

A Legacy Handbook for Low Carbon

A report prepared by *emda*

April 2011

This work, with the exception of logos, photographs and images and any other content marked with a separate copyright notice, is licensed under a [Creative Commons Attribution 2.0 UK: England & Wales License](https://creativecommons.org/licenses/by/2.0/uk/)

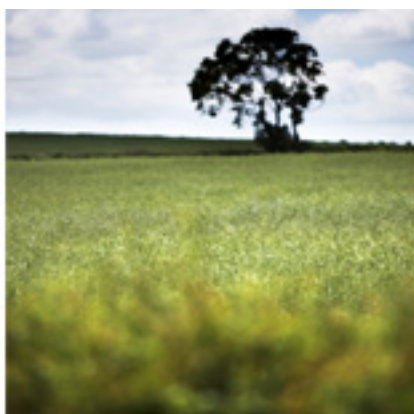
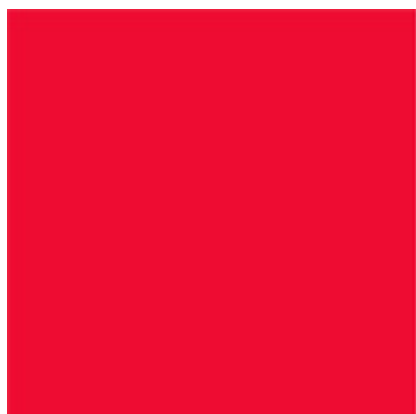
The use of logos in the work is licensed for use only on non-derivative copies. Under this licence you are free to copy this work and to make derivative works as long as you give the original author credit.

The copyright is owned by Nottingham Trent University.



This document forms part of the *emda* Knowledge Bank

A Legacy Handbook for Low Carbon



Contents page

Contents page.....	2
Chapter 1: Introduction.....	3
Chapter 2: Policy and economic context	4
Chapter 3: <i>emda</i> 's approach to tackling the low carbon agenda.....	11
Chapter 4: Achievements	31
Chapter 5: What might the future hold?	36
Appendix 1: East Midlands low carbon economy profile	41

Chapter 1

Introduction

The transition to a low carbon economy can provide tangible benefits for business – both in terms of opportunities linked to emerging low carbon markets, as well as opportunities for all businesses to reduce waste, make savings and improve efficiency through more effective use of resources.

This document has been prepared by East Midlands Development Agency (*emda*) and describes our activities to support the development of the low carbon economy and highlights key learning points from *emda*'s experience. This document aims to provide:

- A snapshot of the challenges and activities to date;
- An overview of the region's low carbon infrastructure and resources;
- A selection of thematic case studies; and
- Some insight into the potential challenges and considerations for taking this agenda forward in the future.

Low carbon is a key strand of *emda*'s support for regional economic development and, as such, has been integrated into a range of activities. The agenda has grown in prominence since the agency was formed and this legacy handbook provides a useful summary of how the agenda has evolved from what was considered a specialist issue, to part of mainstream economic development.

April 2011



Chapter 2

Policy and economic context

2.1 What is the low carbon economy?

In order to understand the approach that *emda* has taken to supporting the ambition for a low carbon economy in the East Midlands, it is first necessary to define what is meant by the 'low carbon economy'.

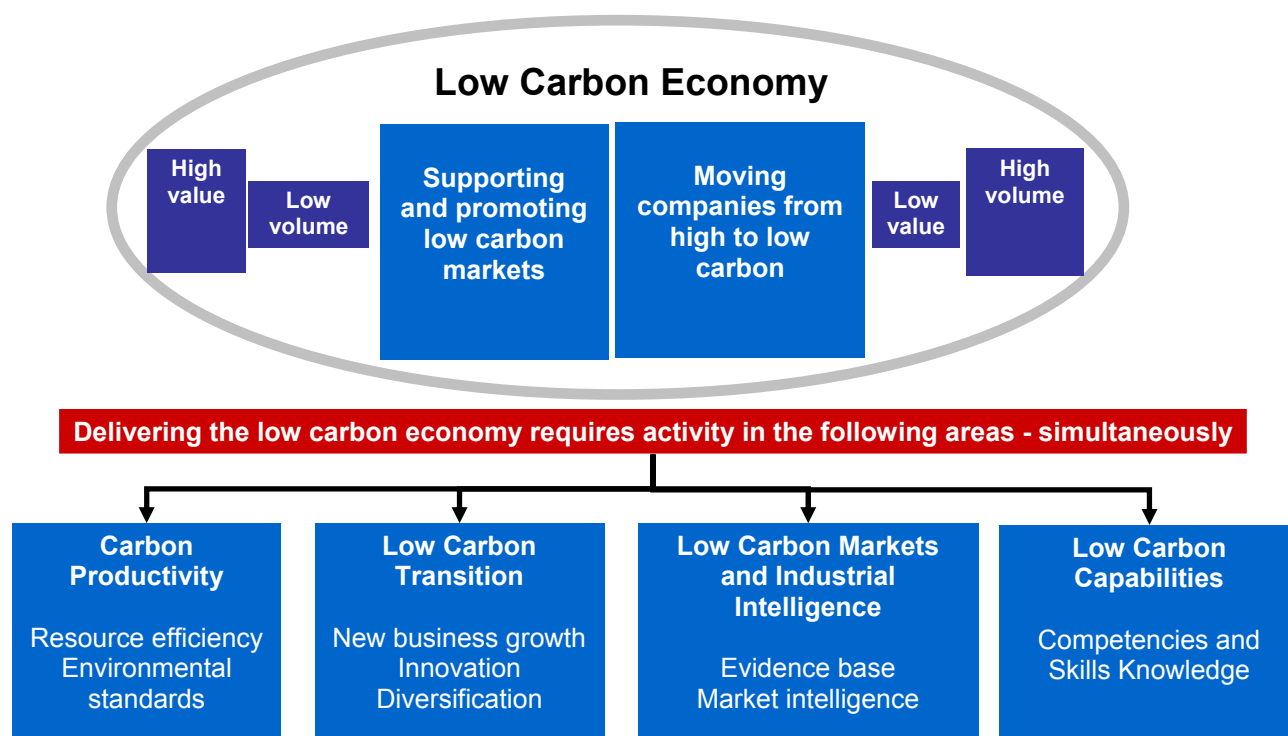
The low carbon economy incorporates traditional environmental solutions (control of air, noise and water pollution, waste management and recycling) along with renewable energy technologies (wind, tidal, geothermal and biomass) and emerging low carbon activities (road transport emissions reduction, nuclear energy, energy management and carbon capture and storage).

The transition to a low carbon economy involves a twofold approach, which requires:

- The support and promotion of emerging low carbon markets, which can be seen to affect a low volume of companies, but with high value from those interventions; and
- Wider action to ease the transition from a high carbon to a low carbon economy, which requires commitment from all businesses.

The delivery requires activity in the following four areas – and most importantly it requires it simultaneously. A piecemeal 'pick and choose' approach will not support the full transition:

- **Carbon productivity:** Supporting companies to manage resources more effectively, be resilient to change, effectively monitor and report and meet environmental standards. This support applies to all companies in all sectors;
- **Low carbon transition:** This relates to the promotion and support of companies within, or looking to move into, the low carbon economy, focusing on new business growth, diversification, innovation and marketing;
- **Low carbon markets and industrial intelligence:** Providing the evidence base and market intelligence to allow companies to prosper and grow, and allowing support providers to target and focus support where it will have most impact; and
- **Low carbon capabilities:** Refers to the skills, competencies, knowledge and abilities to manage technology, change and exploit capabilities. Access to the right level of skills and capabilities is vital to both the development and promotion of the low carbon economy, and the more effective use of resources.

FIGURE 1: WHAT IS THE LOW CARBON ECONOMY?

2.2 Strategic and economic context

2.2.1 Global

The global market for Low Carbon and Environmental Goods & Services (LCEGS) is already worth around £3 trillion per year, and is forecast to grow by half that again by 2015. Almost 900,000 people work in the low carbon sector or its supply chain in the UK and support for emerging low carbon markets provides the potential, if early action is taken, to leverage immense existing industrial and business strengths. Whilst there will be costs to this transition, these are far outweighed by the benefits of acting to mitigate the impacts of climate change and the economic opportunities this presents.

The global market for Low Carbon and Environmental Goods & Services (LCEGS) is already worth around £3 trillion per year, and is forecast to grow by half that again by 2015.

2.2.2 National

Low carbon has steadily risen up the political agenda over the last decade, driven by national and international legislation and a shift in Government policies. This culminated in the Climate Change Act in 2008 and the publication of the Low Carbon Transition Plan in July 2009. The Low Carbon Transition Plan set out how the UK would achieve its carbon reduction commitments as embodied in the Climate Change Act (2008).

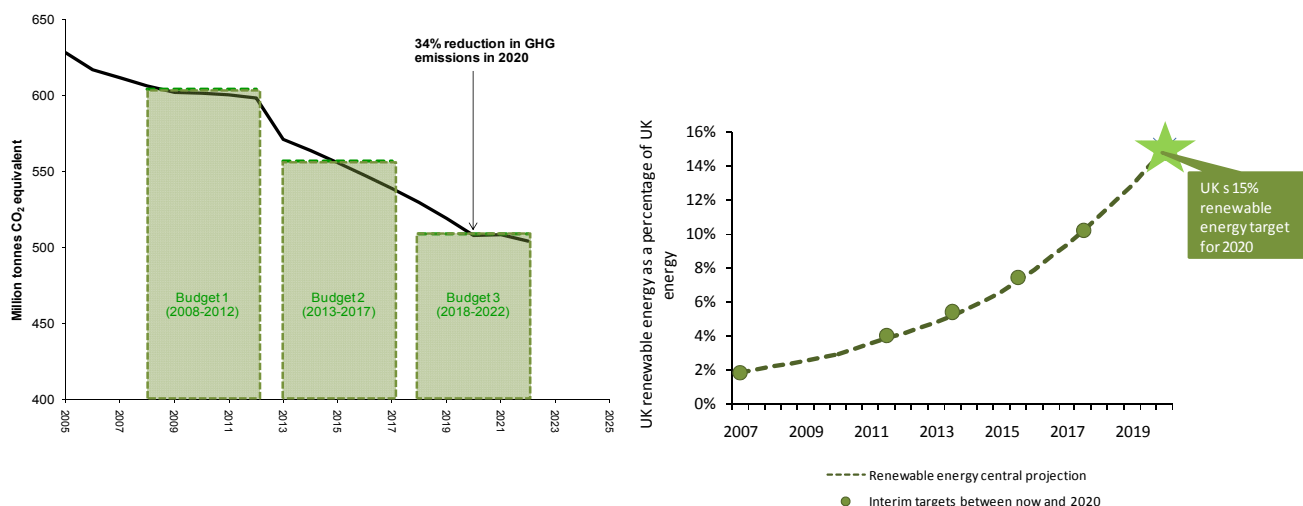
In effect, this White Paper represented a low carbon routemap setting out how the Government will deliver a 34% reduction in carbon emissions by 2020 and 80% by 2050. The White Paper was supported by additional strategies describing how the different arms of Government would contribute to this endeavour:

- **The Low Carbon Industrial Strategy (LCIS):** setting out how the Government will support the transition to a low carbon economy whilst maximising the UK's share of an international global low carbon marketplace expected to be worth £4.3 trillion by 2015;
- **The UK Renewable Energy Strategy:** setting out how the Government will achieve 15% of energy production from renewables by 2020; and
- **The Low Carbon Transport Plan – A Greener Future:** a national carbon reduction strategy setting out how the Government will reduce the 21% of national carbon emissions attributable to transport.

Whilst all the above strategies were relevant to the delivery of regional economic development, LCIS represented the economic and industrial arm of the Low Carbon Transition Plan.

The commitments and targets of the previous Government on the low carbon agenda are still largely valid. The Coalition Government remains committed to the legally binding targets for emissions reduction and the sourcing of energy from renewable resources. A key part of this commitment has been the recognition of the importance of the low carbon economy as a fast growing area of activity where the UK has considerable strengths and thus opportunities which can contribute significantly to emissions reductions and generate wealth for the country.



FIGURE 2: UK Government targets for CO₂ emissions reduction and renewable energy production

Whilst the Government remains supportive of the low carbon economy, the landscape in which this support is delivered is changing dramatically. However, the Comprehensive Spending Review (CSR) in October 2010 outlined a number of key investments in the low carbon agenda, including: the creation of a Green Investment Bank; investment in Carbon Capture and Storage demonstration projects; refocusing Feed-In Tariffs on the most cost-effective technologies; and investment in a 'Green Deal' to revolutionise the energy efficiency of British properties.

Meeting these targets requires not just investment and support for companies in the emerging low carbon marketplace, but support for wider action to ease the transition from a high to a low carbon economy.

