Climate Bonds are another category of green bond which have received extensive coverage (see for example, <http://climatebonds.net/>).

6.1 Introduction

This chapter of the report provides conclusions to the research drawing out the main findings to highlight the:

- Importance of defining a low carbon city
- Low carbon plans and action that UK cities are undertaking;
- Policy and practice implications of the research; and,
- The future of low carbon cities.

6.2 ‘Low carbon city’: a question of definition?

As the literature review suggested earlier in this report, defining the term, ‘low carbon’, an essentially normative concept, is not easy. This applies as much to the way in which the term is applied to ‘society’, ‘economy’ or ‘city’.

Skea and Nishioka’s (2008) normative definition of a low carbon society is a useful starting point; that is, that a low carbon society should:

- Take actions that are compatible with the principles of sustainable development ensuring that the development needs of all groups within society are met;
- Make an equitable contribution towards reducing global carbon emissions;
- Demonstrate a high level of energy efficiency and use low-carbon energy sources and production technologies;
- Adopt patterns of consumption and behaviour that are consistent with low levels of greenhouse gas emissions.

As we saw in the literature review despite attempts to define low carbon society and low carbon development, there has been little progress in defining what is meant by a ‘low carbon city’. A low carbon city is essentially a normative concept, implying that a city has achieved an acceptable state in terms of reducing carbon emissions.

It was also clear from our research that the term, ‘low carbon economy’ was often used in city action plans and strategies. For example, Plymouth City Council (2011:3) provides an initial definition of a low carbon and environmental economy as:

‘Industries that produce goods and services aimed at addressing environmental objectives and, in particular, with the aim of lowering carbon emissions’.

This, however, as the same document points out, is very much business oriented and ignores the important role played by households and other groups. Moreover, the Work Foundation (2010) point out that despite coining a range of related descriptive titles (green economy, green-collar jobs, the environmental economy, eco-industry) agreement on a consistent working definition of the low carbon economy has proved impossible, and that a fundamental problem relates to the breadth of activities which could potentially contribute to lowering carbon emissions. The Work Foundation (2010: 13) suggests the concept is:

‘...best understood as a range of activities which are materially supported by the need to reduce the release of carbon dioxide into the atmosphere, such as:

- using fossil fuels more efficiently (such as hybrid vehicle technology).
- preventing the emissions into the atmosphere or removing carbon dioxide from the environment (such as carbon capture and storage facilities).
- supporting the transition to less carbon intensive operations (such as carbon finance and carbon trading activities)’.

There needs to be a consensus view over what the terms ‘low carbon city’ and ‘low carbon economy’ mean in a UK context. The ASSAF (2011) and Work Foundation (2010) definitions provide a valuable starting point for continuing debate.



The Top 20 cities in the UK are responsible for about 22% of the UK's carbon emissions (2009) and during the period 2005-2009, their overall emissions fell by 12.5%. Similarly the UK's top 20 cities consumed about one fifth of the UK's total energy (2008) whilst consumption fell by about 7.5% between 2005 and 2008.

The analysis in section 3.5 of this report showed that larger UK cities (in terms of population and area) produce more emissions and consume more energy than smaller cities (in total and per capita terms). More densely populated cities are, however, more carbon and energy efficient in per capita terms than less dense cities. Moreover, increased wealth is associated with more emissions (in per capita terms) and cities that create more waste also tend to create more carbon emissions³². Set against this background, UK cities have developed plans and strategies to deal with carbon reduction targets.

6.3.1 Plans and actions

The majority of UK cities have agreed carbon reduction plans in place, either through: (i) climate change plans; (ii) low carbon plans for the local authority as an organisation; (iii) some other kind of plan/strategy (e.g. sustainable energy or sustainable development); or (iv) a low carbon plan for the city as a whole. The top 20 cities tend to have a more integrated approach through their climate change plan which also partly focuses on low carbon.

