

Merseyside Environmental Advisory
Service

**Climate Change Adaptation &
Low Carbon Indicator Report**

Issue

Final Report | March 2012

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Resilience
Resources
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Contents

	Page
1 Introduction	3
1.1 Overview	3
1.2 Why this project?	3
1.3 Structure of this report	4
2 Preparing a SEAP	5
2.1 Background	5
2.2 What is a SEAP?	6
2.3 Key steps to SEAP production	6
3 Creating a Baseline	8
3.1 Introduction	8
3.2 Key issues	9
3.3 Considering baseline options for a LCR	11
4 Baseline Indicators	19
4.1 Introduction	19
4.2 Key Performance Indicators	19
4.3 Considering other indicators	20
4.4 Considering Community Indicators	22
5 Conclusions	25
5.1 Resources	25
5.2 Baseline Option	25
5.3 Considering Baseline & Inventory Options.	25
5.4 Opportunities to influence at a national level	26
5.5 Evaluation and Risk Assessments	26

1 Introduction

1.1 Overview

The core Liverpool City Region (LCR) districts of Halton, Knowsley, Liverpool, Sefton, St. Helens and Wirral have been recently utilising funding from the Climate Change Skills Fund (CCSF), administered by the Climate Change Support Programme (CLASP) through the North West Innovation and Efficiency Partnership (NWIEP), to undertake a range of activities related to renewable and decentralised energy.

This report has been developed to provide evidence and guidance on the key data and indicators needed to create a baseline of energy consumption and resulting carbon (CO₂) emissions for LCR. The scope of this baseline includes domestic, industrial and commercial, transport and agriculture sectors support the production and implementation of Sustainable Energy Action Plans (SEAP). The project also involves the identification of a wider scope of indicators that cover environmental, climate change adaptation and economic matters. This is to help support and enhance the wider sustainability credentials of a SEAP as well as other plans, policies, strategies and programmes developed by local authorities on climate change and carbon management.

1.2 Why this project?

A current barrier to action within LCR is the lack of a set of simple agreed common baseline indicators to underpin coordinated action and support the City Region moving forward to develop a SEAP. The indicators also need to be robust enough to anticipate and satisfy UK and European policy requirements for reducing carbon emissions. Whilst the primary focus is on developing evidence for a SEAP, in the form of a Baseline Emissions Inventory (BEI), the outputs and outcomes of this project are useful for other purposes such as supporting evidence for local development frameworks, preparing climate change actions plans, carbon management and reduction plans, developing community level indicators, supporting applications for funding and accreditation to energy and climate change related initiatives.

The report aims to enable local authorities to tackle the barrier of disparate information sets, sharing best practice. The reports contains and signposts to a wide range of guide. In the first instance the project scopes relevant approaches to developing baselines for energy consumption and greenhouse gas emissions (GHG), understanding relevant datasets and indicators. The report is supported by a number of appendices that contain information and guidance that local authorities can use to develop and identify their own baselines and indicators. Figure 1 provides a basic process diagram of the steps that will be followed to create a baseline and SEAP. This project addresses Stages 1 and 2 of the process.



Figure 1 Basic Stages of baseline and SEAP preparation

1.3 Structure of this report

- **Section 2** provides context on EU and UK energy policy and legislation, the role and purpose of a SEAP and key stages of a SEAP's preparation using the emerging LCR SEAP as an example. The section also provides an overview of key issues that have arisen of the last 18 months regarding National Indicators Sets and the New Nottingham Declaration.
- **Section 3** discusses three of options for creating a baseline emissions inventory and indicates which option is best suited for the LCR SEAP. The section identifies the sources of data for the recommended option and basic information on how to use the data in terms of energy consumption and carbon emissions.
- **Section 4** includes suggestions for Key Performance Indicators (KPI) for monitoring of the baseline. The section then goes on to discuss the scope for further indicators to be included covering environmental, climate change and social / community matters.
- **Section 5** sets out the main conclusions from the work completed to date.
- **Appendix A** includes:
 - Information on the sources used for each of the baselines to be used for the LCR SEAP.
 - Background information on the data sources used and how they are calculated.
 - Policy reviews of relevant local level plans strategies and policies in LCR.
- **Appendix B:** Contains the key data tables for Baseline Option 1 and Baseline Option 2.
- **Appendix C:** Contains a summary of Toolkits & Databases that can be used to inform the development and analysis of baseline information and monitoring for SEAPs.
- **Appendix D:** provides the DECC Timetable for Energy Statistic Releases 2001 – 2012.
- **Appendix E:** Sets out the tools developed for identifying and choosing indicators for future monitoring of SEAPs.

2 Preparing a SEAP

2.1 Background

Energy affects all aspects of life in the UK and the energy industry within the UK is a constantly evolving market with new policy, legislation and directives being introduced by the government on a regular basis.

There are various policy drivers for reducing energy demand, increasing energy efficiency and moving towards renewable and low carbon energy generation. All these drivers are designed to reduce carbon emissions and help the UK mitigate and adapt to the impacts of climate change.

Legislation and policy influencing the UK energy industry follows a clear hierarchy. Legislation is influenced by two key sets of policy makers; the UK government and EU Institutions. Both these sets of policy makers influence the UK energy industry but in different ways; the EU institutions influence the market by introducing regulations, directives and decisions which place implications either upon the UK government to introduce legislation and policy or directly upon operators within the energy market, whilst the UK government has direct influence over the UK energy market.