Following on from the CSR, the Energy Bill published in December 2010 has three principal objectives:

- Tackling barriers to investment in energy efficiency;
- Enhancing energy security; and
- Enabling investment in low carbon energy supplies.

In addition, the Local Growth Paper has identified low carbon as a key activity for Local Enterprise Partnerships (LEPs), with local areas needing to make the most of their areas of strength or comparative advantage through coordination of industry and local partners. LEPs are also asked to consider what local green infrastructure issues they can address to enable growth in this area.

2.2.3 Regional

Understanding the regional context requires an understanding of not only the challenge in terms of emissions reduction to meet strict carbon targets, but also the opportunities presented by the emerging low carbon economy.

In the East Midlands, although there has been a significant reduction in emissions since 1990, they have been on an upward trend since 1999. Analysis by sector reveals that the fuel and power production sector is responsible for the vast majority of emissions. In terms of end-user, the East Midlands has the third highest total CO₂ emissions per head of population, with an above average level attributable to road transport, and this has decreased less over the last three years than elsewhere in the UK. This can be linked to the East Midlands relatively dispersed spatial pattern of development, with no single dominant centre and significant inter and intra-regional flows of commuters and goods.

The East Midlands accounts for a significant share of UK electricity generating capacity, but most energy is produced through fossil fuels. The East Midlands also consumes the third largest amount of energy per capita, and again road transport accounts for a significant share of this.

The region continues to have significant coal reserves, and its coal mining history provides a number of opportunities for clean coal energy extraction, for example through methane from abandoned mines.

The East Midlands accounts for a significant share of UK electricity generating capacity, but most energy is produced through fossil fuels. The East Midlands also consumes the third largest amount of energy per capita, with road transport accounting for a significant share of this.

The East Midlands currently has a relatively low capacity for generating renewable energy overall, at around half the capacity of the leading region. However, there have been significant developments, notably in biomass capacity driven in part by the presence of large coal and biomass co-firing power stations in the region.

Working at the regional and local level to understand how to reduce carbon emissions and meet strict national targets requires a multifaceted approach, looking not only at the source of emissions, but also the demand which drives those emissions, which will not solely reside in the region. For example, the region's high electricity generating capacity (e.g. from sites such as Ratcliffe-on-Soar power station) means that these emissions are affected by demand from elsewhere. Equally, the regional transport infrastructure is affected by traffic flows from outside the region.

The climate change targets are a significant challenge, and even if met, mitigation and adaptation to change brought about by the existing stock of emissions and ongoing emissions will be needed. For example, recent research by the Hadley Centre at the Met Office¹ suggests that by the 2050s the East Midlands will be warmer, will experience wetter summers and drier winters, and will experience higher sea levels along the coast.

¹ Climate Change and the East Midlands Economy, Met Office, August 2010

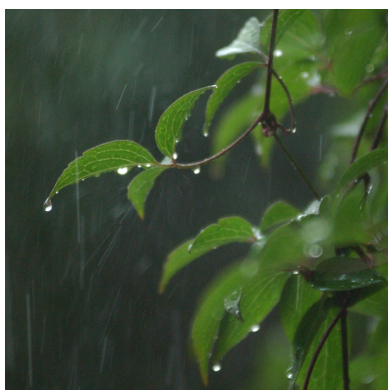
KEY IMPACTS OF CLIMATE CHANGE ON THE EAST MIDLANDS

- Annual average temperatures rising by between 1.5 to 3.5°C, with a central estimate of 2.4°C, compared to the 1961 to 1990 average.
- Mean daily maximum temperatures in the summer months could rise by 3.3°C (with a range of 1.3 to 5.9°C) while winter minimum temperatures are also likely to increase by between 0.9 and 4.1°C, with a central estimate of 2.4°C.
- By the middle of the 21st century, seasonal rainfall patterns across the region are likely to have changed. Annual average summer rainfall is likely to decrease by 16% (with a range of -36 to 6%) with increases of 14% in winter rainfall (with a range of 2 to 29%).
- Relative sea level rise by 2100 is unlikely to be less than 25cm or greater than 90cm, with a central estimate of 58cm – although this could be an underestimate due to the complexity of projecting sea level rise.

2.3 East Midlands opportunities from an emerging low carbon economy

Reducing greenhouse gases and mitigating and adapting to climate change, in addition to being a significant challenge, present a range of opportunities for businesses involved in the provision of low carbon goods, services and technologies.

In their analysis for the then Department for Business, Enterprise and Regulatory Reform (BERR)², Innovas estimated that the size of the low carbon goods and services sector in the UK was around £106 billion in 2009. They estimated that the sector comprises almost 55,000 companies and supports around 880,000 jobs. In the East Midlands the size of the sector was around £7.1 billion, which was 6.6% of the UK total in 2007/08.



² 'Low Carbon and Environmental Goods and Services' Report by Innovas for the Department of Business, Enterprise and Regulatory Reform (BERR), 2009

The share of the low carbon goods and services sector accounted for by the East Midlands is similar to its share of total GVA in the UK. Innovas estimate that there are 3,400 companies in the region employing around 61,000 people. Commercial and research strengths in the region exist in low carbon buildings technology, low carbon vehicles and fuels, and waste management and recycling. In 2010, *emda* invested in a mapping exercise to identify the companies within the low carbon sector, and ascertain their growth prospects and support required, in order to allow targeted interventions to be developed and implemented for the sector.

This research to map the East Midlands Low Carbon Economy (Ekosgen, September 2010) identified that regionally the LCEGS sector constitutes just over 2,000 businesses, with 74% of businesses in this sector planning to grow either moderately or substantially over the next 3 years.

Research to map the East Midlands Low Carbon Economy (Ekosgen, September 2010) identified that regionally the LCEGS sector constitutes just over 2,000 businesses, with 74% of businesses in this sector planning to grow either moderately or substantially over the next 3 years.

The research found that whilst the Environmental Goods and Services (EGS) sector is large in the region, it is serving a relatively mature market. In contrast, the renewables and emerging low carbon sectors, whilst small in size, are expected to grow strongly.

This makes sectors such as Biomass, Wind and Solar/PhotoVoltaic, Carbon Capture and Storage (CCS), Energy Management & Building Technologies, Electricity Generation and Civil Nuclear important to the region. Coupled with the centres of excellence covering aspects such as hydrogen fuel cells, there are significant opportunities to strengthen and grow the sector in the region.

Appendix 1 provides greater detail on individual profiles of low carbon goods, services and technologies in the East Midlands.

In conclusion, alongside the legislative push to meet challenging targets to reduce emissions, there is a clear economic and business case for focusing on the transition to a low carbon economy. This has underpinned the approach that *emda* has taken to the delivery of support for the low carbon agenda, as outlined in the following chapter.

Chapter 3

emda's approach to tackling the low carbon agenda

3.1 The challenge

The principal objective of *emda's* engagement in the low carbon agenda was to facilitate its move from a niche market sector to part of mainstream economic development, with associated investments and support.

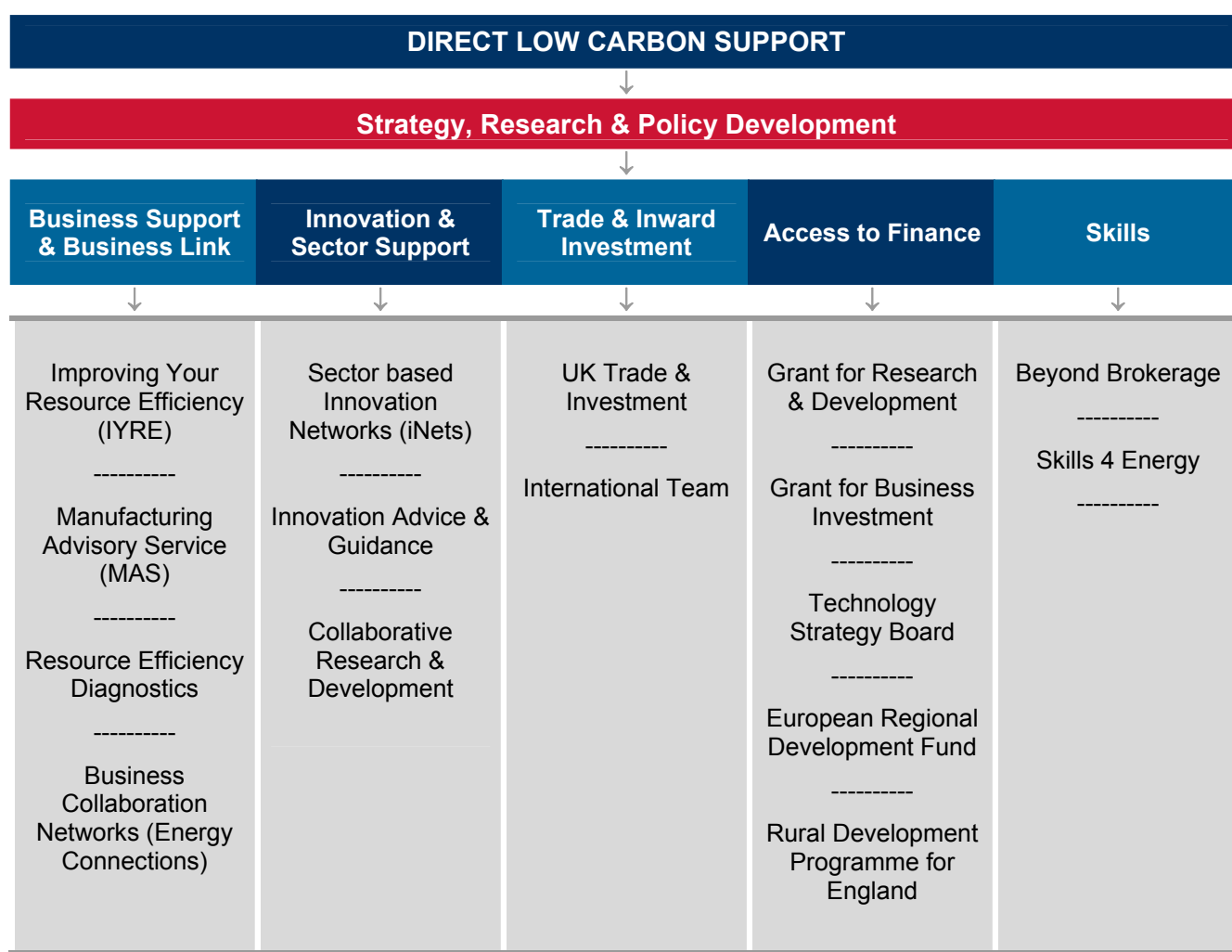
This move has been evidenced as the region's economic strategy has developed from one that provided some support to energy and the environment (*Destination 2010*) to a strategy which had at its heart an aim to deliver economic wellbeing and integrated sustainable development across all activity (*A Flourishing Region*). Low carbon is, therefore, both a cross cutting theme and an important and growing market activity in its own right.



3.2 *emda's* approach

Whilst other regions may have focused on the development of stand-alone low carbon activity, *emda* strove to embed low carbon delivery across all services, making it 'business as usual' and part of wider economic development, rather than a niche agenda. This objective has been reflected in the approach that *emda* has taken to the delivery of the low carbon agenda through a blend of evidence and strategy development, alongside a range of bespoke interventions and investments to support the integration of low carbon issues across a broad range of *emda's* direct delivery. The approach can be summarised in the following diagram, demonstrating activity across the low carbon agenda.

FIGURE 3: *emda's* LOW CARBON APPROACH



The approach outlined above and the specific interventions to support it are described more fully below.

3.3 Strategy, research and policy development

Underpinning all *emda* activity on the low carbon agenda has been the need to both develop a sound evidence base and inform and influence key strategy development, in order to help build a business case for investment. Even before legislation became a key driver for activity, *emda* had already identified this as an area with growth potential, and as such piloted a number of interventions (see Case Study 1).

CASE STUDY 1: Early *emda* investment in the low carbon agenda



- In 2001, *emda* set up the Environmental Industries Forum, which included the delivery of an Environmental Technology Showcase Event and set up 'Pot of Gold' innovation funding.
- In 2002, *emda* piloted the role of Carbon Trust Regional Managers, leading to establishment of a two year regional training and skills programme.
- In order to help East Midlands businesses gain from an anticipated £10bn investment in new installations off the Lincolnshire Coast, in 2006 *emda* contracted Renewables East to act as the regional champion for offshore wind.

3.3.1 Developing the evidence base: Whilst there had been several previous attempts in the region to build and develop the low carbon economy, including the development of the Environmental Industries Forum, these had not been sustained and there was a need to identify interventions with the greatest return on investment.