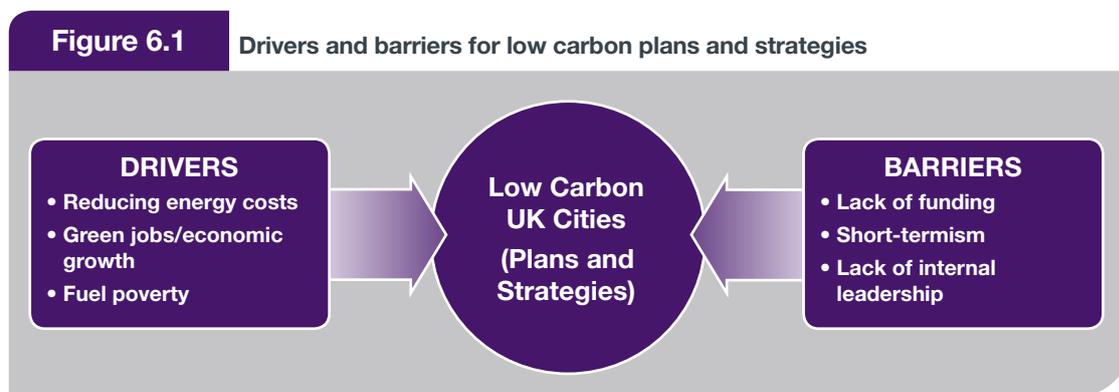
Within these plans, most UK cities have carbon reduction targets in place (city wide, or local authority), and these overall targets (and sectoral targets when they are also present) are embedded in their climate change action plans by Top 20 cities. Nonetheless, more needs to be done because only 7 respondent UK cities had 2050 targets in place and these targets were frequently set for short to medium terms timeframes. There is also limited evidence to suggest that having a plan or strategy in place to reduce carbon emissions can make a significant difference to the amount of overall reduction in emissions over time. In such cases, it is more likely that cities which combine a plan and implementation of actions to fulfil the plan are the cities which lead by example.

In terms of ambitions in setting carbon reductions and tackling the low carbon agenda, the three most important ambitions for cities were (i) energy efficiency; (ii) waste management; (iii) jobs/skills economic growth. Retrofitting was relatively more important for Top 20 cities than for other cities.

³² As indicated in Section 3, the carbon emissions and energy consumption analysis of cities was based on the main local authority in each city for ease of comparison. This does not use a Primary Urban Area basis (i.e. 'city region') therefore, and this approach is replicated in the online survey which is based on the same single, city-based local authorities in the data analysis to ensure consistency.

6.3.2 Drivers and barriers

Figure 6.1 shows the key drivers and barriers for UK cities developing low carbon city plans and strategies.



Not surprisingly the drive to reduce energy costs, and green jobs/economic growth, and the increasing issue of fuel poverty were seen as critical drivers.

In the wake of government cuts, funding issues were seen as a key barrier, not only in terms of capital projects or improvement grants, but also in terms of the provision of resources for local authority teams operating in the low carbon and climate change arena to do their jobs.

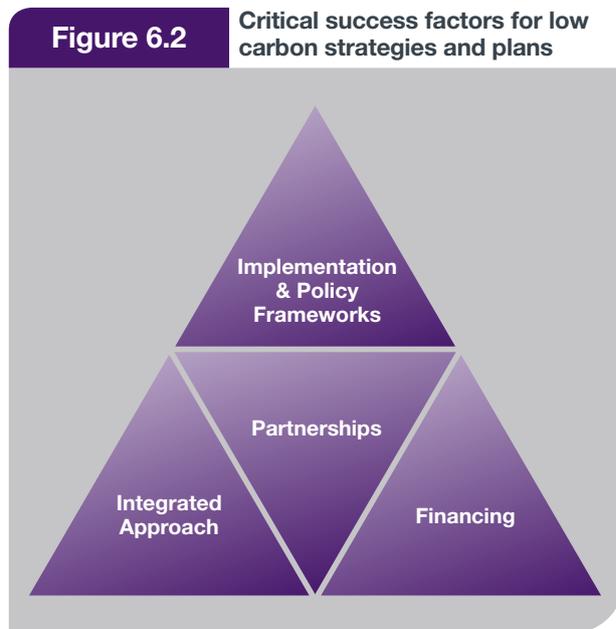
There was still considerable uncertainty over how the localism agenda would play out and many people felt that this and the removal of NI186 would have a negative impact. If national targets are to be met, then local action is needed, but the localism agenda makes the government reluctant to impose targets on local authorities (see also Green Alliance, 2011).