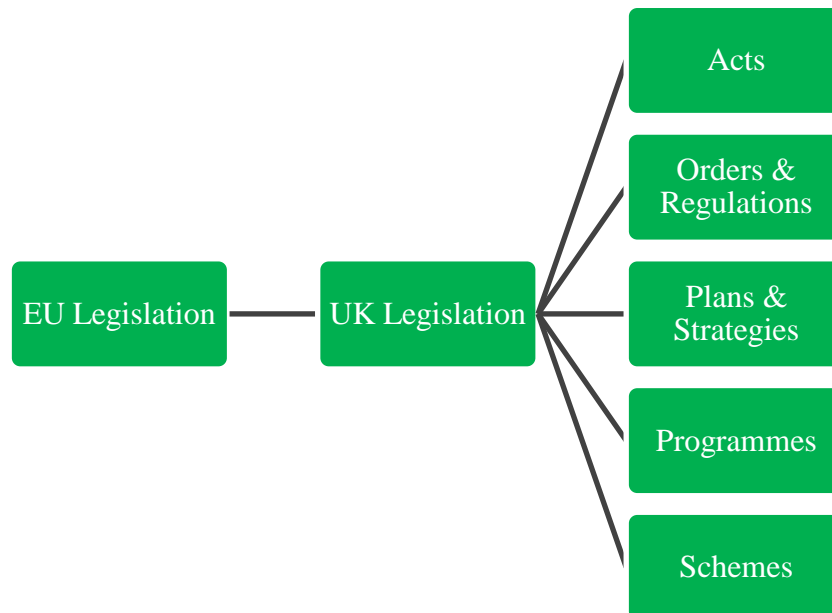
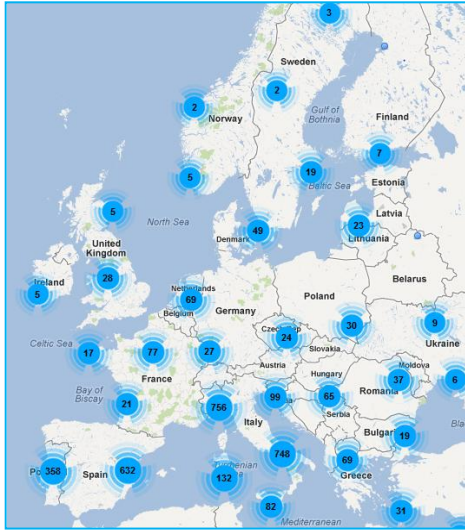


Figure 2 EU and UK Energy Policy Framework

In response to international and national targets set in UK and EU legislation, LCR is preparing its first Sustainable Energy Action Plan (SEAP).

The first stage of the LCR SEAP preparation was the completion of a Position Statement prepared earlier in 2011 that identified the concept of a SEAP, its links to the Covenant of Mayors (CoM) initiative, the benefits of a SEAP and its suitability for LCR.

2.2 What is a SEAP?



A SEAP aims to provide leaders, managers and officers with a coherent, evidence-based and prioritised action plan to shape a sustainable energy system.

The requirements of a SEAP stem from the Covenant of Mayors (CoM) movement that was launched by the European Commission in 2008.

There are major advantages from joining CoM including access to EU funding and opportunities to access technological and financial support. There are currently 3,480 signatories representing across Europe. Joining CoM is optional and anyone is free to develop their own SEAP and gain significant benefits.

Figure 3 (Left) Distribution of CoM signatories (Source: <http://www.eumayors.eu/>)

2.3 Key steps to SEAP production

Directing the preparation of the LCR SEAP is guidance developed by the CoM¹ which sets out clear steps for developing a SEAP. The CoM guidance identifies three key steps in SEAP preparation discussed below.

Step1: Creation of adequate administrative structures

The guidance requires that there are suitable departments set up with appropriate competencies, financial and staff resources to implement the commitments made through the SEAP and wider CoM agenda.

Step 2: Ensuring Community and Political ‘Buy In’

The SEAP guidance identifies the need to develop empowerment and support at the highest political levels in order to ensure effective delivery. This a key stage of developing certainty in an area to help attract investment and leverage funding.

Step 3: Baseline & SEAP Development

CoM guidance identifies that “Energy consumption and CO2 emissions at the local level are dependent on many factors: economical structure (industry/service oriented and nature of the activities), level of economic activity, population, density, characteristics of the building stock, usage and level of development of the various transport modes, citizens’ attitudes, climate. It is useful to understand the influence of these parameters, how they vary in time, and identify upon which the local authority can act (in the short, medium and long term)”

In order to understand the energy system of an area and how actions are performing a baseline is required and it the first critical output needed in order to prepare a SEAP.

¹ How to Develop a Sustainable Energy Action Plan Guidebook, Covenant of Mayors

For LCR, the aims of the SEAP are to:

- Provide a platform to grow the energy sector supply chain in LCR and in doing so create jobs and economic growth through the transformation towards a Low Carbon Economy.
- Provide certainty on energy policy and projects in LCR that will attract and increases access to funding and investment.
- Increase energy security by reducing the reliance on imported energy, improving the mix if low carbon energy generation.
- Reduce energy costs through improvements in energy efficiency and cheaper energy for public-owned assets.
- Reduce CO2 emissions and carbon foot prints across the public and private sectors.
- Increase the resilience of the LCR energy infrastructure thus providing new economic opportunities.
- Create Buy In across the public and private sector, communities and politicians by setting ambitious but realistic targets and prioritising interventions and actions.



Figure 4 Example of EU Funding for Energy projects

3 Creating a Baseline

3.1 Introduction

The UK was first to set its ambition to reduce Greenhouse Gas (GHG) emissions in law, with binding carbon budgets spanning successive Parliaments to give the necessary certainty to investors. The UK Climate Change Act requires that the UK reduces its greenhouse gas emissions by 80% by 2050 (over a 1990 baseline). This equates to a 77% reduction compared to 2005 levels² In 2008, interim carbon budgets were set to ensure the UK meets the 2050 target, including a target for a 34% reduction in greenhouse gases by 2020 (over 1990 baseline). This target has since been amended³ to 37% by 2020 (over 1990 baseline).

The Carbon Plan published on 1 December 2011 set out the UK's progress to date and assessed the cost-effective next steps. The Carbon Plan indicates that:

- UK emissions have already been cut by more than 25% on 1990 levels;
- with the policies already in place the economy will significantly exceed the 34% target set for the first 15 years under the Climate Change Act, and would have done so even if the recession had not occurred; and
- that meeting the fourth carbon budget of a 50% cut in emissions by the mid-2020s will not have any additional cost implications during this Parliament, but beyond that will require a decade of mass deployment of key technologies.