With the publication of the Low Carbon Industrial Strategy in July 2009 and the report by Innovas on behalf of BERR which mapped the low carbon sector in the UK, there was a clear remit for *emda* to invest in a high quality mapping exercise of the low carbon economy in the East Midlands, in order to allow targeted interventions to be developed and implemented for the sector. *emda* therefore oversaw the development of a detailed set of intelligence on the Low Carbon Environmental Goods & Services (LCEGS) sectors and their supply chains within the East Midlands, including company details, niche/sub sector and geographical mapping.

This detailed mapping was then combined with intelligence on key regional strengths and characteristics collated as part of the updated evidence base for the Regional Economic Strategy, *The East Midlands in 2010*. The resulting analysis, details of which are provided in Appendix 1, was finalised in 2010 and ensures that Local Authorities, Local Enterprise Partnerships and other interested parties have access to a key resource to aid future planning and investment.

3.3.2 Investment in activity to look at the potential for companies in the producer sectors (i.e. manufacturing) to move into the low carbon market place: This work complemented the enhanced support available through the Manufacturing Advisory Service (MAS) and aimed to analyse the producer sectors in the East Midlands with the potential to enter the low carbon supply chain. The study sought to identify opportunities and innovation potential linked to the transition to a low carbon economy, along with potential risks. The work also involved pilot interventions with six East Midlands companies to demonstrate the level of support needed to form a new low carbon value chain (see Case Study 2, below).

CASE STUDY 2: Exploiting low carbon opportunities - SME diversification

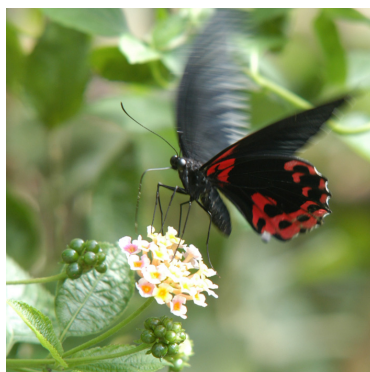
As part of the producer sector mapping project, *emda* supported an SME supplier of bespoke components to heavy industry, which had diversified into pre-stressed concrete and hydraulic control systems.

The company was supported to investigate the potential of supplying components to the decommissioning projects and new build programme for the nuclear sector. They had limited knowledge of the industry, particularly in terms of supply chain structure, immediate customers for its products and the timescale of the UK nuclear programme. The company therefore wanted to obtain support in understanding the decommissioning and new build supply chains, the relevant requirements for goods and services and key supply chain companies, as well as recommendations on accessing the opportunity for its products.

emda was able to establish that the company's products and services were potentially applicable across a wider range of nuclear applications in decommissioning and particularly new build. They already had similar quality and safety requirements to those within the nuclear industry, and there was a strong case for the company making the transition to the sector. The company was also provided with a supply chain breakdown of goods and services opportunities specific to its competencies, key market contacts, transition advice and potential risks.

“We have been able to quickly assess the current state of the nuclear market, identify possible places we could fit in and whom we should be talking to at this stage. Without the assistance, this would have taken considerable resource and time. We can proceed with far more confidence now.”

Managing Director of company supported through the producer sector mapping project



3.3.3 Collaboration with key regional partners on the development of strategies to take forward both the waste, energy and sustainability agendas in the region:

Working with the Government Office and the Regional Assembly, the agency took an active role in the development of the Regional Energy Strategy and the Regional Resources (formerly Waste) Strategy. *emda* had lead responsibility for the Energy for Enterprise strands of the Regional Energy Strategy, including delivery of key actions. We also invested in the development and revision of the Regional Waste Strategy to change the emphasis from waste as a burden on the economy, to waste as a potentially usable resource, leading to a Regional Resources Strategy.

emda also took an active role in ensuring that the developing Integrated Regional Strategy was being positioned to contribute to the dual outcomes of sustainable economic growth and sustainable development and that the exploitation of low carbon economic opportunities would be at the heart of the Strategy. *emda* was instrumental in developing a Sustainable Development Advisory Group (SusDAG) to ensure that the governance arrangements reflected the above aims.

The decision to revoke the Regional Strategy has clearly brought this work to an end, but the original aim was that SusDAG would have advised on a number of cross cutting issues, including: climate change mitigation and adaptation; development of a low carbon economy (including regional carbon reduction targets); and social wellbeing, including equalities issues. This was supported by work to explore how 'sustainable economic growth within environmental limits'³ could be determined and operationalised, including a decision making framework and a methodology for engaging stakeholders.

3.3.4 Integration of low carbon issues into European Programmes: The European Regional Development Fund (ERDF) Competitiveness Programme 2007-13 aims to strengthen economic and social cohesion in the European Union by supporting regional economic development. The East Midlands is eligible for approximately €268m between 2007 and 2013 which provides a significant investment in the economic development of the region. The ERDF programme has an obligation to ensure that environmental sustainability is embedded as a cross cutting theme in funded activity, which translates as:

- Ensuring efficient use of natural resources, energy and transport;
- Minimising waste and pollution;
- Improvements to the built environment; and
- Providing protection for the natural environment to improve local economies and business competitiveness.

east midlands
competitiveness programme
european regional development fund



emda led the development of the region's Operational Programme (OP) for the 2007-13 ERDF Programme and a core objective was to integrate environmental sustainability across all activities financed through the Programme as well as support a degree of direct

³ Sustainable Economic Growth within Environmental limits, Land Use Consultants and GHK Consulting, September 2010

delivery to exploit low carbon opportunities. This has meant that, as well as the obligation to ensure that all projects consider the way their activity will impact on resource use at every stage of the life of a project (from development, application and delivery, through to monitoring and evaluation), the programme has also provided opportunities to fund specific projects which actively support the transition to the low carbon economy through direct delivery. For example, providing funding to enable businesses to transform the way resources are used by supporting the development and introduction of new processes and technologies to improve resource efficiency.

CASE STUDY 3: ERDF support for the low carbon economy

ERDF funds have been used to support the development of a new energy centre at the University of Nottingham. The £7.7m project, including £2.7m ERDF, will combine a major capital build on the University's Jubilee Campus with associated ongoing knowledge and technology transfer activity to create a powerful combination of leading edge energy technology and expertise in one physical location. This will provide SMEs with a dedicated facility to develop new energy products and services, through access to cutting edge research facilities.



The centre will include an outreach programme, provide Research, Development and Demonstration (RD&D) facilities and form a smart energy community. The key aims of the project are to: establish a research and demonstration platform for low carbon technologies; accelerate the innovative development of new energy technologies; increase knowledge transfer of energy issues and emerging energy technologies; and increase the uptake of renewable technologies in the East Midlands.



emda has also been responsible for **delivering the socio-economic elements of the Rural Development Programme for England (RDPE) 2007-13**. Funded by the Department for the Environment, Food and Rural Affairs (Defra) and the European Union, *emda* has approximately £60m available for projects in the East Midlands until 2013. RDPE will mainly target land-based businesses in the East Midlands with the criteria for projects to be eligible for grant funding including:

- Adding value to agricultural, horticultural or forestry products – including the development of new products, processes and technologies;
- Improving co-operation and collaboration between businesses to improve efficiency – including infrastructure and equipment investments; and
- Promoting diversification in the rural economy.



The European
Agricultural Fund for
Rural Development:
Europe investing in
Rural Areas



Defra is the Managing
Authority for RDPE

An excellent example of how the programme has used these criteria to contribute to the low carbon agenda is the funding of the Centre for Renewable Energy (CORE) at East Drayton in Nottinghamshire. The centre is a brand new state of the art business and conference site which offers carbon neutral managed workspaces and meeting facilities. It is also a showcase for a range of cutting-edge renewable energy technologies with the building designed to produce more heat, cooling, electricity and power through green technologies than it uses during its day to day operations.



PICTURE: Centre for Renewable Energy (CORE)

3.3.5 Developing an integrated Low Carbon Innovation Support Service: Given its cross cutting nature, low carbon activity has been delivered by different parts of the agency and by a range of different partner organisations. We identified a need to bring together a more coherent package of support and simplify the offer for businesses. As such, *emda* commissioned a study to examine the requirement, scope and scale for an integrated Low Carbon Innovation Support Service (LCISS) for the East Midlands. This report provided

some useful recommendations for the direction of future support, albeit from the perspective of continued delivery by *emda*.

The key recommendations from the work are summarised in the ‘next steps’ section of this paper and refocused to ensure their applicability to the future delivery landscape.

3.4 Business support and Business Link

3.4.1 *emda* has led the way in terms of **Mainstreaming Resource Efficiency in Business Support delivery**, using both Single Programme and Defra (Business Resource Efficiency and Waste – BREW) funding to help businesses build their productivity through efficiency, innovation and skills development. The East Midlands Programme for Implementing Resource Efficiency (EMPIRE) invested £7m between 2006 and 2008 to support four areas of activity: Strategic Development, Communications, Market Development and Direct Interventions. Key outcomes of the programme are detailed in Case Study 4, below.

CASE STUDY 4: The East Midlands Programme for Implementing Resource Efficiency (EMPIRE)

The EMPIRE Programme has had a significant impact on the provision of resource efficiency and business support in the region. It helped to identify a range of potential environmental and cost savings, and to raise business awareness (in particular SMEs) of resource efficiency, its importance, and the potential for improvements. It provided a lasting legacy by developing the architecture for resource efficiency business support that will help to ensure that future business interventions make significant environmental and cost savings.

The overall evaluation of the EMPIRE programme reported the following key achievements:

- £3.4m of SME cost savings identified;
- Reductions of 10,567 tonnes in CO₂ emissions identified;
- 88,201 tonnes of waste diverted from landfill identified;
- 100,593 m³ of water savings identified;
- 923 businesses assisted with improvements in resource efficiency; and
- 496 individuals assisted with resource efficiency skills development.



As part of this programme, *emda* invested significant resources in mainstreaming resource efficiency in the regional Business Link service (see Case Study 5) to ensure business requirements were correctly diagnosed.

CASE STUDY 5: Integration of resource efficiency in Business Link East Midlands



A comprehensive package of support for Business Link Advisors and their clients was developed and funded by *emda* through the EMPIRE programme. This included:

- Training for Business Link advisors on Resource Efficiency – Continuous Professional Development (CPD);
- Development of an online resource efficiency diagnostic tool;
- Resource efficiency campaign targeting companies from high resource using sectors (Construction, Food & Drink, Agriculture and Healthcare); and
- Provision of grant funding to help businesses implement resource efficiency changes (up to £10,000 per company, matched by business on a 50:50 basis).

Mainstreaming resource efficiency into the way that Business Link delivers services to SMEs was an essential priority driven by both the Simplification agenda as well as a pragmatic need to coordinate what needed to remain a “mass” service. As a result the Information, Diagnostic and Brokerage (IDB) approach was redesigned, including:

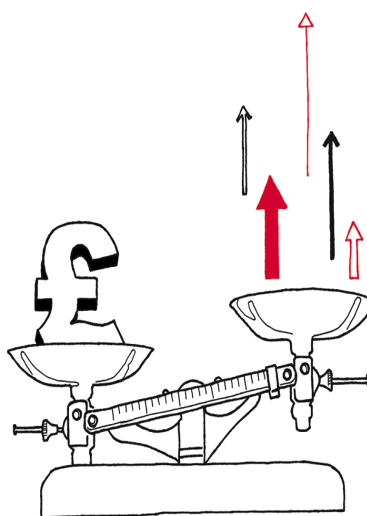
- A new diagnostic tool (for advisors and also available online for other intermediaries such as Local Authorities);
- Delivery of a complete business advisor competency assessment, needs and training programme;
- A new learner management system;
- A review of specialist solutions providers for resource efficiency; and
- Provision of a dedicated Business Transformation Grant of up to £10,000 towards implementing identified efficiency solutions.

This approach underpinned direct implementation support, including eco-innovation and skills delivery and was enhanced by a regional Business Link PR and advertising campaign that has stimulated over 60,000 opportunities for businesses to use the Business Link branded services.

3.4.2 The business support simplification programme, known as Solutions for Business (SfB) allowed for **the provision of intensive support to businesses on resource efficiency through the Improving Your Resource Efficiency Product**. This includes provision by national providers such as the Carbon Trust (CT) and the Waste Resources Action Programme (WRAP), but also allowed for more localised support. A programme of more detailed intervention was developed to take advantage of the IYRE product. Although we had made good progress in terms of shaping the generic Business Link offer and providing a resource efficiency diagnostic, there was no region-wide provision for specialist, on-site support to ensure implementation and commitment. Evidence suggested that there was a gap in the market in terms of specialist support for SMEs, with further support required to ensure that a 'latent demand' was stimulated and businesses were provided with support to help them understand the implications resource efficiency might have for their business, and what actions they might need to take.

