The Economics of Low Carbon Cities

A Mini-Stern Review for Birmingham and the Wider Urban Area

Preliminary Findings

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The Economics of a Low Carbon Birmingham and Wider Urban Area

Today

10% of city-scale GVA leaves the local economy every year through payment of the energy bill. This is forecast to grow significantly by 2022.

Tomorrow

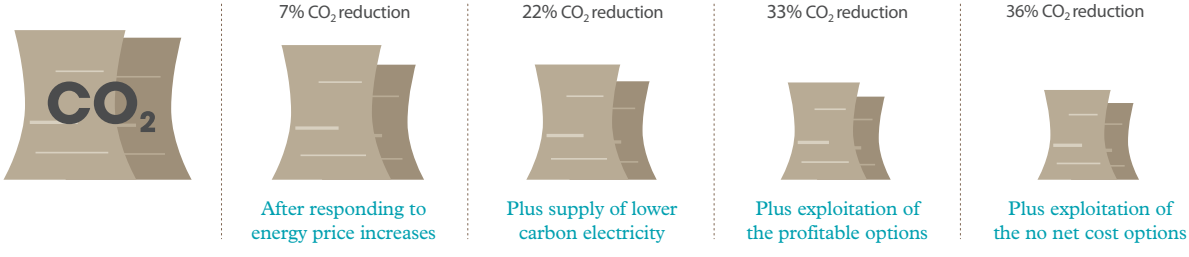
Investing 1% of GVA p.a.

Leads to...

1% of GVA could be profitably invested, every year for ten years, to exploit commercially attractive energy efficiency and low carbon opportunities.

- **Energy**
  reductions in the energy bill equalling 2% of GVA
- **Financial viability**
  just under four years for measures to pay for themselves
- **Employment**
  more jobs and skills in low carbon goods and services
- **Wider economic benefits**
  energy security, increased competitiveness, extra GVA
- **Wider social benefits**
  reductions in fuel poverty, improvements in health

Potential to reduce CO_2 emissions



The Economics of Low Carbon Cities: A Mini Stern Review for Birmingham and the Wider Urban Area

Preliminary Findings

What is the most effective and efficient way to decarbonise Birmingham and the wider urban area as represented by the Greater Birmingham and Solihull and the Black Country Local Enterprise Partnerships? There are hundreds of low carbon options available and, although they present a significant opportunity to reduce energy bills and carbon footprints, there is often a lack of reliable information on their performance. The higher levels of risk and uncertainty that emerge as a result of this lack of reliable information can be a major barrier to action, making it hard to develop a political, a business or a social case for investment in low carbon options.

Birmingham and the wider urban area has a population of 3 million, an economy worth £50 billion a year and an energy bill of £5.1 billion a year.

The Context

In an attempt to address this problem, this report reviews the cost and carbon effectiveness of a wide range of the low carbon options that could be applied at the local level in households, industry, commerce and transport. It then explores the scope for their deployment, the associated investment needs, financial returns and carbon savings, and the implications for the economy and employment.

It does this for Birmingham and the wider urban area, an area with a population of 3 million, an economy worth £50 billion a year and an energy bill of £5.1 billion a year. Whilst highlighting the very significant and commercially viable opportunities for the decarbonisation of this area – and the potential economic benefits associated with these – the report also recognises the scale of the challenge, the need for investment and the requirement for investment vehicles and delivery mechanisms that can exploit the potential for significant change.

Preliminary Findings

Our Approach

Our approach has been to develop a robust model for assessing the costs and benefits of different levels of decarbonisation at the city region scale. We use UK Committee on Climate Change Data on the potential energy, cost and carbon savings from thousands of low carbon measures. We take into account changes in the economy and the wider energy infrastructure, but we focus primarily on the potential for the wider deployment of energy efficiency measures and small-scale renewables. We also assess the potential for their deployment and the rates at which they could be deployed at the local level.

We use realistic projections of the energy, cost and carbon savings emerging from different measures. Typical interest rates (8%) and energy prices are used and ambitious, but realistic, scenarios for the rate at which different technological and behavioural options are adopted. Projected savings are reduced to take into account implementation gaps. The scope for the adoption of different measures is adjusted to take into account hard to reach households and businesses.