The 2009 Renewable Energy Directive sets a target for the UK to achieve 15% of its energy consumption from renewable sources by 2020, the reality is that as of 2009 just 3% of our energy generation came from renewable energy sources. While analysis demonstrates it is possible to achieve the target and industry say they have the capacity to deploy at the rate required, the scale of the increase over the next 10 years represents a huge challenge and will require strong contributions from all three key energy sectors that supply electricity, heat and fuel for transportation.

When setting targets at a national level the UK typically uses a 1990 relative baseline. However at a more local level a 1990 baseline is often unsuitable. This is due to local authorities not holding sufficiently detailed data at local levels on energy consumption and greenhouse gas emissions from 1990, and the majority not having any data until 2005 through collation of National Indicator 186 data. Consequently there is a need to adjust

² The Climate Change Committee (CCC) published its first report in December 2008 'Building a low-carbon economy – The UK's contribution to tackling climate change. The First Report of the Committee on Climate Change December 2008'/. The report suggested that Greenhouse Gas (GHG) (all six Kyoto gases) emissions within the UK would need to be reduced by 80% on the year 1990, which, they stated, is the equivalent of a reduction of 77% on the year 2005. This is an important issue for the LCR SEAP as it shows that a 1990 baseline year is not essential. In terms of the target the committee has since gone further and suggested that we will need to reduce our CO₂ emissions by 90% over 1990 – with this corresponding to a reduction of 89% on 2005.

³ The Climate Change Committee (CCC) published its second report in December 2010 'The Fourth Carbon Budget Reducing emissions through the 2020

targets set at a national level (ie, 1990) to a more suitable baseline year. As with emerging practice in other local authorities the most suitable baseline year is 2005.

This project has been commissioned to inform the delivery of Step 3 of the CoM guidance (see section 2.3). The commission provides guidance to support local authorities that are looking to prepare local and sub regional SEAPs. The project is focused on the development of a baseline, its scope, structure, content, the indicators and data that should be used and the sources where that data can be obtained. In addition to the requirements of SEAP development, the project has also been designed to widen the scope of a baseline to include other indicators that transcend energy and carbon emissions and provide local authorities with a suite of indicators that address environmental, climate change adaptation and economic matters and which can be applied for a range of purposes. The reasons for identifying indicators include:

- **The need to develop a baseline to support SEAP preparation and implementation.** The project identifies the key national statistics and data sources needed in order to develop and maintain a baseline for a SEAP.
- **A need to develop a flexible set of indicators that will meet a range of local authority requirements.** Whilst the project is primarily focused on setting out the data needed for a baseline, this project begins to set out a range of indicators already being used by local authorities to monitor the performance of plans, policies, programmes and strategies on climate change, energy and carbon matters. The project does this by reviewing LCR documents, this project looks at the types of documents being produced at local authority level and the indicators used to monitor progress.
- **Uncertainty regarding the future of indicators that are produced at local levels.** At a national level there have been significant changes to national indicators and the reporting requirements for local authorities. This project is timely, and provides a steer on the core indicators that should be used to develop baseline information using minimum resources and using reliable sources.
- **Local authorities have increasingly limited resources to plan, monitor and manage strategies, plans policies and programmes.** This project provide guidance on which indicators should be used to create baseline firstly to meet the requirements of a SEAP, but also plans, policies, strategies and programmes on climate change, carbon, economic and environmental matters.

3.2 Key issues

Guidance produced by the Covenant of Mayors (CoM) identifies the preparation of a baseline as a critical output produced by any CoM signatory to formally secure their membership to the initiative. For CoM the baseline year is the year against which the achievements of the emission reductions in 2020 in a SEAP would be compared against.⁴ It is therefore important to ensure that the baseline is understood, the data used to form undertake future monitoring against the baseline is achievable and will be accurate, relevant and easy to undertake.

For local authorities in England there are a number of key issues to consider when developing a baseline. This project is timely; there have been significant changes to the

4. How to Develop a Sustainable Energy Action plan Guidebook, Covenant of Mayors

national and local indicator frameworks with have implications on the type data that is collected and returned to central government.

The government has reduced the requirements for local authorities to produce information for national indicator reporting. Many indicators have now been abandoned entirely, some have been decentralised to a local level only and others now being owned and maintained by DECC. For example, the Department for Communities and Local Government (CLG) announced in October 2010 that it was decentralising Local Area Agreements (LAAs) and replacing the National Indicator Set with a single comprehensive data list from April 2011 onwards. This is set out in a Single Data List that provides a catalogue of all the datasets that local government should submit to central government in a given year⁵. The Single Data List identifies that local authorities have a much reduced set of indicators to report on. The two key indicators that relate to carbon reduction that remain are:

- Ref 067-00 Emissions from local authority own estate and operations (former NI 185). This data is reported to DECC annually through the submission of Greenhouse Gas (GHG) reports in accordance with DEFRA Guidance for GHG Company Reporting⁶
- Ref 075-00 Local Pollution Control Statistics. This data is reported to DEFRA, through environmental permitting.

This has resulted in DECC now taking ownership of a number of indicators that were previously the responsibility of local authorities and which build on the indicators identified in the Single Data List.

In addition to the changes to data collection and returns to central government there have been changes to how local governance can ensure climate change policies and programmes are developed to protect and help the most vulnerable, particularly the fuel poor. In March 2011 a Memorandum of Understanding (MoU) was agreed between The Local Government Group (LGG) and the Department for Energy and Climate Change (DECC). The MoU's objectives include meeting the 80% greenhouse gas emissions reduction target in the Climate Change Act 2008 by 2050 against a 1990 baseline. Meeting fuel poverty targets arising from the Warm Homes and Energy Conservation Act 2000 and to meet the target to supply 15% of the UK's energy consumption from renewable energy by 2020 as set out in the 2009 Renewable Energy Directive.

