Mapping the East Midlands Low Carbon Economy: Volume 2 - Market Analysis

A report prepared for *emda*

Ekosgen Consulting (UK) Ltd

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Mapping the East Midlands Low Carbon Economy:

Volume 2 – Market Analysis

Final Report

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INVESTORS IN PEOPLE

TABLE OF CONTENTS

1 INTRODUCTION

1.1 This report presents the findings of a comprehensive mapping exercise of the Low Carbon Environmental Goods and Service sector (LCEGS) undertaken by ekosgen on behalf of the East Midlands Development Agency.

1.2 The aim of the research was to re-map this sector in detail in the light of new national and international research into market opportunities and regional research into sector strengths and build on the national research in two ways:

- Developing a detailed set of intelligence on the LCEGS sectors and their supply chains in the East Midlands; and
- Given existing sector specialisms in the East Midlands, nuclear and conventional power generation and their supply chains should be included.

1.3 The following outputs were required:

- Development of a **directory of LCEGS businesses in the East Midlands** and their supply chains, including power generation and nuclear power supply chains supporting Rolls Royce. The directory was to include company level information such as name, address, contact details, size and sub-sector. National research suggested that there were approximately 3,400 companies in the sector.
- **Detailed Database** – For 1,000 of these companies, detailed information on business motivation and capacity was collected to provide a better understanding of the issues facing businesses in this sector.
- **Market Analysis** – To underpin the directory work and support the conclusions, a detailed market analysis of each of the LCEGS subsectors was undertaken. This involved a detailed, in–depth and well evidenced analysis of regional, national and international carbon sensitive market trends and opportunities.

1.4 This report contains the findings of the Market Analysis phase of the research.

2 Methodological Approach

Overview

2.1 The research involved the following main stages:

- ***Market Analysis*** – Desk research to identify sub-sectors with the greatest potential to deliver regional benefit. The desk research exercise involved producing a short but comprehensive report for each sub-sector identifying international and national trends, priorities and strengths and weaknesses. The report also clearly defined each sector showing the relevant business classification codes covering the sector.
- ***Development of a Primary Database*** – Using the business classification codes identified as part of the market analysis, business data was purchased from Experian. This was supported with investigative techniques to find company details where business classification systems were not adequate. This included working with trade associations, industry bodies and the Carbon Trust.
- Use of a ***telephone survey*** to make contact with all the businesses identified on the primary database, filtering out those that do not perceive themselves to be operating in the sector or supplying to it. Thus forming the ***basic business directory***.
- For those that were part of the sector, businesses were invited to take part in an ***in-depth interview***, with 1,000 full responses received. This explored their capabilities, capacity and attitudes to growth.

Conducting the Market Analysis

2.2 The purpose of this task was to identify LCEGS (and some non-LCEGS) sub-sectors and niches within the East Midlands economy which have the greatest potential to deliver regional benefit by exploiting a carbon sensitive market place.

2.3 There are three different types of green business:

- LCEGS business and supply chain - delivering core services to support the low carbon market;
- Non-LCEGS businesses but makers of 'green' products e.g. a software company may produce energy management software; and
- Businesses in the wider economy adopting 'green' solutions e.g. a retailer sourcing organic/recycled materials.

2.4 All three types of business will be impacted by a carbon sensitive market place and will be presented with both opportunities and threats. However, for the purposes of this

research, we are principally interested in the first two. National research has shown that comparative advantage may be achieved more easily through developing “green” products and services in sectors where the UK currently has a comparative advantage e.g. software, electronic equipment, business services etc. (i.e. group 2), rather than through sectors traditionally considered “green”. For this reason, the analysis was conduced in two parts:

- Opportunities for LCEGS businesses and supply chain; and
- Opportunities for non LCEGS businesses to make 'green' products.

LCEGS Market Analysis

2.5 LCEGS Subsector - Information on each LCEGS sub-sector was reviewed and a summary report produced detailing:

- Global market situation;
- National market situation;
- Political Drivers;
- Supply chain/Niches;
- Investment Trends;
- East Midlands (Supply);
- East Midlands (Demand);
- Higher Education;
- Role of Energy Technology Institute;
- Skills and Capabilities;
- Trade Associations; and
- Business Classifications.