Attitudes towards the Green Deal were more positive, and Top 20 UK cities were the most positive group amongst respondents, although there were also concerns expressed over uncertainty regarding the exact mechanisms of the deal.

Finally, the majority of respondents also felt that the renewables target was unlikely to be achieved by 2020, again perhaps implying a tension between localism and the need to have a coherent set of mandatory local targets, and this will certainly not be helped by the recent cutting of renewable energy subsidies (Harvey, 2011).

6.3.3 Critical success factors

The case studies showed that there were four critical success factors (Figure 6.2) which can help create an environment which is supportive of effective low carbon strategies and plans in UK cities.



In summary these are:

- **Frameworks for policy-making and implementation.** There is no single blueprint for success for a low carbon future but cities which are successful in reducing carbon emissions within a broader low carbon framework also ‘measure-commit-plan-measure-monitor’. Levering policy and linking policy at a city level with national policy can also strengthen responses: cities which anchor their targets within the national framework are more likely to succeed. UK cities should certainly strive more to set carbon emissions targets in the context of national 2020 and 2050 targets. It was clear from the online survey and the three A’s assessment (‘awareness’, ‘analysis’ and ‘actions’) of the Top 20 city respondents (and indeed other cities) that there needs to be further action from UK cities on target setting and implementing coherent action plans.
- **Integrating low carbon and climate change agendas.** Cities are using a range of plans to tackle the low carbon agenda. Generally, the most successful cities are those with a tradition of sustainable development or energy action and which integrate and link their low carbon plans within a broader climate change strategy. Sectoral targets are often part of a detailed plan for a low carbon future and cities which lead by example in their own administration (i.e. the local authority) are more likely to be successful in achieving their aims. Cities which lead by example, are those which set tough targets within their plans and provide strong leadership.
- **Partnerships.** Strong and collaborative relationships with government, not for profit organisations, citizens, and business and industry is essential. Cities which have a history or tradition of environmental action are also leading by example, and cities which link with business through the green jobs/green growth agenda are also achieving success. The Local Strategic Partnership model has helped achieve success in England, although doubts remain as to whether and how the new Local Enterprise Partnerships will knit together to provide possible linkages between the existing ‘green growth’ and climate change/low carbon agendas in city-based local authorities.
- **Innovative financing solutions.** Cities which have developed innovative financing solutions to tackle energy efficiency and retrofitting issues are also leading by example. In some cities, this is leading to solutions which link with energy supply (Copenhagen) or with spatial planning innovations which have an in built fiscal incentive (Vancouver’s Green Enterprise Zone). In others, it is built around a strong retrofitting focus (for example, London and Birmingham).

6.4 Policy and practice implications for UK cities, national government and RICS

The results of the research suggest that cities (and their constituent local authorities) and national government need to take the following actions.

Cities should....

- Do more to develop fully integrated low carbon plans and strategies. Although there has been progress towards implementing low carbon plans and strategies, cities need to do more to:
 - o work with government to introduce low carbon budgets which tie in with national carbon emissions targets.
 - o ensure the low carbon agenda is fully developed and integrated with wider climate change plans and strategies and that the linkages with good sustainable planning principles are fully developed.
 - o ensure carbon emissions targets are realistic and challenging.
 - o integrate sectoral carbon emissions targets within their plans.
 - o use proper measuring planning and monitoring techniques to ensure change happens.
- Help play a leading role in developing and promoting a low carbon economy. The role of the new LEPs and how these work together will be critical. It will be important for LEPs to knit and mesh together with the existing LSPs. Cities will need to be proactive in driving change but may well require further resources from national government to be able to do so effectively³³.
- Help develop networks to ensure best practice, through such bodies as the Local Government Association (LGA) in UK and ICLEI. Global initiatives are helping provide cross-boundary knowledge and learning, and UK cities need to work together more closely to share best practice, perhaps within a more fully developed, national 'low carbon city' framework supported by government, building on the initial work of the Carbon Trust in this area.