The MOU sets out how DECC and the LG Group will work together to help and encourage all councils to take firm action by reducing the carbon emissions from their own estate and operations; reducing the carbon emissions from homes, businesses and transport infrastructure, creating more, appropriate renewable energy generation, using council influence and powers and participating in national carbon reduction initiatives at the local level, particularly the roll out of the Green Deal, smart metering and renewable energy deployment.

⁵ For more information visit the single data list page of the CLG website (<http://www.communities.gov.uk/localgovernment/decentralisation/tacklingburdens/singledatalist/>)

⁶ Guidance on how to measure and report your greenhouse gas emissions (DECC/Defra, September 2009)

Consequently there is an opportunity for this project to identify a baseline and wider set of indicators that can build on the Single Data List requirements, meet the future requirements of the New Nottingham Declaration and meet SEAP BEI requirements ⁷.

3.3 Considering baseline options for a LCR



Figure 5 Key Greenhouse Gas Reporting Guidance.

(Left) Greenhouse Gas Protocol (<http://www.ghgprotocol.org/standards/corporate-standard>).
 (Middle) DEFRA (GHG Conversion Factors for Company Reporting: Methodology Paper for Emission Factors and Guidance on how to measure and report your greenhouse gas emissions (Right) (<http://www.defra.gov.uk/environment/economy/business-efficiency/reporting/>)

This section discusses a number of options local authorities can consider when developing a baseline emission inventory. In considering options, Greenhouse Gas emissions (GHG), GHG reporting protocol has been considered. GHG reporting involves three categories covering direct and indirect emissions across 3 scopes. Scope 1 addresses all direct GHG emissions, Scope 2 addresses all indirect emissions from electricity, heat or steam and Scope 3 address other indirect emissions. Further details on GHG reporting are provided in Appendix A.

From the work completed there are 3 options that LCR could consider:

⁷ A consultation on a new local government sector-led approach to committing to take action on climate change was undertaken between August and September 2011. The aim of the consultation was to gauge councils' enthusiasm for a new Nottingham Declaration, and what a new declaration should look like. A total of 154 local authorities took part in the consultation, which was a 54 per cent response rate. Additional responses were received from representative bodies such as Core Cities and the Carbon Action Network. Following this consultation, and working with the Nottingham Declaration Partnership, LGG will be launching a new initiative called "Climate Local – a local commitment to action on climate change. Councils also supported a 'tackling climate change' route map for local authorities to help them continue to progress and improve their performance. Councils want a coordinated way to share good practice, information, data and benchmarking. In response LGG will be using the Local Carbon Framework Pilots to develop a 'Council Framework on Climate Change'

- Option A makes use of national indicators produced by DECC on carbon emissions estimates and energy consumption data.
- Option B relates to local authorities that are / have designated air quality management areas and have an existing Atmospheric Emissions Inventory in place to monitor
- Option C involves the commissioning of a bespoke carbon foot printing service to create a baseline emissions inventory. This option is likely to involve the procurement of an external consultancy service.

Option A – Use of DECC carbon emissions estimates and energy consumption data

This option will be taken forward for the LCR SEAP and is consistent with other SEAP baselines prepared in the UK.

- **Quality:** The data being produced is continually improving, is subject to external verification and links in with the National Atmospheric Emissions Inventory (NAEI). DECC and partners are also continuing to develop analytical tools for the data produced which can be used local authorities to prepare baselines and undertake future monitoring. By using this data local authorities can develop a baseline that is consistent with other baselines developed for SEAPs in the UK, data and indicators used to support local authorities deliver action through the initiatives such as the New Nottingham Declaration.
- **Wider scope:** Many of the datasets produced by DECC on energy consumption and carbon emission estimates now have National Statics Status and can therefore – where relevant – be analysed as part of the wider national package of indicators. For example there is potential for DECC’s experimental indicators Quality indicators of energy data at regional and local authority level⁸.
- **Value for money:** The option has limited impacts on local authority resources and through the LGG and DECC MoU there is an existing resources in place to collect and analyse the data.

This option has some limitations including up to 2 year time lag in data being published. There is also limited control for local authorities in terms of capturing data at source. This can constrain the effectiveness of monitoring and the responsiveness of local authorities to address issue and trends

⁸ http://www.decc.gov.uk/en/content/cms/statistics/energy_stats/regional/quality/quality.aspx

Option B – Adapt an Atmospheric Emissions Inventory

Local authorities may have existing resources which could be used and / or adapted to take on baseline emissions inventory work individually or jointly. For instance, following discussions with the officers at Sefton Council, there is an opportunity to utilise existing tools and resources to develop a Baseline Emissions Inventory using the Merseyside Atmospheric Emissions Inventory (MAEI).

- **Quality:** The inventory would be prepared by an established team / resource with existing protocols in place for drawing together sub regional data. The data can be subjected to external verification / review.
- **Wider scope:** By integrating carbon into wider scope of GHG emissions, the MAEI would this automatically provide a number of wider environmental indicators are also covered. There is also potential for modelling to be undertaken and evidence (eg, commercial and industrial) that an inventory could be expanded to included district outside of LCR.
- **Value for money:** This option would secure and potentially expand an established joint resource within LCR ie, the MAEI team based in Sefton Council.

A summary of the MAEI indicators include:

- Major road traffic
- Minor road traffic
- Cold starts, hot soaks, diurnal evaporation
- Rail traffic (based on 2008 timetables)
- Bus & rail stations
- Airport (Liverpool)
- Shipping port
- Industrial & Commercial Electricity Use
- Industrial & Commercial Gas Use
- Other Industrial & Commercial Fuel Use & Activities
- Domestic Electricity Use
- Domestic Gas Use
- Domestic Solid Fuel Use
- Domestic House & Garden Machinery
- Agriculture

Details of each indicator are presented in Appendix A of this report.