The Potential for Carbon Reduction – Investments and Returns

We find that – compared to 1990 levels – Birmingham and the wider urban area could reduce its carbon emissions by 2022 by:

- 10.8% through cost effective investments that would pay for themselves (on commercial terms) over their lifetime. This would require an investment of £3.6 billion, generating annual savings of £954 million, paying back the investment in 3.8 years but generating annual savings for the lifetime of the measures.
- 14.8% through cost neutral investments that could be paid for at no net cost to the economy if the benefits from cost effective measures were captured and re-invested in further low carbon measures. This would require an investment of £6 billion, generating annual savings of £1.1 billion, paying back the investment in 5.3 years but generating annual savings for the lifetime of the measures.
- 16.1% with the exploitation of all of the realistic potential of the different measures. This would require an investment of £7.9 billion, generating annual savings of £1.3 billion, paying back the investment in 6.1 years but generating annual savings for the lifetime of the measures.

Impacts on Future Energy Bills

These figures are particularly significant in the context of projected energy price increases. We calculate that the 2012 energy bill for Birmingham and the wider urban area is £5.1 billion per year, but we forecast that this will grow to £6.6 billion by 2022.

- With investment in all of the cost effective measures, this £1.5 billion increase in the annual energy bill could be cut by £954 million (64% of the projected increase).
- With investment in all of the cost neutral measures, it could be cut by £1.1 billion (76% of the projected increase).
- With investment to exploit all of the realistic potential, it could be cut by £1.3 billion (87% of the projected increase).

Birmingham and the wider economic area could therefore insulate itself against projected energy price increases to a very large extent through investments in energy efficiency and low carbon options.

The energy bill for Birmingham and the wider urban area is £5.1 billion per year, but we forecast that this will grow to £6.6 billion by 2022.

The Wider Context – Other Influences on Carbon Emissions from Birmingham and the Wider Urban Area

To put these energy savings and carbon reduction figures into a wider context, we find that:

—With other things constant, background trends in economic growth combined with changes in the energy and carbon intensity of GDP will lead to a 7% increase in carbon emissions between 1990 and 2022.

— Higher energy price increases will impact on demand, and this will lead to a 14% drop in carbon emissions compared to the 1990 baseline by 2022. The total effect of the background trends plus the response to higher energy price will be a 7% drop in emissions between 1990 and 2022.

—The decarbonisation of the national electricity system will lead to a 15% drop in carbon emissions by 2022. The total effect of background trends, the impacts of price increases and the decarbonisation of the national electricity supply system will be a 22% drop in emissions between 1990 and 2022.

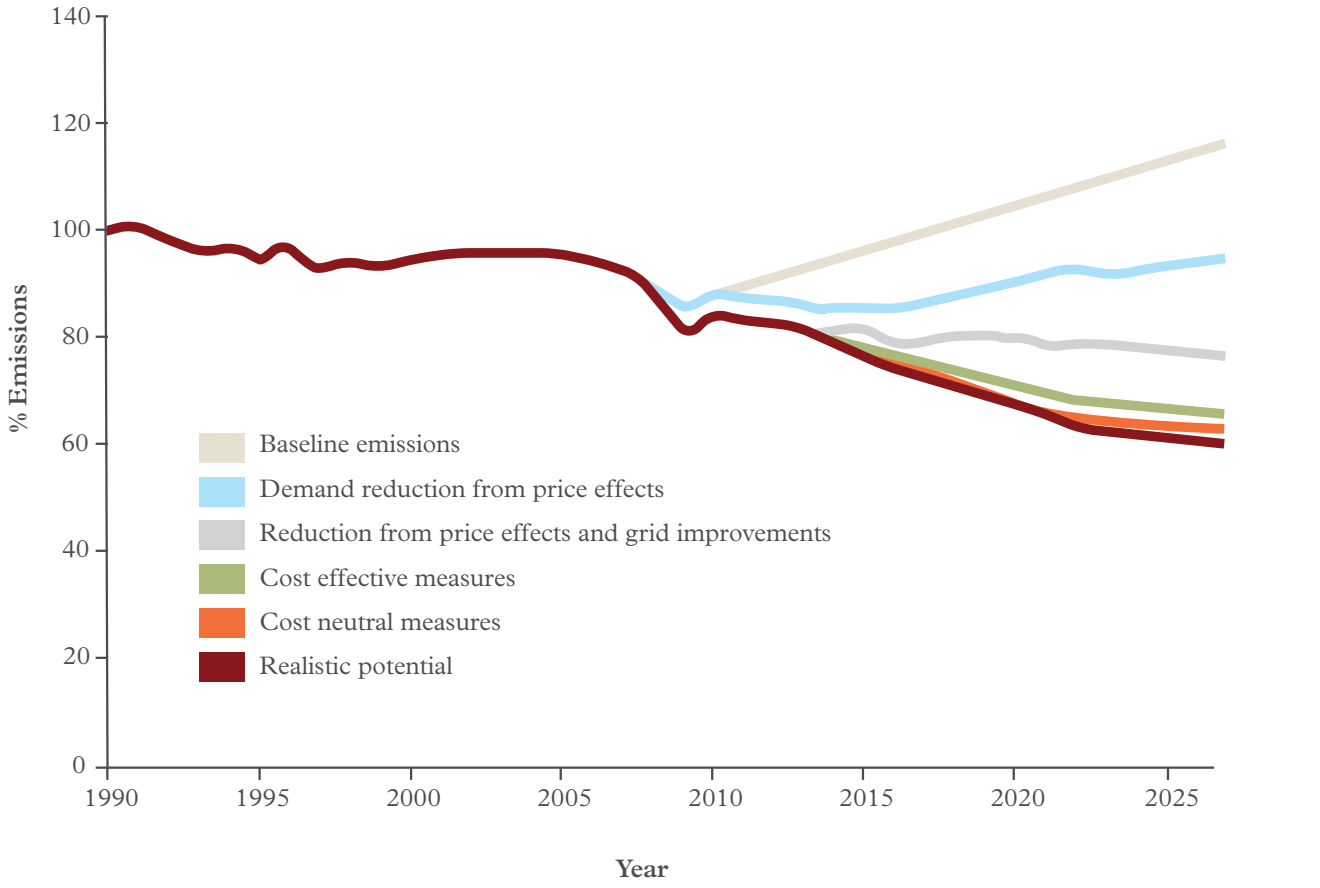
—The total effect of all of the above plus the exploitation of all of the cost effective low carbon options will be a 32% drop in carbon emissions between 1990 and 2022.