UK government should....

- Develop a new policy framework which recognises the role of cities in the climate change and low carbon agendas. The majority of the UK's population lives in cities, and they are vital in providing a focus for tackling climate change and responding to the low carbon agenda through technology deployment and access to finance. A new 'low carbon city' framework, which builds on the existing DECC pilots, should be developed and the concepts of 'low carbon city' and 'low carbon society' should be clearly defined within this framework.
- Introduce mandatory local carbon budgets. The government should work with local authorities to introduce mandatory low carbon budgets for all local authorities, including those in cities (Box 6.1). These LCBs should be anchored within the NI186 (or equivalent) carbon emissions indicator set. Monitoring of progress towards carbon emissions targets should also be carried out, preferably at central and local government level, and the system could, for example, be underpinned by centralised low carbon fiscal/grant incentives or grant penalties tied into local government funding.
- Help resolve funding delay issues and use the Green Investment Bank (GIB) to assist in funding city-based low carbon plans. The government needs to take urgent action to address the funding crisis for low carbon projects. Delays in the Green Deal³⁴ and the deferred implementation of the GIB have led to further uncertainty. More certainty should be provided so that local authorities can become Green Deal providers. Government also needs to work with the funding institutions to help develop new vehicles for financing the low carbon economy in cities: this could be through such initiatives as 'City Investment Funds'.

³³ Worryingly, a recent research report by Nathaniel Lichfield (2011) found that only 28% of all English local authorities specifically identified, in their economic development strategies or other economic policy documents, the 'green economy' sector (environmental services and goods) as an area of growth or one which they were targeting or supporting. ³⁴ At the time of writing legislation had just been enacted to implement the Green Deal by Autumn 2012.

Box 6.1 Local carbon budgets

Local carbon budgets (LCBs) are founded on the principle of prioritising local action. A step change is needed if we are to fulfil our carbon emissions targets by 2050 in the UK. Carbon emissions are about 80% 'localised' and so joined-up participatory local action is a key way to bring about a major transition to a low carbon future. Local carbon budgets are an area-based approach, where the Committee on Climate Change would help each local authority set its carbon budget, and provide best practice advice. The targets set would be in line with national targets. So for example, Friends of the Earth (2010) suggest an approach which is shown in Figure 6.3.

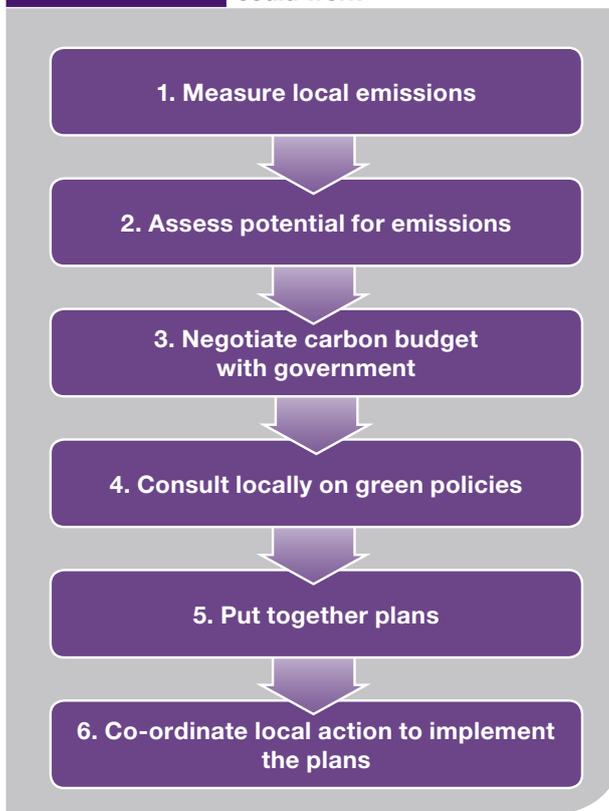
The concept of LCBs has received wide support across the political spectrum and there was lobbying for the Energy Bill to include them in an amendment but ultimately this was not carried through. If LCBs were to be made mandatory for local authorities then NI186, or an equivalent data set, would need to be used. Monitoring of progress towards targets would also be required, which under the current government is more likely to be at local level than central level.