Option B continued – Adapt an Atmospheric Emissions Inventory

Despite the benefits of this option, there are a number of issues that would need to be addressed in order for this option to be taken forward. Currently the issues include:

- The baseline of the MAEI is currently 2006. Work would be needed to create a new baseline for 2005 in order to improve comparability and consistency with other inventories and baselines.
- Insufficient resource capacity and finance available to maintain a LCR Baseline Emission Inventory as currently constituted (ie, as Merseyside it is constituted as a service for five of the six authorities, excluding Halton). These limitations are greater still if a BEI was to be expanded to include Halton.
- The need to ensure consistency across all aspects on an inventory ie, the MAEI is currently weighted towards transport emissions with a methodology and resource allocation that means that emissions data industrial & commercial, domestic and agriculture sectors are less comprehensive and detailed.
- Limited coverage of Halton with the majority of data – particularly on transport – being covered for Merseyside districts only (ie, Wirral, Liverpool, St Helens, Sefton and Knowsley).

Option C – Undertake an inventory service

This option has been used for the preparation of a number of SEAPs in the UK. The option uses GHG reporting protocol to provide a framework for developing baselines at different levels of detail and scope. GHG protocol is now used by local authorities to report on the GHG emissions from their own assets and operations. This has resulted in many local authorities developing in-house resources to prepare annual GHG reports that measure the energy consumption and emissions from a local authority's assets and operations.

For LCR, all the GHG reports produced by each local authority cover scope 1 and 2 reporting, with Knowsley and Halton including some scope 3 reporting. However for the purposes of a SEAP the reporting needs to cover a wider scope than just local authority assets and operations and therefore a consultancy service is often required to undertake the broader footprinting of domestic, transport, commercial and industrial sectors, particularly if a Scope 3 assessment is undertaken.

- **Quality:** The data used will come from established sources such as the NAEI. The consultancy service could provide independent external verification of all data sources.
- **Wider scope:** There are a number of established inventory models on the market that can provide flexible tools for a future LCR / local authority SEAP baseline. Many models can be adapted to meet local requirements and data. A number of models also include carbon emission forecasting and scenario development which would provide a useful tool for developing actions and setting targets. Examples include Carbon Decent, Greenhouse Gas Emission Protocol, dCarbon Northwest
- **Value for money:** There is potential that the procurement of an external consultancy could provide a lower cost option (eg, than the costs incurred to set up a bespoke inventory and fund the necessary resources for its update and maintenance within a Council service). Choosing the baseline for the LCR SEAP

3.3.1 Choosing the preferred baseline option for LCR

Currently the most appropriate baseline for a LCR SEAP is Option A. This option uses DECC carbon estimates and energy consumption data. It is viewed that, for the short term at least, this provides the best option for a recognised, consistent, comparable and easy to use baseline that requires resources to collate, analyse and report on data.

The datasets that will form the baseline are summarised in Figure 3 and details of each dataset / indicator are presented in Appendix A. The research completed for this study included a review of options for developing baseline inventories at local and LCR level. From the work completed there have been a number of issues raised regarding the use of DECC data for the baseline. As identified, in the short term at least, this is the preferred option for a robust and credible baseline at this stage; however the project has identified that Options B and C would both provide LCR local authorities with more detailed baselines and greater scope for controlling and understanding local energy consumption and emissions.

Source	Data Set	Web Link
Sub-national energy consumption statistics	Sub national gas consumption 2005 - 2009	http://www.decc.gov.uk/en/content/cms/statistics/energy_stats/regional/gas/gas.aspx
	Sub national electricity consumption 2005 - 2009	http://www.decc.gov.uk/en/content/cms/statistics/energy_stats/regional/electricity/electricity.aspx
	Sub national transport energy consumption 2005 - 2009	http://www.decc.gov.uk/en/content/cms/statistics/energy_stats/regional/road_transport/road_transport.aspx
	Sub national consumption of other fuels 2005 - 2009	http://www.decc.gov.uk/en/content/cms/statistics/energy_stats/regional/other/other.aspx
CO2 emission estimates statistics	Total final energy consumption 2005 - 2009	http://www.decc.gov.uk/en/content/cms/statistics/energy_stats/regional/total_final/total_final.aspx
	Local and regional CO2 emissions estimates for 2005-2009 – Full dataset	http://www.decc.gov.uk/en/content/cms/statistics/climate_stats/gg_emissions/uk_emissions/2009_1aco2/2009_laco2.aspx
	Emissions within the scope of influence of Local Authorities for 2005 - 2009	http://www.decc.gov.uk/en/content/cms/statistics/climate_stats/gg_emissions/uk_emissions/2009_1aco2/2009_laco2.aspx

Figure 3 DECC datasets to be used for LCR Baseline Emissions Inventory

One of the main issues in setting up a baseline inventory using DECC data is that energy consumption and carbon emissions are two separate datasets, with no dataset available at present that present energy consumption and emissions together in one source. Both dataset have been categorised to cover the domestic, transport, industrial sectors commercial sectors, however there are differences, with the energy consumption data focusing on fuel types / sources and the carbon emission estimates data focusing on more refined sub categories for search sector (see Figure 4).

Sector	DECC Energy / Fuel Data Categories	DECC CO2 Emissions Data Categories
Domestic	Electricity	Domestic Electricity
	Coal	
	Natural gas	Domestic Gas
	Manufactured fuels	Domestic 'Other Fuels'
	Petroleum products	

Sector	DECC Energy / Fuel Data Categories	DECC CO2 Emissions Data Categories
Industrial & Commercial	Electricity	Industry and Commercial Electricity
	Natural gas	Industry and Commercial Gas
	Coal	Large Industrial Installations
	Petroleum products	Industrial and Commercial Other Fuels
	Manufactured fuels	
Transport	Petroleum products	Diesel Railways
		Road Transport (A roads)
		Road Transport (Motorways)
		Road Transport (Minor roads)
		Road Transport Other

Figure 4 DECC Energy & Carbon Dataset Structure

To address the differences between the two datasets there are two options available to local authorities:

Option 1 - Using energy consumption datasets and converting to carbon emissions:

Local authorities' calculate their own CO2 emissions. DECC energy data is used to provide a baseline for energy consumption measured in GWh. The energy data then has DEFRA Carbon Conversion Factors⁹ (see Appendix for more details on carbon conversion) applied to create a CO2 and CO2e (kt) emissions total. The data set covers the period 2005 – 2009.