As a result, *emda* developed and delivered the IYRE East Midlands programme, which started in April 2009 with the aim of providing SMEs with practical, on site support on how to improve their use of resources and enhance their profitability. The programme used a panel of expert contractors to provide up to one day of free support for each company. Over a year, the project provided on site support to 82 companies, identifying £2.9m of potential cost savings and CO₂ savings of 14,300 tonnes. Feedback from the companies participating in the programme has been very positive, with the quality of site visit reports particularly praised.

Improving Your Resource Efficiency



Funded by
 east midlands
 development agency



3.4.3 Supporting businesses through pilot interventions and support for business to business collaboration: Following research that identified that take up of the Carbon Trust interest free loans scheme⁴ was very low in the East Midlands, a pilot project (Energy Efficient Technologies) was set up to provide support to businesses to help them access loans through the scheme. The programme helped companies identify potential projects, supported them through the application process, and helped them to identify and record energy savings data in order to comply with the requirements of the scheme. The programme completed at the end of the 2010-11 financial year and early indications show that the programme delivered a measureable reduction in the region's carbon emissions and proven cost savings to the participating companies in the face of a shifting framework (i.e. changes to the Carbon Trust loans criteria).

CASE STUDY 6: Piloting research in resource efficient design

emda also provided support for a number of pilot interventions related to resource efficient design – essentially ensuring that products are designed to minimise resource use and ensure ease of disassembly at end of life.

The most recent of these projects has involved work with De Montfort University's design team to demonstrate to SMEs the business performance benefits of resource efficient design. The project is working with five organisations (including Travis Perkins, Scott Bader and Primarius) to develop low carbon/renewable products or services using in depth resource efficiency design and environmental supply chains.

The case studies from this work (due to complete in July 2011) will be used at dissemination events with a wider audience of SMEs, but the project is already producing valuable results, with one of the participating companies working on an innovative new packaging solution to reduce transportation costs which will lead to huge efficiency savings, with potential for wider application with other companies.



3.4.4 Evidence suggested that the region would benefit from a business to business network specifically dedicated to the low carbon sector: As such, *emda* invested in a business collaboration network for businesses operating in the energy and low carbon sectors. This provided support for companies to network and collaborate (including with universities) through briefings, meetings and events, access to an information resource and tender alerts. The network has over 80 members from a range of sectors and members are keen for this work (in particular tender alerts, briefings and events) to continue in the future - discussions are currently underway with regional partners (including universities and local authorities) to ensure continuity of the network. Case Study 7 outlines a typical member experience from the network.

⁴ The Carbon Trust can provide 0% business loans of between £3,000-£100,000 to help organisations (SMEs) finance and invest in energy saving projects. Loans can be repaid over a period of up to 4 years.

CASE STUDY 7: Energy Connections Business Collaboration Network

Romax Technology Limited is a leading independent drivetrain consultancy offering technical consulting, design services and software tools for gearboxes, drivetrains and bearings for the wind energy industry. For the last 20 years Romax has provided innovative engineering consultancy services across industry through their global network, creating customised and localised solutions directly suited to local market conditions.

Romax became involved with the Energy Connections programme after learning about the Smart Grids event which was held in June 2010. They were interested in support to adapt their existing software, which is used to model power demands within automotive systems, for use in hybrid / low carbon vehicles.

Energy Connections was able to broker contact with two companies who had experience of smart grid designs. As a result of this Romax were able to put together a proposal for funding with the Manufacturing Advisory Service. The project is currently running and should be completed in the next six months.



The result of the project will allow Romax to offer niche services to a sector which will have huge growth potential, especially with the current high cost of fuel and the current Government subsidies that are available for consumers to purchase low carbon vehicles.

3.5 Innovation and sector support

3.5.1 Integration of low carbon in the development of the revised Regional Innovation Strategy (RIS) in 2010 and the delivery of the Regional Technology Framework (RTF):

An independent evaluation of the existing RIS in 2009 stated that low carbon should be identified as a key driver and major opportunity for the region, and recognised that technologies, like low carbon, cut across all sector areas. The conclusion being that these technologies should be at the very core of the RIS, serving to widen its reach and enable all businesses, whatever sector they are in, to benefit from innovation.

The revised RIS acknowledges that, with regional strengths in energy conversion, transport and construction, the East Midlands is well placed to address the challenge of moving towards a low carbon economy. Significant innovation investment in low carbon activities already existed, for example, through the work of the Sustainable Construction iNet and in technology projects funded under several of the Technology Framework priority areas. However, it was also recognised that, moving forward, regional innovation activity and investment needed to give greater consideration and prioritisation to low carbon opportunities. As such, low carbon was a prominent cross cutting theme and feature of the second RIS, the future success of which will rely on integrating existing and new innovation

activities with a number of other areas, such as skills support, access to finance, digital connectivity, low carbon targets and technology support.

Alongside low carbon delivery in the RIS, energy and waste are also priority actions in the Regional Technology Framework (RTF). The RTF prioritises five energy and waste technology areas:

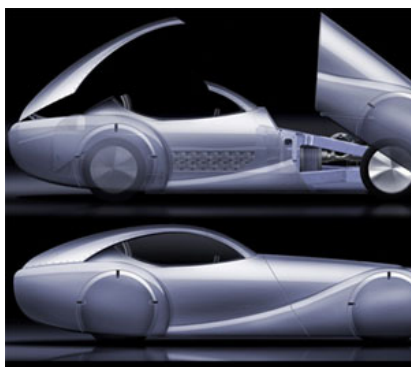
- Energy efficiency;
- Fuel combustion;
- Energy storage, integration and distribution
- Renewable energies; and
- Waste minimisation and recycling.

The four Innovation Networks (iNets) have been key to the implementation of the RIS – they provide targeted and proactive innovation support to businesses and other stakeholders in each of the priority sectors (sustainable construction, food & drink, transport and healthcare & bioscience).

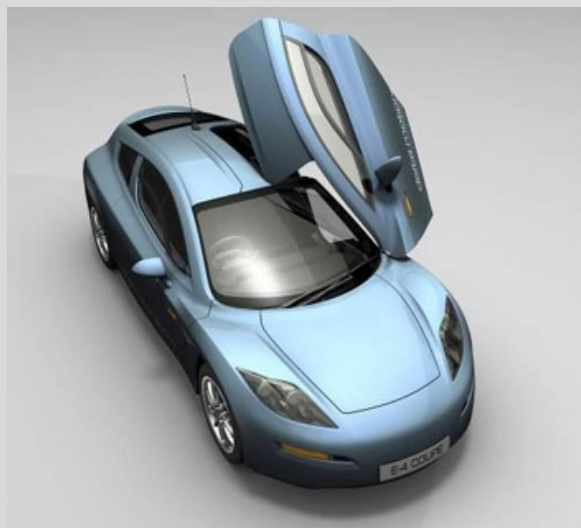
Each iNet is managed by a consortium and is responsible for delivering a programme of activity including events, support through innovation advisors, and funding. Case Study 8 describes how the integration of low carbon in key innovation strategies was then followed through to delivery, using the Transport iNet as an example.

Since the first RIS was published, the low carbon economy has become a fundamental driver of economic development and will be a prominent feature of all aspects of the RIS and regional growth. This second RIS has a major focus on low carbon, in developing new technologies and helping businesses take advantage of new opportunities. The RIS can make a major contribution to the move towards a low carbon economy, with our important work on low carbon buildings and as the home of the UK's Energy Technologies Institute.

Innovation Strategy for the East Midlands, 2010-2013, *emda*.



CASE STUDY 8: Transport iNet – Delta Motorsport E-4 Coupe



Using support from the *emda* funded Transport iNet, Northampton based Delta Motorsport is building five battery powered E4 Coupés which reduce harmful emissions by 67% without compromising performance or driver enjoyment.

In 2009 Delta Motorsport was awarded a Grant for Research and Development (GRD) worth £222,000 by *emda* and the ERDF programme. The grant was used to research, design and build the initial prototype low energy car.

Following the research and development work, the company was then introduced to a Transport iNet innovation advisor, who worked with the

business on producing the demonstrator product, the E-4 Coupé

"The investment and support in Delta Motorsport from *emda* and the Transport iNet has provided us with a significant understanding of how we can build the E-4 Coupé to a world class standard. Green vehicle technology is still very much a developing area and the help we have received has enabled us to create solutions to a wide range of problems, answering questions we didn't even know we would find. The financial support we have received has also been vitally important to us, allowing us to give our vehicle an even more competitive edge."

Nick Carpenter, Co-Founder and Technical Director of Delta Motorsport

3.5.2 Investing in innovation and new technologies through pilot and research

programmes: In addition to the mainstream innovation activity outlined above, *emda* has invested in pilot interventions to assess the potential for new technologies in the region. This has involved a combination of bespoke, localised technology research projects (for example assessing the potential for hydropower in a specific housing development in Newark) or wider partnership research projects to assess the contribution the East Midlands can make to developing new technologies (e.g. working in partnership with the Centre for Excellence for Low Carbon and Fuel Cell Technologies on hydrogen fuel cells and working with the National Non-Food Crops Centre to assess the East Midlands potential for non-food crops). These research projects have provided useful evidence for the further development of this activity, particularly in areas where there is ongoing national interest e.g. non-food crops and hydrogen fuel cells.

CASE STUDY 9: Investing in regional strengths – Hydrogen Fuel Cells

In 2009 *emda* provided funding to support the development of a Hydrogen Forum in the East Midlands. The project was led by Cenex (the UK's Centre of Excellence for Low Carbon and Fuel Cell Technologies) and included the development of a Midlands Hydrogen Framework to identify regional capabilities in hydrogen and fuel cell (H2FC) technologies.

emda saw this as vital work to ensure the effective exploitation of the Midlands cluster of technology companies and universities with world leading capabilities in hydrogen and fuel cell technologies. The development of this cluster, which includes Intelligent Energy and Rolls-Royce Fuel Cells – has occurred gradually over a 20 year timeframe.



The work produced a significant report, outlining:

- Regional capabilities in hydrogen and fuel cell technologies;
- A set of project proposals for hydrogen technology activities capable of showcasing regional capabilities;
- A regional hydrogen roadmap for key business propositions associated with a hydrogen economy;
- A new constitutional format for a regional Hydrogen Forum (as a successor to the British Midlands Hydrogen Forum); and
- A case for long term operation of the Hydrogen Forum.

Although this work will not now be able to be taken forward by *emda*, the report and recommendations have been made available to partners and raised with Central Government.

emda has worked with Cenex, DECC and BIS to ensure that support for the cluster is secured. The Government has expressed a commitment to this agenda and discussions are ongoing.

3.4.3 Leading the way in low carbon construction: *emda*'s lead role on construction placed the agency in a position to both guide policy and delivery across the RDAs, and to interface with Government at a national level on issues related to the sector. Alongside this national role, *emda* has also supported regional activity, particularly in relation to sustainable construction through the iNet model. In addition, we strove to embed low carbon outcomes in all our capital investments. This has led to the creation of a number of award winning BREEAM⁵ excellent buildings in the region (for example the iCon building in Daventry).

An additional and important element has been a focus on the challenges of retrofitting existing buildings. 70% of buildings that will continue to be in use in 2050, and 40% of those predate more strict building regulations. A key challenge for the future, therefore, is how to cut emissions from existing buildings. *emda* has led on a response to this issue through a range of activity, using both investment and influence. For example, we ran a "Green Futures for Existing Buildings" influencing programme which led to the creation of a business focused decision support tool, Sustainable Buildings.



PICTURE: iCon Centre, Daventry.

3.5.4 Low carbon support for manufacturers: As part of the Government's approach to industrial policy, additional funding was provided to the Manufacturing Advisory Service (MAS) network for the 2009-11 financial period to help manufacturers make the most of opportunities in the emerging low carbon market place. With its emphasis on lean manufacturing, the MAS programme has always complemented more specialist support on resource efficiency, and this additional funding allowed it to target a particular market sector.

In 2010-11, MAS East Midlands delivered a Low Carbon Manufacturing Initiative to help small and medium sized manufacturers make the most of low carbon business

⁵ Building Research Establishment Environmental Assessment Method

opportunities. The aim of the initiative is to help support regional manufacturers to become part of new supply chains for low carbon technologies, enter new markets in low carbon, take advantage of emerging technologies in sustainable manufacturing, and develop and introduce new low carbon products.

Manufacturers were able to take part in regional engagement seminars, request a free manufacturing review to identify opportunities for improvement, or apply for a MAS consultancy improvement grant.

CASE STUDY 10: MAS

BGB innovation is a leading manufacturer and exporter of slip ring assemblies for the wind turbine industry. They benefited from support from MAS to increase capacity and reduce costs through the implementation of lean manufacturing techniques.

“MAS assistance has been invaluable. Thanks to our work with MAS we’re now benefitting from a 33% productivity improvement and a £40,000 cost saving.”

David R Holt, BGB Innovation.