Source: Friends of the Earth, 2010

The implications for RICS and its members are that the context for a low carbon built environment needs to be understood at a city level. This is essentially a 'scale' issue and those cities which are leading by example in the low carbon agenda are the cities most likely to provide a successful low carbon built environment and related buildings and infrastructure, both of which will help underpin property asset values and quality of life for their citizens. RICS members have an important role to play not only in the overall building 'lifecycle', but also in the retrofitting agenda, which will become increasingly important at a city level.

The scope of surveying advice (which could range from acquisition, disposal, purchase, development or management and maintenance) stretches across a variety of property owners and user organisations, varying in scale from multi-million corporate owners and occupiers, large-scale public sector bodies and international pension funds, through to the small and medium enterprises sector. The professional advice that surveyors offer has a huge potential to influence the climate change and low carbon agendas at national, city and building level, because the built environment also contributes to some 40% of global carbon emissions.

Figure 6.3 How local carbon budgets could work



Source: Adapted from Friends of the Earth, 2010

So understanding the context for UK cities and their engagement with the low carbon agenda is not only important for potentially 'picking winners' in, for example, the sustainable property investment and development arena, but also for offering the potential for business opportunity through expert advice and input to stakeholders in cities who are currently performing less successfully in the low carbon agenda.

6.5 Looking to the future: low carbon cities and economic development

The city of 2050 is likely to be very different to that of today. Respondents in our survey highlighted a range of best practice measures which they were using to take them to a low carbon future. These included sustainable transport initiatives, including schemes to promote electric vehicles; smart metering projects within neighbourhood projects or within local authorities themselves (as an organisation); community low carbon or retrofit programmes; and major renewable energy projects. As far as the built environment is concerned, carbon emissions from existing buildings will be tackled through re-engineering the existing fabric of buildings; improving appliance efficiencies; decarbonising energy supplies; and changing behaviour. Moving to a sustainable low carbon future will not happen at an individual or neighbourhood level. It must happen at a city level if change is really going to happen.

Cities have much to gain from embracing a low carbon agenda (World Bank, 2011). Not only are the costs of inaction high, but the co-benefits of public health improvements, costs savings and energy security are also substantial. Moreover, a city's quality of life is closely linked to low carbon emissions and low pollution. In another sense, cities can be pilots or champions for change in the low carbon agenda as there are clear economies of scale in retrofitting and deploying technologies in existing centres of economic activity and wealth creation. Given the fact that cities also have control over land use, transport, buildings, waste management and other services, then they are well-positioned to use their influence to create a step change towards a low carbon future. Finally, cities anchoring their low carbon agenda alongside 'green growth' and 'green jobs', can also help drive change across the local and regional economy.

With the growth of a city-region narrative, it is vital that city-based local authorities work with national government, business, community and other stakeholders to develop a national, 'low carbon city' framework. This will be vital for English cities in a changed political landscape and the emergent localism agenda, but also for the rest of the UK. As a recent Local Government IDEA paper (2011:3) suggested:

"Local authorities have a leading role to play in promoting the low carbon economy locally. Responding to this challenge requires local authorities to establish a corporate response, encompassing local authority functions outside of economic development. The UK Low Carbon Industrial Strategy acknowledges this when it states that 'local authorities have a critical role in developing their local economies as well as helping central government deliver its low carbon ambitions generally.' According to the Strategy, part of this role is securing better co-ordination at the local level, ensuring that various local agencies have a shared understanding of the strategic priorities pertinent to sustainable economic development".

Establishing new partnerships, growing existing ones, and finding new funding sources will therefore be crucial to success.



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