—The total effect of all of the above plus the exploitation of the remaining cost neutral options will be a 36% drop in emissions between 1990 and 2022.

—The total effect of all of the above plus the exploitation of all of the remaining realistic potential will be a 38% drop in carbon emissions between 1990 and 2022.

The impacts of these price effects, grid decarbonisation and cost effective, cost neutral and realistic potential are shown in the Figure below.

Figure 1: Baselines and Analysis of Price Effects, Grid Decarbonisation and Cost Effective, Cost Neutral and Realistic Potential



Preliminary Findings

Longer Term Impacts in the Period to 2027

If the currently available options were exploited in the period before 2022, they would continue to impact on energy bills and carbon footprints through to 2027 and beyond. With a continuation of current trends, where the impacts of growth are to some extent offset by the impacts of continuing increases energy prices, further decreases in the carbon intensity of electricity supply and on-going improvements in energy efficiency, we predict that the full exploitation of all of the currently available options included in this study would lead carbon emissions from the Birmingham and the wider urban area to fall by 39% in the period between 1990 and 2027. However, it is important to stress that these are the levels of decarbonisation that could be achieved through the wider deployment of the technologies and other options that exist now. New technologies, structural changes in the economy and deeper changes in behaviour would also contribute to deeper levels of decarbonisation.

New technologies, structural changes in the economy and deeper changes in behaviour will also be needed to deliver deeper levels of decarbonisation.

Preliminary Findings

Wider Impacts on Employment and Economic Growth

We also calculate that the levels of investment required to realise these reductions in energy bills and carbon footprints could have wider economic benefits within Birmingham and the wider urban area:

- Over the next ten years, the levels of investment needed to exploit all cost effective measures with employment generating capacity would lead (directly and indirectly) to the generation of 1,651 jobs and to growth in GVA of £102 million per year.
- Over the next ten years, the levels of investment needed to exploit the all of the cost neutral measures with employment generating capacity would lead (directly and indirectly) to a further 2,957 jobs and to GVA growth of £144 million per year.
- In total, therefore, we predict that the levels of investment needed to exploit all of the cost effective and cost neutral measures with employment generating capacity would lead to the generation of 4,608 jobs over the next ten years and to GVA growth of £245 million per year.

Low Carbon Investment: Supply and Demand

The analysis highlights that within Birmingham and the wider urban area there is considerable potential to reduce energy use and carbon footprints through cost effective and cost neutral investments on commercial terms. However, the fact that these opportunities exist on this scale is obviously not enough to ensure that they are actually exploited. Incentives – no matter how strong they are – have to be matched with appropriate capacities if progress is to be made. These relate both to the capacity to supply appropriate levels of investment and to the capacity to stimulate and sustain demand for such investments.