Advance Lighting Ltd is a Melbourne based manufacturer of energy efficient lighting systems, who have already secured several large retail contracts for its own brand tri-light LED products. MAS provided support to help make improvements in the use an integration of manufacturing and design software being used to support the development of new products. Advance has doubled in size over the past three years and is currently looking at new premises where state-of-the-art production facilities will give the company the opportunity to develop its technology base further.

“This help effectively resulted in us being able to launch our own-brand products a lot earlier than would have otherwise been the case. This has helped us get an initial toehold in this market much quicker than our competitors.”

Adam Hamilton-Fletcher, Sales Director, Advance Lighting Ltd.



3.6 Trade and Inward Investment

emda recognised the opportunities for trade and inward investment that the low carbon economy presented, with energy and the environment an integral part of the offer for investors in the East Midlands. The region is promoted as an ideal location for companies in the energy sector, with the following areas particularly highlighted as having significant opportunities:

- **Clean tech;**
- **Low carbon vehicles;**
- **Waste to energy;**
- **Wind; and**
- **Hydrogen and fuel cells.**

The success of this approach is evidenced by the decision of Changan Automobile Co. Ltd, one of China's leading car manufacturers, to select Nottingham for its new 200-person UK Research and Development Centre, where it will help to develop the low carbon vehicles of the future.



3.7 Access to Finance

Grant for Business Investment (GBI) and Grant for Research and Development (GRD):

GBI and GRD are national schemes managed by *emda* at the regional level. GBI is a capital investment grant scheme aimed at encouraging businesses to invest in land and buildings, plant and machinery to support expansion and modernisation in England's more deprived areas. GRD helps businesses carry out research and development work that will lead to technologically innovative products or processes. It is aimed at individuals planning to start up businesses in any part of the East Midlands and at SMEs already operating within the region.

Whilst the grant schemes do not specifically focus on low carbon activity, they provide good examples of mainstream activity which is nonetheless able to support this agenda. GBI has provided support for some key low carbon investments in the region, including support for the relocation of Intelligent Energy to assist expansion of their hydrogen powered scooter production (see Case Study 11 below) and Easy-Do Products Limited, who manufacture an innovative range of clothes and food packaging solely from recycled plastic (known as 'Ecoforce' pegs).

CASE STUDY 11: Grant for Business Investment - Intelligent Energy



Intelligent Energy is a Loughborough based business which specialises in clean fuel cell power systems. It received an £800,000 GBI investment from *emda*, to help it relocate and expand to new premises at Holywell Park in Loughborough. The move enabled the company to continue to grow and expand its business operations in relation to bespoke clean fuel cell power systems for its blue chip clients, which include Boeing, Suzuki, Scottish & Southern Energy and Airbus.

As well as funding the relocation, the GBI investment also helped the business equip the building, including the installation of a low volume production line with automated features, the purchase of engineering test rigs, measurement equipment and IT systems.

The total cost of the project was over £8.5m and it is expected to create approximately 130 full-time equivalent jobs across the business over time, with more than 90% of these being at graduate level.

“The move to Holywell Park will allow us to better serve our Blue Chip business customers and partners and up the tempo of our commercial activities significantly as a result. We are an international business actively working with some of the world's leading companies to bring our clean power systems to market. The business started as a spin-out from Loughborough University and with the help of *emda*, we are delighted to strengthen our bond with the East Midlands”

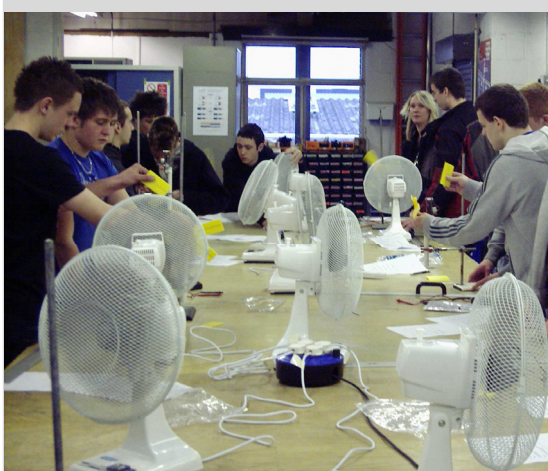
Dr. Henri Winand, Chief Executive of Intelligent Energy

GRD has awarded funding for several low carbon vehicle projects, supporting Cougar Red to develop a 'clean' two stroke internal combustion engine which has the capability to run on both petrol and bio-fuels, and funding Delta Motorsport in Northampton to research, design and build the initial prototype low energy car (see Case Study 8 above).

3.8 Skills

Building capabilities – delivering the low carbon skills agenda: Access to the right level of skills and capabilities is vital to both the development and promotion of the low carbon economy, and the more effective use of resources. *emda* has provided support for the Beyond Brokerage programme, which included a focus on energy and low carbon, and provided independent specialist advice to participating organisations so that they could understand and quantify the potential benefits of an improved skill base in energy and low carbon alongside the potential costs and time investment required. In 2008-09, *emda* launched an energy technologies grant scheme for Further Education (FE) colleges. The scheme allowed colleges to purchase energy technology capital equipment in return for the development of qualifications relating to new energy technologies. Consultation with industry and business identified a lack of skills and skilled installers, operators and maintainers of new energy technologies. Many skills providers expressed a desire to begin teaching skills relating to new energy technologies, but the cost of installing working systems is often prohibitive. The project aimed to overcome the capital investment barrier by funding working installations that can then be used to provide practical skills and training. In turn this supported and accelerated the provision of level 3 skills and above.

CASE STUDY 12: Providing a catalyst for low carbon skills – the Energy Technologies FE grant scheme



The £400,000 grant fund supported FE colleges in Grantham, Northamptonshire, Leicestershire and Nottinghamshire. Examples of the energy technology equipment purchased include a mini CHP (combined heat and power) system at Stephenson College and a wind turbine at South Nottingham College.

The investment has led to a range of low carbon skills qualifications being developed by the colleges, ranging from courses on solar hot water heating (Grantham College), wind power (South Nottingham College), wood biomass (Stephenson College) and rainwater harvesting (South Leicestershire College). Overall these courses have led to 1,100 people being assisted in skills development.

The success of the FE grants pilots resulted in the creation of the East Midlands Further Education Energy Task Group. The group aims to help the transition towards a low carbon economy and has, during 2010-11, used additional *emda* investment to take forward a number of research studies such as scoping the need for a low carbon apprenticeships scheme and mapping the low carbon skills offer from FE colleges in the region.

Chapter 4

Achievements

As stated in Chapter three, the principal challenge for *emda* was to ensure that the low carbon agenda moved from a niche market sector to part of mainstream economic development, with associated investments and support.

This section demonstrates the difference the agency has made to the agenda through its investments and activities, providing leadership and bringing about a change in the way the low carbon agenda is viewed and addressed in the region. These achievements fall into the following broad categories:

- Evidence;
- Visibility and profile;
- Catalyst for change; and
- Best practice and expertise.

4.1 Evidence

In line with *emda*'s evidence-based approach to investment, the agency **developed a comprehensive evidence base which articulates the benefits of working on the low carbon agenda and highlights opportunities for further investment.**

emda therefore leaves the region well equipped to plan activity and investments which will maximise the region's low carbon assets and strengths and build on strong foundations. The key elements of this legacy are:

- Research reports and recommendations from a number of pilot interventions;
- The integration of low carbon into key regional strategies, providing a framework for the development of localised strategies; and
- A comprehensive and up-to-date evidence base to inform future investments.

These elements provide a template for future investment and a mechanism to engage the wider business community in the low carbon agenda through evidence of return on investment. This is particularly important in a time of tightened budgets and competition for investment.

4.2 Visibility and profile

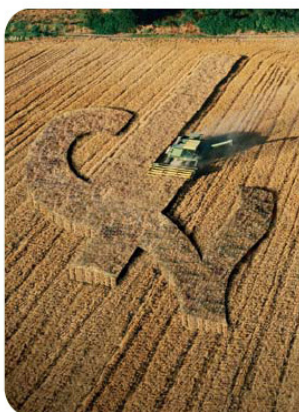
Investments and interventions by *emda* have raised the visibility and profile of the low carbon agenda. This was achieved through a gradual mainstreaming process, which culminated in the prominence of the agenda in the most recent RES, both as a strong cross

cutting theme, and through specific priority actions that ultimately supported targeted investments. In turn, this facilitated the integration of the agenda at the heart of supporting strategies, e.g. the revised Regional Innovation Strategy, and enabled it to be applied across all disciplines within the agency.

The low carbon agenda has, therefore, been successfully integrated and is regarded as a key component of project development. The change in perception has made investment in the low carbon agenda through mainstream mechanisms a much easier proposition. This is evidenced by the rise in investments through programmes such as GBI, MAS and the iNets outlined in the previous section. It is also demonstrated through specific programmes to raise the profile of the agenda such as the Resource Efficiency marketing campaign (Case Study 13) and associated training programme for Business Link advisors.

A key learning point, therefore, is ensuring that strategies and investment plans have the right 'hooks' to support the transition a low carbon economy.

CASE STUDY 13: Raising the visibility of the low carbon agenda – Resource Efficiency marketing campaign



**Minimise
waste and
harvest the
profits**



**Tap into
better profits
with resource
efficiency**



**Enjoy a
thicker
slice of the
profits with
resource
efficiency**



**Build better
profits with
resource
efficiency**

4.3 Catalyst for change

A key role for the agency has been to spot gaps and opportunities and use investment as an incentive to bring partners together and stimulate activity. This can take the form of brokering partnerships to deliver core strategies, or acting as a catalyst through pump priming activity. Chapter three has provided a number of examples of how *emda* has used limited investments alongside partnership working and influencing to act as a catalyst for activity on the low carbon agenda.

Brokerage and partnership work has been particularly successful in maximising opportunities through regional strengths. Partnership working with CENEX is a particularly strong example of the agency working with regional, cross-regional and national partners (including the Government) to support the development of the Midlands Hydrogen Forum.

Pump priming activity using a limited initial investment in a targeted manner has paved the way for further investment and activity on the low carbon agenda. This is evidenced through partnership working and investment in the FE sector, which has resulted in sustained, coordinated low carbon skills activity across the region. Investment in capital infrastructure to secure strategic investment in the region has also been important. A particular achievement was the use of joint investment by Advantage West Midlands and *emda*, demonstrating cross-RDA collaboration, to strengthen the bid from universities (Loughborough, Birmingham and Nottingham) to host the Energy Technologies Institute in the region. The capital investment to allow building refurbishment and leasing of premises for a substantial period was acknowledged as a key factor in the success of the bid to Government in an extremely competitive bidding process.



CASE STUDY 14: The Energy Technologies Institute (ETI)

emda worked with regional businesses and universities to bring the Energy Technologies Institute (ETI) 'hub' to the region. ETI is a £1bn public-private partnership to develop and deploy energy technologies fit for a low carbon economy.

The project involved collaboration with Advantage West Midlands to support the Universities of Loughborough, Nottingham and Birmingham in securing the location of ETI in the Midlands. Using a joint Midlands RDA commitment of £5m, the project provides physical accommodation over a 10 year period and ensures further integration of regional and national priorities and activities for the energy and sustainable development agendas.

ETI brings together major companies such as BP; Caterpillar; EDF Energy; E.ON UK; Rolls-Royce plc; and Shell. Their funding contributions, along with that of Government, provide the Institute with a potential budget of more than £600m over 10 years to invest in bringing forward leading new technologies with commercial applications.

The fact that explicit support, involvement and commitment from the RDAs was contained within the Midlands bid to attract the ETI was a differentiating factor to other bids in the shortlist and demonstrated the extent of regional buy in and coordination that the involvement of the RDAs can bring.



4.4 Best practice and expertise

emda has used its unique regional role to become a credible expert source of advice and information on the low carbon agenda.

The agency has been able to **undertake activity that other public sector organisations are unlikely to tackle**. For example, *emda* has been able to take risks with investment in pilot activities to either address market failures (for example through resource efficiency business support) or to test out the potential for deployment or investment in new technologies (for example hydropower feasibility studies; investigation into the use of non food crops).

emda is **has provided expert support to businesses**, matching effective support to a range of companies of different sizes and sectors. This has allowed it to integrate support for the low carbon agenda in a range of different interventions, whether through resource efficiency support for all businesses, or innovation support for key sectors.

emda has **led by example in developing mechanisms for the measurement of carbon emissions in mainstream economic development activity**. Working with the other RDAs, *emda* developed a system to measure carbon from programme investments to ensure the agency was accountable to Government and the general public, and to drive change in the project development process. The practical and robust approach which *emda* developed to capture, quantify and report on the agency's carbon reduction savings provides useful learning for future measurement of carbon in mainstream economic development.