Option 2 - Using estimated carbon emission dataset: Use of DECC's local and regional CO2e emissions estimates for 2005-2009. This data provides CO2e (kt) totals for energy / fuel types, however does not include information on the energy consumption (GWh). The data set covers the period 2005 – 2009.

This identified that the total carbon emissions for the domestic, transport, industrial and commercial sectors in Baseline B increased by 0.5%. In terms of using the data it is viewed that both baselines A & B will required in order to present energy and carbon emissions and to provide information in terms of sector use and fuel type.

⁹ The latest guidance is the 2011 Defra/DECC Guidelines to greenhouse gas conversion factors for company reporting (AEA for DECC/Defra, October 2011)

3.3.2 Developing a baseline inventory structure

Following collation of baseline data the next step was to develop a structure for the overall baseline. This work has been informed by an analysis of the Greater Manchester SEAP which has been developed using DECC energy consumption data that was then converted into carbon emissions GHG reporting carbon emissions factors (see Appendix A) to create a 2005 baseline year.

The baseline(s) produced for the LCR SEAP baseline all use the national statistics / indicators to provide a 2005 baseline year from which all energy generation and associated CO₂ emission actions in LCR will be assessed against. Each baseline will covers domestic, transport, industrial and commercial sectors across a range of energy / fuel types and sectors / sub sectors.

The baselines developed include:

- **Baseline 1: Energy Consumption and CO₂e Emissions as at 2005:** This baseline would set out the combined total energy consumption and resultant emissions for all sectors (domestic, transport, commercial and industrial) across all fuel types / sources (Electricity, Natural gas, Coal, Petroleum products, Manufactured fuels) for a local authority or sub-region.
- **Baseline 2: Energy Use by Fuel Type:** The baseline would breakdown baseline 1 into energy use and emissions totals by fuel type / source. This includes Electricity Coal, Natural gas, Manufactured fuels, Petroleum products, Renewable and Waste.
- **Baseline 3: Energy Use and CO₂e Emissions by Sector:** This baseline would provide a further breakdown of baseline 1 in terms of sectors (domestic, transport, commercial and industrial).
- **Baseline 4: Energy Use and CO₂e Emissions Per Capita:** The baseline would provide analysis of emissions using the DECC carbon estimates datasets. Analysis of CO₂ emissions per capita can be provided for domestic, transport, commercial and industrial sectors. Emissions totals can also be produced for 12 sub categories across the domestic, transport, commercial and industrial sectors. Further analysis of Agricultural combustion and Land Use, Land Use Change and Forestry (LULCF) can also be provided.
- **Baseline 5: Energy and CO₂e Emissions Since 2005:** The baseline would provide indications of the overall direction of travel for energy consumption and CO₂e. Trend data can be analysed from the baseline year of 2005 onwards.

4 Baseline Indicators

4.1 Introduction

The brief prepared for this project requires that a usable set of baseline environmental, climate change adaptation and low carbon indicators are identified. The indicators should provide straightforward, innovative, effective and flexible monitoring and benchmarking at a number of different spatial levels.

The brief also required that outputs of this project are built up from existing data sources that provide a simple, efficient and targeted set of indicators that can be collated and updated at minimum or no extra cost to a local authority.

4.2 Key Performance Indicators

From the baseline there are a number of Key Performance Indicators that can be developed to understand the overall performance of a SEAP. The project has identified and confirmed the need for a consistent and comparable set of indicators to support the baseline. It is considered that the proposed principles for the development of the baseline there are a number of Key Performance Indicators (KPI) that can be developed that cover energy generation and carbon emissions requirements.

The KPIs identified to date include:

- Baseline 1 KPI: Total Energy Consumption and CO₂e Emissions per year
- Baseline 2 KPI: Energy Use by Fuel Type
- Baseline 3 KPI: Energy Use and CO₂e Emissions by Sector
- Baseline 4 KPI: Energy Use and CO₂e Emissions Per Capita
- Baseline 5: Energy Generation in LCR. Electricity and heat generated in LCR (GWh per annum) using:
 - renewable sources (wind power, solar (heat and electricity) heat pumps, biomass)
 - low carbon sources (e.g. gas CHP plants, heat pumps)
- Baseline 6 KPI : Energy and CO₂e Emission Change Since 2005

Other KPIs include:

- CO₂ emissions per capita;
- CO₂ emissions per capita (Domestic, Industrial and Transport)
- CO₂ emissions per £ of Gross Value Added (GVA).
- Total Energy efficiency measures completed across domestic sector per year

4.3 Considering other indicators

There is potential to widen the number of KPIs for SEAP monitoring and implementation. In order to understand the scope of indicators available, the project involved a review of key documents relating to carbon, climate change, energy and sustainability for each local authority. A summary of the sources reviewed is provided in Figure 4 with a more overview of each document in Appendix A.

National	<ul style="list-style-type: none"> • Single Data List • Sustainable Cities Index.
Local	<ul style="list-style-type: none"> • Carbon Management Programmes/ Plans • Greenhouse Gas Reports • Annual Monitoring Reports • Sustainable Development Documents • Climate Change (Adaptation) Action Plans • Annual Monitoring Reports • Affordable Warmth Strategies / Programmes
Merseyside	<ul style="list-style-type: none"> • Merseyside Atmospheric Emission Inventory • Merseyside Local Transport Plan 3 • Merseyside Waste Development Plan
Liverpool City Region	<ul style="list-style-type: none"> • Low Carbon Economy Action Plan • REECH Programme

Figure 5 Examples of strategies, plans, policies and programmes reviewed for indicators

A review was then undertaken which has focused on identifying a wider scope of indicators to include economic, environmental, energy and climate change adaptation. The review has looked at how indicators could be used to inform the future monitoring of a SEAP in addition to the roll is already plays in measuring the performance of existing strategies, plans, policies and programmes. To do this effectively an indicator selection tool has been developed to identify and select indicators for consideration. Details of the indicator section tool are set out in Appendix F.