To stimulate the supply of the very significant levels of investment that are needed, we need to think about innovative financing mechanisms, based on new forms of cost recovery and benefit sharing and new ways of managing risk. And we need to develop new delivery vehicles that can stimulate and sustain demand for investment in low carbon options by overcoming the many potential barriers to change.

Preliminary Findings

Conclusions and Recommendations

From a climate and carbon perspective, the analysis in this report suggests that all of the cost effective and cost neutral measures identified here have to be exploited in Birmingham and the wider urban area to reduce carbon emissions by 36% by 2022 and by 39% by 2027.

Decarbonising on this scale and at this rate should be possible. The technological and behavioural options are readily available, the energy and financial savings associated with these are clear (even based on conservative assessments), the investment criteria are commercially realistic, and the deployment rates have been judged by the independent Committee for Climate Change to be challenging but still realistic.

The economic returns on investment could be very significant indeed. Many of the measures would pay for themselves in a relatively short period of time, they would generate significant levels of employment and economic growth in the process, and if done well there may be a wider range of indirect benefits (not least from being a first mover in this field). The political and business case for very large investments in the low carbon economy is very strong indeed.

However, the transition depends on political and social capital as well as financial capital. The levels of ambition, investment and activity needed to exploit the available potential are very significant indeed. Enormous levels of investment are required, along with major new initiatives with widespread and sustained influence in the domestic, commercial and industrial sectors.

And, of course, we need to think about some major innovations, particularly in stimulating the supply of, and the demand for, major investment resources. We need to think about innovative financing mechanisms, based on new forms of cost recovery and benefit sharing and new ways of managing risk. And we need to develop new delivery mechanisms that can stimulate and sustain demand for investment in low carbon options by overcoming the many potential barriers to change.

Whilst this report provides some vital insights, we should recognise that economics is not the only discipline that has something useful to say on the transition to a low carbon economy/society. A wider analysis should also consider the social and political acceptability of the different options, as well as issues relating to the social equity and broader sustainability of the different pathways towards a low carbon economy and society. We also need to think about `future proofing' investments to consider their compatibility with the more demanding targets for carbon reduction and with the different levels of climate change that are likely to come after 2022.

Preliminary Findings

Table 1: Cost, Benefits and Carbon Reduction by LEP and Local Authority from exploiting the cost-effective options

Local Authority	Energy bill 2012	Level of investment that could be secured*	Potential cut in energy bill*	Jobs created*	Carbon saved by 2022 (1990 baseline)*	Carbon saved by 2027 (1990 baseline)*
Birmingham	£1.65 billion	£1.09 billion	£ 294 million	505	-24.55%	-24.94%
Bromsgrove	£290 million	£139 million	£34 million	40	-26.98%	-29.56%
Cannock Chase	£134 million	£100 million	£30 million	46	-38.13%	-41.55%
East Staffordshire	£238 million	£151 million	£41 million	70	-38.16%	-41.59%
Lichfield	£233 million	£123 million	£34 million	50	-32.19%	-35.54%
Redditch	£130 million	£129 million	£32 million	46	-26.08%	-25.30%
Solihull	£449 million	£319 million	£73 million	99	-31.89%	-34.57%
Tamworth	£99 million	£81 million	£25 million	65	-41.08%	-43.35%
Wyre Forest	£160 million	£154 million	£38 million	88	-42.13%	-42.99%
Birmingham & Solihull LEP	**£3.02 billion**	**£2.31 billion**	**£601 million**	**1,009**	**-29.35%**	**-30.75%**
Dudley	£460 million	£316 million	£89 million	153	-36.35%	-38.30%
Sandwell	£531 million	£420 million	£111 million	223	-34.99%	-35.76%
Walsall	£412 million	£281 million	£77 million	136	-38.46%	-40.05%
Wolverhampton	£355 million	£251 million	£73 million	133	-42.17%	-44.94%
Black Country LEP	**£1.57 billion**	**£1.268 billion**	**£266 million**	**645**	**-37.68%**	**-39.37%**

*from exploiting cost effective options and taking into account other impacts

About us

The Centre for Low Carbon Futures is a collaborative membership organisation that focuses on sustainability for competitive advantage. Formed by the University of Birmingham, University of Hull, University of Leeds, University of Sheffield and University of York, we work across the EU, Asia and Latin America. The Centre brings together engineers, natural scientists and social scientists to deliver high-impact research on our 2013/14 themes of Energy Systems, Green Growth and Smart Infrastructure. We provide evidence to inform policy formation, encourage technological innovation and build capacity to improve resource efficiency and promote sustainable leadership in the food-energy-water nexus.

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