4.5 *emda's* low carbon legacy

As a result, we believe that the region is left with a strong legacy in relation to low carbon. Firstly, it is significantly better informed and able to target investments through a comprehensive evidence base. We have also provided a high quality framework of strategies to support priorities and activities (e.g. the RES, the Regional Innovation Strategy and the Regional Technology Framework). A series of flagship investments and centres of excellence have already raised the profile of the region and will support continued investment in this agenda including the Energy Technologies Institute (ETI), the Sustainable Construction iHub and CENEX (the UK's centre of excellence for low carbon and fuel cell technologies).

Whilst the low carbon agenda has been a relatively modest part of *emda's* mainstream delivery, over 1000 businesses have been supported to improve their resource efficiency, contributing to the challenge of moving all companies in the region from high carbon to low carbon users, and producing significant cost savings along the way, including:

- **£6.3m** of SME cost savings identified;
- Reductions of **25,000 tonnes** of CO₂ emissions identified;⁶
- **88,201 tonnes** of waste diverted from landfill identified; and
- **100,593 m³** of water savings identified.

In addition, nearly 500 individuals have been assisted with resource efficiency skills development and in 2010/11 alone over £800,000 worth of investment was made in low carbon projects through the Grant for Business Investment and Grant for Research and Development programmes.



⁶ Cost savings and CO₂ savings data is based on outputs from the EMPIRE programme, IYRE programme, and Energy Efficient Technologies programme

Chapter 5

What might the future hold?

5.1 Introduction

Whilst we believe that the region is in a strong position to capitalise on the opportunities of a low carbon economy, there are clearly challenges in terms of maintaining momentum on this agenda. As with many other policy areas, changes to the sub-national economic development landscape will have a significant impact on support for the low carbon economy. The Government has, however, expressed a commitment to the low carbon agenda, and new developments such as the Green Investment Bank should provide support for the development of low carbon infrastructure.

However, there is a possibility that delivery of the low carbon agenda could become increasingly fragmented as the new economic development architecture takes shape. This document seeks to outline key considerations for future activity and investment and is based on research undertaken to look at the coordination of low carbon support, along with lessons learnt from delivery programmes.

In order to maintain the four key elements of the transition to a low carbon economy (carbon productivity, low carbon growth, market intelligence and skills and capabilities), it is vital that any future support maximises the opportunities available through national programmes, and that smart decisions are made on what will provide the greatest return on investment for this sector at the local level.

In order to deliver this potential future growth, a clear focus is required. Whether at the local, LEP or regional level, in a time of tightened resources the key consideration of any support service has to be:

- **What is the return on investment?**
- **What are the key aims of the investment?**

For example, is the aim to focus on producing more of a particular technology (e.g. wind turbines), or to improve employment rates, or to generate a greater level of inward investment? Different parts of the low carbon network (Government, local authorities, industry leaders, SMEs) will have different objectives – bringing these positions together is vital.

Research undertaken to look at the coordination of support (LCISS) identified a number of key recommendations, the majority of which were specific to *emda's* delivery of the agenda. However, a number of these recommendations have more generic applicability. The key points from this study, alongside lessons from the programmes outlined in the previous sections, and *emda's* rigorous evaluation process, have been extracted and are presented below.

5.2 Lessons and considerations for future activity and investment

Generic recommendations

One of the key lessons learnt in the delivery of the low carbon agenda is the need to ensure that delivery is effectively coordinated and supported by a clear 'offer' to business. Key recommendations for the future are therefore:

- Low carbon activity must continue to be integrated into wider economic development activity and evidence fed into the development of key strategies with agreed targets for investment;
- Businesses require clarity on what is on offer and how it can be accessed;
- A much greater and more focused level of intervention is required to meet demanding targets on carbon reduction and exploit the best opportunities from the transition to a low carbon economy; and
- Activity should be focused on areas where the locality has existing strengths and emerging capabilities.

Evidence base

The collation of detailed, up-to-date evidence base to inform investment has been highlighted as a key factor in successful engagement in the low carbon agenda. Key recommendations are:

- Ensure that quality, up-to-date market intelligence is available on the low carbon sector to enable targeted provision of support; and
- Investigate the potential to produce (or adapt regional data) at the local level to enable investment decisions based on local strengths.

Business support

The landscape of business support will dramatically change, with the closure of the regional Business Link service and existing regional resource efficiency services being discontinued.



Delivery through national bodies such as the Carbon Trust and Waste Resources Action Programme is currently under review, potentially leaving significant gaps in delivery. There is scope for localised projects through LEPs and local authorities, but there are limited funds available for investment. In order to ensure this activity remains a high priority in terms of mainstream support, it is important to consider the following recommendations:

- Focus on high resource (energy, waste, materials) users when tackling wider generic support for business resource efficiency;
- Build on the provision of national providers (e.g. Carbon Trust, WRAP) to ensure effective use of resource and no duplication of activity;
- Consider whether there is indeed a market failure in the delivery of resource efficiency support, or can the private sector provide this support;
- Increase the level of intensive interventions, in particular targeting high resource users, to maximise return on investment; and
- Look to online provision to provide support to lower resource users.

Innovation and sector support

In the future, responsibility for the delivery of innovation support will rest largely with the Technology Strategy Board (TSB), who will manage GRD and be responsible for Technology and Innovation Centres (TICs) (with low carbon potentially a key driver for these centres). Key recommendations for this area of activity are:

- Work with the TSB to increase access to low carbon focused support and enhance sectoral knowledge and take up of existing generic schemes such as GRD;
- Ensure that future innovation strategies fully consider and prioritise low carbon opportunities;
- When targeting investment activity consider the risks of not investing in areas of regional strengths (e.g. hydrogen fuel cell technology), which could lead to the region losing out to international competition or the technology simply failing to penetrate the market; and
- Consider how activity to support more mainstream innovation and R&D could be focused on the low carbon agenda. This approach is about ensuring generic programmes are not restricted and are open to supporting the low carbon economy (and understand how to do so).

Trade and Inward Investment

In terms of future activity, UKT&I will deliver trade and inward investment activity, with the potential for some level of sub-national delivery and the assumption that the requirement for quality low carbon market intelligence remains. Key recommendations are:

- Keep market intelligence on the low carbon sector up to date to enable targeted provision of support through UKT&I and the local authority/LEP Inward Investment programmes. This intelligence would provide the means to easily identify other companies and organisations that could provide services or skills and potential partnerships to accelerate growth within the region. This would also enable the

targeting of gaps in provision within the region that may be suitable for inward investment; and

- Consider low carbon in terms of its capacity to 'sell' an area in terms of inward investment opportunities, and as a key driver for economic activity (e.g. in new manufacturing capabilities and techniques).

Access to Finance

As detailed above, GRD will in future be managed by the TSB. GBI funding will, however, be discontinued. Funding through national bodies such as the Carbon Trust is currently under review, but there will be continued opportunities through other programmes, e.g. ERDF. Future delivery could therefore be reliant on ever decreasing funding streams, leading to fierce competition for investment and a danger that the low carbon agenda is marginalised. It is therefore vital that opportunities from funds such as the Regional Growth Fund (RGF) and the Green Investment Bank (GIB) are maximised and bids for funds use a sound evidence base to support their applications. Key recommendations include:

- Look to align local and regional work with the proposed mechanisms for a Green Investment Bank; and
- Maximise opportunities through more generic schemes such as GRD and the RGF, ensuring that any bids focus on the economic opportunities available through investment in low carbon activity.

Skills

The Government has committed to an apprenticeships programme, and low carbon apprenticeships could form a key part of this. Regionally, there remains a commitment to the low carbon agenda through the East Midlands Further Education task group. Key recommendations for future activity are:

- Identify low carbon skills requirements and fill any identified gaps, whilst increasing skills brokerage to the low carbon sector; and
- There is scope for LEPs/local authorities to maximise the opportunities available through partnership working with established skills networks (such as the low carbon FE task group).

5.3 Key opportunities for the region to take forward

Alongside the recommendations outlined above, there are also a number of opportunities for further activity, should suitable investment vehicles/partnerships be identified. For example:

- Continuation of the Energy Connections business to business collaboration network, whether in a regional or local form;
- Activity to 'localise' the evidence base to ensure investments are targeted at local strengths and capabilities;

- Collaboration with the FE low carbon task group to ensure low carbon remains a strong element of the regional skills agenda;
- Building on key findings from recent research reports (for example resource efficient design pilot interventions); and
- Building on key regional strengths such as ETI, CENEX and the new Energy Centre at the University of Nottingham to maximise opportunities for investment and broker new partnerships at the local level.

5.4 What is *emda* doing to take this forward?

Alongside the development of this legacy document, we have already been working with local and regional partners to ensure that maximum use is made of the agency's low carbon legacy. This has included a workshop with key regional stakeholders, including local authorities. One of the recommendations from that workshop was for the legacy document to include key recommendations for future activity, which we have acted on and included above. In addition, a full range of low carbon reports and studies will be included in the agency's legacy archive and we are currently investigating options for the transfer of key databases (for example the low carbon mapping work) to other regional stakeholders so that they can be developed further.

5.5 Conclusion

emda leaves the region in a strong position to capitalise on the opportunities available through the transition to a low carbon economy. In the current economic climate there are clear benefits to maximising the cost savings available to businesses through resource efficiency and building on the growth potential available through the low carbon sector. With tightened budgets and a changing delivery landscape, we believe that this document provides some important learning points and identifies a range of priorities for future delivery.



Appendix 1: East Midlands low carbon economy profile

This appendix profiles the key low carbon and related technologies in the East Midlands economy and highlights their local, regional and national importance in terms of key assets and, where available, quantitative data. The sub-sectors discussed are profiled using information on key businesses and higher-education institutions (HEI) within the region. This information is drawn from work undertaken by GHK and Centre for Urban and Regional Development Studies⁷ that supported the New Industry New Jobs (NINJ) agenda late in 2009, and a mapping study of the low carbon economy in the East Midlands undertaken by ekosgen in 2010.

There are many definitions of low carbon goods and services. This paper makes use of definitions used in the previous Government's New Industry New Jobs agenda and those used by Innovas in their report on the low carbon goods and services sector to the then Department for Business, Enterprise and Regulatory Reform⁸. This definition includes a mix of goods, services and technologies. This paper provides brief profiles of these goods, services and technologies.

1. Power generation

As noted in the main document, power generation is a major activity in the East Midlands and the largest source of greenhouse gas emissions. Demand for electricity is expected to grow significantly during the next 20 years. This sector therefore represents a large market for low carbon goods, services and technologies. Nuclear technologies are profiled in the following section.

Demand for electricity is expected to grow significantly during the next 20 years. This sector therefore represents a large market for low carbon goods, services and technologies.

In the East Midlands the majority of energy is generated from fossil fuels, traditionally based on the production of coal in Derbyshire, Leicestershire and Nottinghamshire. This abundant energy source, coupled with local demand and the nearby River Trent for cooling, led to the development of numerous major⁹ power stations in the Trent valley. Three of these, Ratcliffe-on-Soar, Cottam and West Burton, are in the East Midlands. Ratcliffe (along with Drax in Yorkshire) is one of the two largest generating stations in the UK, and has been retro-fitted with flue gas desulphurisation (FGD) equipment and other clean technologies to reduce sulphur emissions by 97%. The region's coal-fired power stations account for approximately 10-15% of the UK's total generating capacity.

⁷ Expertise and Excellence in NINJ Technologies, Technopolis, CURDs, GHK, November 2009

⁸ Low Carbon and Environmental Goods and Services: An Industry Analysis, BERR, 2009.

⁹ Refers to power stations generating ~2,000 Mega Watts - MW

There are two gas-fired power stations, at Spalding and Sutton Bridge, both of which utilise North Sea gas. Staythorpe (formerly coal-fired) power station is being reconstructed as a gas-fired station. E-ON have successfully applied for consent to rebuild Drakelow station, a demolished former coal-fired power station near Burton-upon-Trent, as a 1,220MW combined cycle gas-fired power station, which is now scheduled for completion by 2017.

In contrast, electricity generation from renewable sources is less significant, with the region having the fifth lowest share of generation from renewable sources. Nevertheless there is significant activity in some renewable technologies in the region.

1.1 Wind

Both on and offshore wind are growing sectors worldwide. The onshore wind sector is relatively mature, while the offshore sector is still in the development phase. There are currently no UK-owned large-scale wind-turbine manufacturers but the UK has a presence in the Tier 1 and Tier 2 supply base to large manufacturers, which are based mainly on continental Europe. These include Denmark's Vestas and Germany's Enercon which are worldwide leaders in both the onshore and offshore wind turbine manufacturing field. Although the UK accounts for around 3.3% of the global market, this is a fast growing sector in the low carbon economy.