It is anticipated that indicator sets will be developed over time, and guided by the projects and actions identified in the emerging SEAP and through the use of the indicator toolkits produced for this project (see Appendix E). Examples of the indicators that could be used are provided in Figure 6 below.

Indictaor Title	Description	Source
Waste indicators	<ul style="list-style-type: none"> • Proportion of transport (and thereby fuel consumption) is used from waste transportation. • No. of new waste facilities drawing at least 10% of energy from renewable 	<p>Waste DPD monitoring</p> <p>WasteDataFlow - LA waste management</p>

Indicator Title	Description	Source
	<p>or similar sources.</p> <ul style="list-style-type: none"> Annual quantity of emissions from waste management facilities 	statistics
<p>Climate Change</p> <p>Climate Change adaption includes energy as a priority action area and Provides five key indicators that indicate level of resilience to climate change.</p>	<ul style="list-style-type: none"> Level 0 Baseline – Assessment of Threats and opportunities and agreed next steps. Level 1; Public commitment and prioritised risk- based assessment. Level 2 Risk-based assessment and prioritised risk-based assessment. Level 3 Action plan and prioritised action in all priority areas. Level 4: Implementation, monitoring and review. 	NI188 Indicator 188 – Planning to Adapt to Climate Change
<p>Greenhouse Gases</p> <p>Using indicators from Greenhouse Gas Inventories and or measuring energy consumption using scope 3 carbon conversion factors. Use of this information would automatically link low carbon indicators with wider environmental issues such as air quality and also provide CO2e data.</p>	<p>Indicators cover a 'basket' of greenhouse gases: carbon dioxide, methane, nitrous oxide, HFC, PFC, SF6 Agriculture, Rail stations, Industrial & Commercial Electricity Use, Industrial & Commercial Gas Use, Other Industrial & Commercial Fuel Use & Activities, Domestic Electricity Use, Domestic Gas Use, Domestic Solid Fuel Use, Domestic House & Garden Machinery, Major road traffic, Minor road traffic, Cold Starts, Hot soaks, Diurnal evaporation, Rail traffic (based on 2008 timetables), Bus stations.</p>	NAEI MAEI
<p>Economic</p> <p>Economic indicators would provide the framework for monitoring actions in a SEAP that would build in the KPIs identified in the report.</p>	<ul style="list-style-type: none"> Number of funding applications eg, EIB (ELENA, JESSICA, JASPER) Green Investment Bank, Regional Growth Fund. Number of successful funding applications. Total value of funding applications Total value of funding applications. Total funding secured. Total net increase of employment from energy sector growth. 	All indicators would be new indicators developed at a local level.

Indicator Title	Description	Source
	<ul style="list-style-type: none"> Private inward investment Number of Special Purpose Vehicles (SPV)s and / or number of projects delivered by SPVs 	
<p>Built Environment</p> <p>Built Environment indicators would allow monitoring of new development and retrofit of the existing built environment to reduce energy consumption and improved energy efficiency</p>	<p>Number of measures delivered in homes through CERT/ CESP - Green Deal / ECO.</p> <p>Number of Code Level 3,4,5 and 6 homes BREEAM buildings.</p> <p>Number of Registered Social Landlords (RSL) / Stock Improvement Programmes.</p> <p>Number of dwelling meeting Decent Home / Decent Home + standards.</p> <p>Number of Energy Performance Certificates.</p> <p>Energy Saving Trust Advice Centre Activity (ESTAC)</p>	<p>Building Regs</p> <p>RSLs</p> <p>EST</p>

Figure 6 Summary of Potential Indicators for SEAP monitoring

4.4 Considering Community Indicators

A further requirement of this project has been to consider and provide some general guidance on developing community level monitoring of energy consumption and carbon. This section briefly provides an introduction to the type of tools and intervention measures that can be considered by local authorities and communities to improve the monitoring of local energy consumption.

4.4.1 Smart Metering



People make inefficient decisions as a result of poor information. Information enables better decisions and with better information behaviour change can be achieved. Smart systems encourage changes in behaviours which prompt new choices and activities, creating a shift in the way communities and individuals consume and share energy and, in doing so, contributing to the development of low carbon economies and communities.

A new generation of integrated hardware, software, and network technologies that provide systems with real-time information of the real world and advanced analytics to help people make more intelligent decisions about alternatives and actions that will improve how we use energy and resources.

Case Study: Fix my street

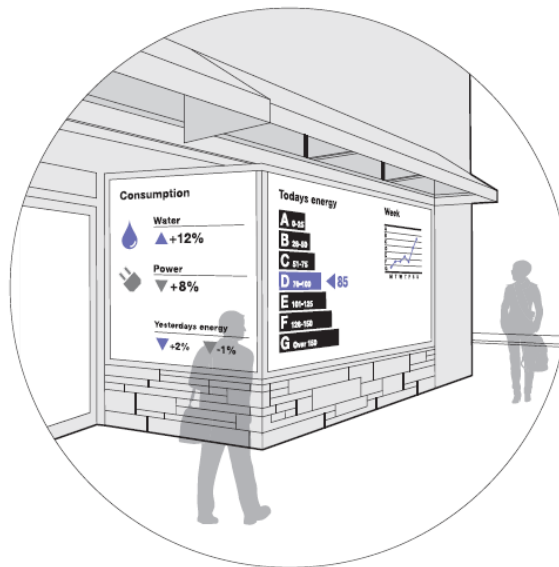
Launched in February 2007, FixMyStreet is a web service to help people report, view, or discuss local problems with their local council by simply locating them on a map. Built by MySociety, a not-for-profit company, in conjunction with The Young Foundation, FixMyStreet smartly routes reports of things that are broken or dumped, or need fixing, cleaning or clearing, direct to the relevant council in the UK. Similar systems include CitySourced in the USA, which uses an iPhone ‘app’ as the primary interface.