East Midlands context

Offshore wind development in the region consists of a 180 MW scheme offshore Skegness. Planned further developments offshore Lincolnshire have a potential of 1.25 GW and there is a potential offshore resource of 12.4 GW. The East Midlands has a relatively poor onshore wind resource as westerly winds have travelled over a large land area before reaching the region. However, technological improvements mean that there are a range of sites in the region that are suitable. Existing capacity is based mainly in Lincolnshire and Northamptonshire.

In their work for the then Department for Business, Enterprise and Regulatory Reform, Innovas estimated that the East Midlands accounted for a relatively large 9.8% of total UK gross value added (GVA) in the wind sector. In their mapping exercise, ekosgen identified almost 40 companies in the region involved in the sector, employing almost 5,400 people in 2010.

East Midlands research assets

The strength of the East Midlands in wind research is based mainly around the region's HEIs. The UK has many world-class research departments addressing the R&D requirements of the wind power sector. The UK Energy Research Centre has compiled a comprehensive Energy Research Atlas in wind and a summary of the East Midlands is presented in Table 1.

TABLE 1: Key research capabilities

University	Capability
The University of Nottingham	Composites & structures (and manages Energy Supply Research (ESR) Network)
Loughborough University	Wind resource forecasting; remote condition monitoring; energy storage

Sources: UKERC Wind Research Atlas; Adam Brown, Energy Sector Champion, UKTI; Clarke Simmons, Offshore Wind Programme, Carbon Trust; Pete Clusky, Mitsubishi Power Systems; Super-gen Wind Energy Technologies Consortium (EPSRC); university websites

The Energy Technologies Institute helps the region enormously, being an anchor tenant at Loughborough, where the wind power research of CREST is also located, with their expertise in the energy storage, wind resource modelling, aerodynamics and condition monitoring of wind turbines. CREST works with key industry players such as EON, Shell Renewables, Airtricity, National Grid Transco, consultants Garrad Hassan and Enercon of Germany.

Super-gen Wind Energy Technologies Consortium

A key focus for applied wind research in the UK is the EPSRC funded Super-gen Wind Energy Technologies Consortium, established in 2006. The research programme aims to improve the cost-effective reliability and availability of existing and future large-scale wind turbine systems in the UK. Led by Strathclyde and Durham Universities, the consortium consists of nine research groups with expertise in wind turbine technology, aerodynamics, hydrodynamics, materials, electrical machinery and control, and reliability and condition monitoring. The Consortium has the active support of 10 industrial partners, including wind farm operators, manufacturers and consultants. In the East Midlands Loughborough University is part of the consortium.

TABLE 2: Super-gen Wind Consortium

Academic research partners	Industry partners
University of Strathclyde University of Durham University of Manchester Rutherford Appleton Laboratory University of Surrey Manchester Metropolitan University Loughborough University	Areva T&D UK Ltd Cefas Clipper E.ON UK Renewables Ltd Garrad Hassan & Partners Mott MacDonald New & Renewable Energy Centre (NaREC) Nordic Windpower Qinetiq Rolls-Royce Romax Scottish-Power Generation Ltd Siemens TNEI Vestas Blades Ltd Wind Prospect

1.2 Marine Power

Marine Power encompasses a number of technology types that are designed to harness tidal and wave forces to generate electricity. Research into the sector focuses on new materials and plant designs, with regional and coastal geography playing a key role in the distribution of related activities across the country.

East Midlands context

Marine Power is a relatively small sector in the UK at present but there are substantial opportunities for long term growth. The UK is expected to become a major player in marine power, a function of technological advances and transferable skills from the oil and gas sector, and potential tidal resources around the UK. It is estimated that the UK currently accounts for around 3.7% of the global market. Conditions for marine energy off the East Midlands are less favourable than other places in the UK and Innovas suggest that the region is relatively under-represented, accounting for around 4.7% of UK GVA in this sector. ekosgen have highlighted only a handful of companies in the region who are active in the sector.

East Midlands research assets

There is less commercial activity outside the HEIs than expected given the position of Lincolnshire on the region's coast. Regional HEI activity in Marine Power is low. However, the University of Nottingham Power Electronics Group has a number of main research aims that include power electronic converters and electric motor controls. The centre is also capable of dynamic modelling techniques for electrical machines, and has a number of high quality labs which are used for a number of priorities, including the development of efficiency and instrumentation improvements.

1.3 Hydro

Hydropower is one of the most established renewable energy sources, producing around 20% of the world's electricity. In 2008 hydropower accounted for 40% of renewable energy in the UK. As one of the more mature low carbon sub-sectors, growth of the hydropower sector is expected to be relatively modest.

The potential for hydropower generation in the East Midlands is somewhat limited by the terrain. In 2009 there were 11 hydropower installations in the region but most of these are relatively small. The largest, on the River Trent at Beeston Weir, generates less than 2MW. Current total operation capacity in the region is estimated at 3.5MW with a further 3.2MW under construction or planned.

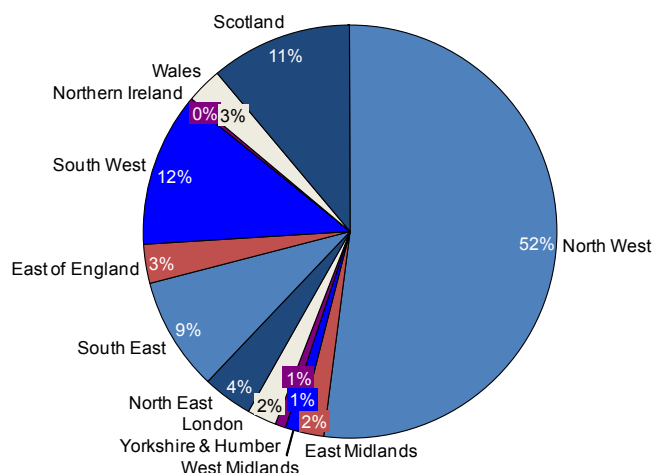
ekosgen estimate that this sub-sector is relatively small in the East Midlands and have identified only a small number of companies. However, despite this there is some evidence of localised schemes (for example planned hydropower developments on the River Derwent in Derby).

1.4 Civil Nuclear Power

The Civil Nuclear sub-sector includes those manufacturers who are concerned with the manufacture of high-tech nuclear power generation equipment, and equipment for the storage and reprocessing of nuclear waste. This is an established sub-sector globally and nationally, producing an estimated 15% of the world's electricity. There is large interest in the sub-sector both from HEIs and the private sector given the status of the current generation of reactors, which are due for renewal, and demand for additional reactors as part of the drive towards CO₂ reduction targets.

East Midlands context

Innovas estimate that the civil nuclear sub-sector and its supply chain has a turnover of £3.6 billion and employs over 33,000 people. Chart 1 illustrates how the civilian nuclear workforce is distributed by region. The East Midlands has one of the smallest proportions of the workforce in this sector. However the region still plays a role in the supply-chain in the Nuclear New Build sector.

CHART 1: Civil nuclear workforce by region (2008)

Source: (Adapted from Cogent, 2009)

Although the North West is the most significant UK region in terms of activities relating to the civil nuclear sector, there are clusters of nuclear R&D, power plants and suppliers in other regions, most notably the Yorkshire and the Humber, East Midlands, South West and East regions.

East Midlands assets

Although there are no nuclear reactors and none planned for the East Midlands, the region nevertheless has a significant presence in the supply chain. ekosgen, in their mapping study, have identified almost 120 companies in the region that are active in this sub-sector and supply chain.

There are a number of major companies involved in the supply chain that are located within the region. These include:

- **Alstrom**
- **Rolls-Royce**
- **E.ON**
- **Siemens**
- **BNS Nuclear Services.**

Rolls Royce in particular is a major manufacturer based in the region that undertakes extensive R&D and construction in the sector. Rolls Royce is the lead industrial partner of the University of Manchester which hosts the Nuclear Advanced Manufacturing Research Centre (NAMRC) alongside the University of Sheffield.

Research activity within the region is occurring in regional HEIs, including Loughborough University (Energy Technologies Institute) and the University of Nottingham.

1.5 Low Carbon Buildings Technology

Low Carbon Buildings (LCB) is a catch-all term covering the whole suite of future buildings and associated power systems that have lower carbon footprints, including zero-carbon buildings. LCB technologies can be split into two key areas: building fabric and energy management and generation.

Energy management includes energy saving lighting, heating, ventilation and electrical equipment. This is a relatively mature sub-sector. Demand for improvements in these technologies has been increasing as a result of regulatory activity (for example building regulations).

Generation is defined to include biomass, geothermal/heat pumps and solar/photovoltaic. Biomass is important, both internationally and nationally and currently accounts for around half of UK renewable energy generation. Although geothermal/heat pumps is a relatively small sub-sector it is growing rapidly, as is the market for solar power.

East Midlands context

The Carbon Trust estimates that buildings account for around 40% of the UK's carbon emissions. The construction sector is also significant, regionally and nationally, accounting for around 8% of output and employment. The East Midlands Sustainable Construction iNet offers assistance to HEIs and businesses in research and development and the implementation of new services, products and processes. It also promotes knowledge sharing and networking opportunities. ekosgen suggest that this is an important sub-sector in the region and have identified almost 300 companies in this sub-sector. Significant construction related businesses in the region include:

- Northamptonshire: RPC Containers, Astraseal, Deejak Builders, BTS Construction, Recticel Corby, Arctic Products.
- Leicestershire: Lafarge, Hanson, Aggregate, British Gypsum, Apex Construction.
- Derbyshire: Tomlinson, Alstom, Omya, Bloor holdings, CDW Construction.
- Lincolnshire: Calders and Gradidge and Saint-Gobain Isover.

Innovas have identified the East Midlands as a region that has a comparative advantage in energy management activities and ekosgen have identified over 300 businesses in the region that operate or supply to this sub-sector. On a smaller scale, ekosgen have identified just under 50 companies in the biomass sub-sector. There are an increasing number of biomass boilers installed throughout the East Midlands from domestic boilers to large industrial boilers. In 2010 the capacity of biomass boilers in the region was estimated to have been 60,000 KW¹⁰.

The number of ground source heat pumps in the region is increasing, with up to 150 installations estimated to be in place in the region. There is, however, no current exploitation of the heat resource contained within the deeper rocks in the region. ekosgen

¹⁰ Regional Biomass Active Demand Mapping Project, Natural England, 2007

suggest that this is the smallest of the low carbon buildings sub-sectors in the region, identifying just under 30 businesses that operate in the sector.

The utilisation of solar power with solar photovoltaics is confined to a number of small but significant projects. It is estimated that there is 0.64MW of generation capacity in the region. ekosgen have identified around 60 businesses in the region that operate in this sub-sector.

East Midlands research assets

In addition to the significant levels of commercial activity highlighted above, the East Midlands is also home to a number of large research centres that focus on low carbon buildings and associated activities. These are highlighted in Table 3.

TABLE 3: Low Carbon Building Technologies and micro-generation activity in the East Midlands

University	Main area of focus
University of Nottingham: Sustainable Technologies Group	<ul style="list-style-type: none"> • Sustainable building design • Photovoltaic • Solar thermal systems • Earth construction (environmentally responsible alternatives to cement and concrete) • Biomass
Loughborough University	<ul style="list-style-type: none"> • Sustainability and Building Performance • Innovative Construction Technologies
De Montfort University	<ul style="list-style-type: none"> • CaRB Project: Modelling of economic impact of various carbon saving measures

Source: EPSRC, Low Carbon Task Force 2009

In addition to these academic strengths, there are a number of high profile Engineering and Physical Sciences Research Council (EPSRC) funded projects that are currently located within the region:

- **Leicestershire:** Carbon Vision Buildings Project (CaRB): is a £3.1 million, 4-year initiative. The project has a wide range of academic and private sector partners and is aimed at developing computer models that will make it possible to pinpoint effective ways of cutting carbon emissions arising from energy use in buildings. Partners include De Montfort University, University College London, University of Reading, University of Newcastle-upon-Tyne, University of Sheffield, Royal Institute of Chartered Surveyors (RICS) and Energy for Sustainable Development Ltd. Stakeholders involved include NES Ltd, PowerGen, Leicester City Council, the Energy Saving Trust and Defra.
- **Nottinghamshire:** Technology Assessment for Radically Improving Asset Base (TARBASE) is a £1.3 million, 4-year initiative is focusing on the scope for retro-fit measures capable of reducing carbon emissions by 50 per cent by 2030, for example through greater use of combined heat and power (CHP) in buildings, use of building materials with improved insulating properties and the use of renewable energy technologies. The project is led by Heriot-Watt University, but also involves University of Ulster, University of Surrey, University of Nottingham, BSRIA, Integer, CIRIA and JB&B.

1.6 Low Carbon, Carbon Capture and Storage

Low Carbon, Carbon Capture and Storage (LC-CCS) technology encompasses a broad concept of technologies as opposed to a single technology. This is a new and potentially important sector. LC-CCS in this section is specifically concerned with energy generation and key technologies and can be separated into three broad categories¹¹:

- **Combustion, CO₂ separation and capture**
- **CO₂ transportation**
- **CO₂ storage.**

East Midlands context

The UK has considerable expertise in the offshore oil and gas industry from the exploration and exploitation of undersea deposits but there is a lack of expertise in the re-injection of CO₂ to enhance the recovery of oil and gas. Therefore, it is believed that there is considerable scope to develop this sector using the knowledge and geography of the UK.

Although ekosgen have identified only a handful of companies operating in this sector in the region, the East Midlands is a potential location for large-scale CCS activities. The region provides a supply of high carbon emitting industries and processes: CO₂ from power generation (see the section on Power Generation) and heavy manufacturing in particular are cited as the possible major sources of carbon for CCS processes. There is also the possibility of the development of a CCS network to link high carbon emitters with carbon storage areas in the North Sea.

¹¹ GHK – “Identification of Expertise and Excellence in New Industry New Jobs (NINJ) Industrial Technologies – Low Carbon, Carbon Capture and Storage”, November 2009.

East Midlands assets

Regional activity in LC-CCS appears to be forming a research corridor alongside the M1 motorway. The academic institutions that have developed interest in the area include the University of Nottingham and Loughborough University. As part of its research atlas, the UK Energy Research Centre has provided an overview of the research landscape in CCS.¹² This atlas highlights considerable strengths in carbon storage, but possible weaknesses in carbon capture (and carbon transportation). The British Geological Survey (BGS, which is headquartered in Nottingham) is recognized as a European centre of excellence for the study of carbon dioxide storage, with “up to 16 research and technical staff” at any one time working on CCS. The BGS has joined the University of Edinburgh (School of Geosciences) and the University of Herriot-Watt (Institute of Petroleum Engineering) to form one of the UK’s largest academic groups in CCS – the Scottish Centre for Carbon Storage (SCCS, 21 academic staff). This centre also includes the UK Biochar Research Centre. Scotland also hosts the centre for process integration and membrane technology at the RGU in Aberdeen.

The major activity within the region includes developments at the University of Nottingham and Loughborough University. The University of Nottingham has established:

- **The Centre for Innovation in Carbon Capture and Storage (CICCS):** This is a leading international centre (of 13 academic staff) for research to accelerate the technological innovation needed to facilitate the wider deployment of CCS. Current R&D programmes include: integrating capture and storage systems; utilising CO₂ as a fuel, improving efficiency and reducing costs in CO₂ capture, terrestrial CO₂ storage, and cleaner coal technologies.
- **The Energy Technologies Research Institute** (which will include expertise on clean coal).

Activity at Loughborough University includes:

- **The Energy Technologies Institute (ETI):** Collaborative work with the neighbouring Ratcliffe coal-fired power station, the home to E.ON Engineering Limited (which conducts related industrial research in energy generation).

¹² UKERC Energy Research Atlas: Carbon Capture and Storage, Version 3, May 2009.

1.7 Low Carbon Vehicles and Fuels

The Low Carbon Vehicles sub-sector includes industries, organisations and research institutions that are concerned with alternative vehicles (such as hybrid and electric vehicles), fuel cell and other alternative fuel technologies.

Several major car manufacturers have been producing hybrid vehicles for a number of years (e.g. Toyota has been producing the Prius since 1997). The share of the car market accounted for by these vehicles is increasing, though it remains relatively small. The commercialisation of fuel cells has been developing rapidly across the world, with the number of units deployed increasing at a rate of 70% per annum between 2002 and 2006. The market for these alternative vehicles and fuels is being driven by tightening regulatory standards at EU level.

East Midlands context

The automotive sector and its supply chain form a major part of the East Midlands economy. The sector in the region includes mass production (Toyota in South Derbyshire) and high performance engineering, largely centred around Northamptonshire. This constitutes a large market for low carbon vehicles and fuels. However, ekosgen have identified around 30 businesses in the region that operate in the sector. This does include a number of significant businesses, for example:

- **Intelligent Energy Holdings** – Development of automotive fuel cell technology;
- **Zytek Engineering** – Advanced vehicle design and engineering; and
- **Rolls-Royce Fuel Cell Systems** – Fuel cell design and systems design.

East Midlands research assets

The major research centre in the East Midlands concerning Low Carbon Vehicles is at Loughborough University. The Centre of Excellence for low carbon and fuel cell technologies (CENEX), located in Loughborough, is a delivery agency established with support from the Department for Business, Innovation and Skills (BIS) to promote UK market development and competitiveness in low carbon and fuel cell technologies for transport applications.

The East Midlands has also taken the lead in demonstrating how a hydrogen infrastructure can be implemented. The UK's first Hydrogen Refuelling Station has been opened in Loughborough linking in with the low carbon innovation hub at Holywell Park, which also hosts the Energy Technologies Institute and CENEX.

The Energy Technologies Institute is home to the Plug-In Vehicle Economics and Infrastructure project. This project will evaluate the potential role and economics of plug-in vehicles as part of a number of low carbon transport scenarios.

Table 4 highlights other institutions and departments that have capabilities that are relevant to the development and commercialisation of fuel cell technologies.

TABLE 4: Alternative fuels research capabilities in the East Midlands

HEI	Department/Centre	Capabilities
Loughborough University	Centre for Renewable Energy Systems and Technology	Control systems, fuel storage, integration with renewables, systems integration
Loughborough University	Department of Aeronautical and Automotive Engineering	Automotive engine modelling, control systems, fuel processing, fuel storage, hybrid engines, integration with renewables, materials/components, PEMFC
Loughborough University	Institute of Polymer Technology and Materials Engineering	Materials/Components, SOFC
University of Nottingham	Advanced Materials Research Group, School Mechanical, Materials, Manufacturing Engineering and Management	Fuel Storage, Materials/Components
University of Nottingham	Division of Chemistry, Hydrogen Storage Group	Fuel Storage, Materials/Components

2. Environmental services

This final section provides a short profile of a number of environmental services that will all contribute to the successful move towards a low carbon economy. The services considered include: air pollution, environmental consultancy, environmental monitoring, noise and vibration control, contaminated land, waste management, water and waste water, carbon finance and recovery & recycling. In their mapping study of the low carbon economy in the East Midlands, ekosgen identified a total of just under 1,600 businesses operating in these sectors in the region.

2.1 Air pollution

The air pollution control sector is defined as products, systems and services for the prevention, reduction and removal of gaseous and particulate pollutants from air. The level of air pollution from Environment Agency regulated sources has fallen significantly in the East Midlands between 1998 and 2007. Most of the air pollution is from transport, and although levels of air pollution in the region are better than average, along the main routes air quality is poorer.

The air pollution sector is relatively mature having been driven by regulation, particularly at the European level. As such it has a projected growth rate that is lower than some other low carbon sub-sectors. ekosgen have identified around 80 businesses in the region operating in this sub-sector.

A number of the region's universities have centres that conduct research into air quality: the University of Nottingham, Loughborough University and the University of Derby.

2.2 Environmental consultancy

Environmental consultancy covers a wide range of environmental services. This is a growing sub-sector as increasing awareness of environmental issues, together with national and international regulation, means that companies need to be aware of, and minimise, the impact of their activities on the environment.

Innovas consider the East Midlands to have a comparative advantage in this sub-sector, and ekosgen have identified over 250 businesses in the region who operate in this sub-sector.

2.3 Environmental monitoring

Environmental monitoring covers the sampling, detection, measurement, impact analysis and management of contaminants in all environments, including analysis and monitoring of contaminants, contaminant source characterisation, transport and deposition, contaminant pathways (uptake, metabolism, transformation, fate), multi-media sampling/monitoring (air, soil, water, sediment), and biological monitoring and surveillance. It also covers quality assurance/control and legislative issues and guidelines. There will be overlaps with other sub-sectors as some of these services may be offered by companies in other sectors, particularly environmental consultancy.

This is currently a small sector nationally and internationally, but is growing quickly as a result of increasing environmental regulation and legislation. ekosgen have identified over 100 businesses in the region that operate in this sector.

2.4 Noise and vibration control

Noise and vibration control can be described as products, systems and services for monitoring and reducing noise and vibration. This is a relatively small sub-sector but is expected to grow quickly as a result of the introduction of regulations concerning noise and vibration in the workplace. Innovas conclude that the region is under-represented in this sector and ekosgen identify fewer than 50 businesses in the region that operate in this sub-sector.

There are a number of universities in the region with departments/centres that have expertise in this area. These include the Environmental Pollution & Research Group and Engineering & Development Centre at Loughborough University and the Centre for Environmental, Earth and Applied Sciences Research at the University of Derby. The latter provides the Institute of Acoustics Certificate of Competence in Workplace Noise Assessment and the Institute of Acoustics Certificate of Competence in Environmental Noise Measurement.

2.5 Contaminated land

The contaminated land sub-sector centres on those industries and professions associated with remediating contaminated land and this includes: products, systems and services required for the decommissioning of toxic and hazardous facilities; remediation and land reclamation of coalfields/heavy industry sites; decommissioning of nuclear sites; waste collection and containment; regulatory consultancy and training.

The East Midlands contains a significant amount of derelict land and other sites in need of remediation. Many of these can be found in Derbyshire and Nottinghamshire, a legacy of the coal mining and heavy industry heritage of these areas. The region is a significant market for these processes, and includes examples of the implementation of leading technologies (such as the Avenue Coking Works).

This is one of the more mature low carbon sub-sectors and is expected to experience modest growth compared to other sub-sectors. In their mapping exercise ekosgen have identified around 50 businesses in the region that operate in this sub-sector. A number of universities are active in research relevant to this sub-sector: the Environmental Pollution & Research Group and Engineering & Development Centre at Loughborough University, the Centre for Environmental, Earth and Applied Sciences Research at the University of Derby, and the Centre for the Environment at the University of Nottingham.

2.6 Waste management and recycling and recovery

Waste management is a diverse sub-sector and includes: construction and operation of waste treatment facilities; equipment for waste treatment; landfill; specialised containment; mechanical and biological treatment; shredders and compactors; waste minimisation consultancy; regulatory advice consultancy and training. This is a large and mature sub-sector with growth driven by legislation and the need to reduce the

negative environmental impacts of waste. Innovas indicate that as a result of this maturity expected growth rates are not expected to be as high as in some emerging sub-sectors.

The East Midlands accounts for around 10% of waste arisings in England, with two thirds of this coming from construction & demolition and industrial and commercial sources. In 2006, 330 tonnes of waste were produced for every million pounds of gross value added generated, compared to a figure of 244 tonnes for England. On this measure the region is less resource efficient than average. However, the region is better than average at recycling/recovery of waste. In 2006 43% of waste produced in the region was recycled/recovered compared to an average of 38% for England.

This suggests that there is a sizeable market in the region for the businesses that operate in this sector. ekosgen have identified over 220 businesses in the region that operate in waste management and over 550 that operate in recycling and recovery. The region has a strong R&D presence in this sub-sector:

- **University of Northampton** (Centre for Research into Sustainable Wastes Management) – a leading UK specialist centre working closely with Defra and with specialisms in healthcare waste
- **Nottingham Trent University** (Centre for the Environment and Environmental Technology Centre)
- **Loughborough University** – Environmental Pollution Research Group & Engineering and Development Centre
- **University of Derby** – Centre for Environmental, Earth and Applied Sciences Research.

2.7 Water and waste water

This sub-sector encompasses all aspects of water and waste intake (domestic and industrial) and output; sewerage and waste, pollution (agriculture, sewerage) of rivers, lakes and seas, and all the manufacturing, resource/ wastewater management and efficiency procedures used to sustainably supply high quality water. This is a large sub-sector and ensuring an adequate quality and quantity of supply is an increasingly important global challenge.

Water resources in the region are under pressure. Parts of Lincolnshire are among the driest in the country but require large amounts of water for the irrigation of some of the most productive land in the country. Project population and climate change will increase the pressure on the region's water resources in the future. The quality of water resources in the region has been improving, with significant increases in the proportion of river length being of good biological and chemical quality between 1990 and 2007.

ekosgen have identified over 250 businesses in the region that operate in this sub-sector. in common with a number of low carbon sub-sectors, regulation plays an

important role in the growth of the water and waste water sub-sector. Innovas suggest that this sub-sector will experience one of the slower rates of growth in the low carbon economy.

2.8 Carbon finance

Carbon finance is an emerging sector that supports trade in carbon emissions. It is a rapidly growing sector and is dominated by the London based emissions trading exchange, which is twice as active as its nearest competitor. London accounts for 97% of GVA generated from this sector in the UK. There is very little activity in the East Midlands.