Using smart metering to collate disseminate data

Civic smart metering is a city-wide service in which streets and blocks can broadcast their resource data – such as energy and water usage – to a service managed by the urban administration.

The data is collated and verified, then distributed to public displays. Displays are designed to deliver detailed information up-close whilst key information is viewable from a distance.



4.4.2 Community Energy Online (CEO)

The Community Energy Online (CEO) tool provides the starting point for future community scale monitoring of energy and carbon emissions, CEO has been developed by DECC as a portal to support local authorities and community groups delivery local energy schemes. The CEO is formed around community ownership and management of low carbon energy networks that generate local and sustainable energy. CEO focuses on on-site energy generation from microgeneration and aims to ensure that generation makes a real contribution to decarbonising the grid. It is also focused on delivering efficient energy systems, whereby surplus energy in district heating schemes is used to heat buildings, whilst also ensuring that buildings are designed to zero carbon design and passive energy standards. To achieve effective project delivery the CEO sets out The Community Energy Process. This contains guidance structured by four key stages to guide individuals and communities.

- **Stage 1: Getting your project started:** Stage 1 provides guidance from a range of sources including EST, IDEA, Local Government Association, DECC, MCS and PlanLoCaL on how to get started, the structures that local authorities and communities will need to put in place and the skills that are needed in order to progress projects.
- **Stage 2: Developing a project:** This stage considers the technology options in more detail and focuses on the more specific feasibility assessments that should be undertaken. The guidance sets out the fundamental steps local authorities and communities will have to go through to move a project from an idea to a real commercially viable project via feasibility assessments.
- **Stage 3: Financing and writing the business plan:** Once a viable technology has been identified Stage 3 looks at the types of work that is needed to fund a project and deliver 'financial payback'. This covers a range of issues for local authorities and community groups including the forms of finance available to them, the business planning needed, the mechanisms that may need to be set up in order to secure the investment to finance an energy scheme and the project management required to deliver a project successfully.
- **Stage 4: Project delivery:** Stage 4 provides guidance on the implementation and rollout of projects. Advice includes guidance on procurement, how to set up energy service and billing systems with local consumers, procedures for the installation and testing of energy infrastructure and rollout to energy consumers. The final stage also provides guidance on how to set up the operational and maintenance contracts needed to service the energy schemes in the long term.

5 Conclusions

5.1 Resources

A critical issue for developing and maintaining a Baseline Emissions Inventory is the resources available at local authority level. The work undertaken for this project has identified the need to develop an approach that is essentially resource and cost neutral. The project has prioritised this issue when considering baseline options and has sought to identify an option that largely removes the need for data collation and analysis that would need on specific skills and dedicated resource and time.

5.2 Baseline Option

For the first LCR SEAP, the baseline will be Option A, using DECC carbon estimates and energy consumption data. It is viewed that, for the short term at least, this provides the best option for a recognised, consistent, comparable and easy to use baseline. The recommended baseline for the LCR SEAP will:

- Be based on DECC's energy consumption and CO₂ emission estimates data.
- Have a baseline year of 2005.
- Be categorised in terms of industrial, domestic and transport sectors
- Present data in terms of total energy consumption (GWh) and carbon equivalent (CO₂e)

The baseline will be structured in six parts and is consistent with the baseline used for the Greater Manchester SEAP. The baseline(s) will use national statistics / indicators to provide a 2005 baseline year from which all energy generation and associated CO₂ emissions will be assessed against:

- Baseline 1: Energy Consumption and CO₂e Emissions as at 2005
- Baseline 2: Energy Use by Fuel Type
- Baseline 3: Energy Use and CO₂e Emissions by Sector
- Baseline 4: Energy Use and CO₂e Emissions Per Capita
- Baseline 5: Energy and CO₂e Emissions Since 2005

All five baselines use DECC sub national energy consumption and carbon emission data. An overview the data sources are summarised Appendix A of this report.

5.3 Considering Baseline & Inventory Options.

In addition to the recommended option for the SEAP baseline, there are two further options that local authorities may wish to consider:

- The research undertaken in LCR identified that the MAEI could provide a comprehensive model for future SEAP monitoring and would meet wider greenhouse gas emission monitoring requirements. However further work is needed to make the data coverage consistent across the six LCR local authority areas.

- There are a number of commercial options that can be used to create bespoke inventories. Such options would need to be subjected to a cost benefit analysis to determine if a service should be tendered and the long terms benefits and requirements are of this option.

5.4 Opportunities to influence at a national level

As part of the research of this project a number of tool, data sources and datasets have been identified. One of the most useful tools identified is the DECC Sub National Energy Consumption Analytical Tool. The limitations of this toolkit is that although it provide a platform for updating and monitoring changes in energy consumption, it does not provide the associated CO₂ or CO_{2e} emissions.

Consequently contact has been made with DECC to establish if there are plans to develop a CO₂ Analytical toolkit and if there is potential to produce a combined energy and carbon tool. It is also considered that this work could form part of a wider initiative that links to the MoU between LGG and DECC for the New Nottingham Declaration and that further work is undertaken to provide suitable baseline data and tools for local authorities to assist in SEAP and climate change action planning.

5.5 Evaluation and Risk Assessments

A three stage process has been developed to assess indicators in order to help local authorities prioritise and assess the suitability of indicators.

- Step 1: Determine the Importance and Suitability of Indicator(s)
- Step 2: Apply Risk Assessment on Indicator
- Step 3: Apply the principles of SMART (Specific, Measurable, Achievable, Realistic, Time – bound to the Indicator

The 3 steps have been developed so that indicators can be assessed collectively (ie, all 3 steps being completed sequentially) or separately (ie, one or two of the steps and / or part of steps). Step 2 has also been produced in an Excel format with additional assessment functionality. Further details are set out in Appendix E.