2.6 A very wide range of information was reviewed for each of the sub-sectors including general literature such as:

- Low Carbon and Environmental Goods and Services: An Industry Analysis, Innovas 2009;
- Towards a Low Carbon Economy, economic analysis and evidence for a low carbon industrial strategy, BIS, 2009;
- Market Opportunities in Environmental Goods and Services, Renewable Energy, Carbon Finance and CATS, UK Trade and Investment October 2008;
- Commission on Environmental Markets and Economic Performance, November 2007;

- Delivering the low-carbon economy – Business Opportunities for UK Manufacturers, EEF, January 2008; and
- Sector Skills Mapping in the Environmental Technology Sector, Energy and Utility Skills, March 2006.

2.7 As well as specific sub-sector information such as:

- Relevant Government Strategies, research and publications;
- Relevant legislation;
- Trade Association information and publications; and
- Carbon Trust information and publications.

2.8 This was supported by regional information such as:

- Regional Strategies;
- Regional Targets;
- Specific project information;
- Specific business information; and
- HEI information

The Non-LCEGS Sector

2.9 Development of a paper exploring the regions strengths outside the LCEGS sector and the opportunities to develop low carbon products.

3 Environmental Technologies: Air Pollution

Air Pollution
Rating: Medium
The air pollution sub-sector is a relatively small sub-sector with moderate growth potential internationally, but relatively low growth potential in the UK. Politically, there are a number of pieces of air quality legislation in the UK, largely driven by European directives; however the sub-sector is not high on the political agenda. Whilst the East Midlands universities have some strength in this area, there is little evidence of any commercial comparative advantage.

Global Market Situation

3.1 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. Examples include external and internal emission and odour control, filters and catalytic converters and treatment systems. This sub-sector may also include Environmental Monitoring, Instrumentation and Analysis activities specific to this sector (see the environmental monitoring profile).

3.2 While developed countries have made considerable progress in improving air pollution, rapid growth in developing countries, particularly urban areas, has led to a significant increase in airborne pollution and pollution control measures are still at an early stage.

3.3 The international market value of this subsector stands at £28.18 billion, which represents 0.93% of the total global LCEGS market[1].

3.4 At the European scale, there is no one country that is dominating investment in this sector however there are opportunities in air pollution control in Australia, air pollution technology markets in Brazil and air pollution abatement in the USA[1].

National Market Situation

Size of sub-sector	Proportion of UK market	UK share of global market	No. of Businesses	No. of employees
£0.95bn	0.89%	3.38%	508	8863

3.5 The environmental sector has a total value of £22.28bn[1], air pollution accounts for 4.27% of this. The sub-sector accounts for 8,863 employees in the UK, fourth highest among the environment sector after water, recovery and recycling, and waste management (but well behind these in scale). Employment is predicted to grow to 10,700 by 2014/15[1].

[1] Low Carbon Goods ands Services: an industry analysis, Innovas Solutions 2009

3.6 Innovas estimate that market value for the Air Pollution subsector will grow by a compound growth rate of 19.6% or £190 million between 2008 and 2015[1]. This is the second lowest predicted growth (in percentage terms) of the environment sub-sectors.

3.7 Exports make up 16% of the value of the sub sector (with exports worth £159 million) in 2007/8 representing 1.52% of total LCEGS exports.

Political Drivers in the Subsector

3.8 The UK Government and the devolved administrations published the latest Air Quality Strategy for England, Scotland, Wales and Northern Ireland in 2007. The Strategy sets out a way forward for work and planning on air quality issues, air quality standards and objectives to be achieved, new policy framework for tackling fine particles and identified potential new national policy measures to give further health benefits and move closer towards meeting the Strategy's objectives.

3.9 The Air Quality Framework Directive on ambient air quality assessment and management defines the policy framework for 12 air pollutants known to have a harmful effect on human health and the environment[2].

3.10 The National Emission Ceilings Directive sets ceilings for each Member State for emissions of ammonia, sulphur dioxide, oxides of nitrogen (NOx) and volatile organic compounds (VOCs)[3]. These four pollutants are primarily responsible for acidification, eutrophication and ground-level ozone. The ceilings must be met by 2010.

3.11 The Solvent Emissions (England and Wales) Regulations 2004 gives effect to the European Council Directive "on the limitation of emissions of volatile organic compounds due to the use of organic solvents in certain activities and installations". The Solvent Emissions Directive applies to specified activities carried out at an installation[4].

3.12 The Paints Directive aims to reduce emissions of volatile organic compounds across the UK and Europe. VOCs are precursors to the formation of ground level ozone (summer smog) and reductions resulting from implementation of this Directive will lead to improvements in air quality and public health[5].

3.13 The Sulphur Content of Liquid Fuels Directive aims is to reduce emissions of sulphur dioxide resulting from the combustion of heavy fuel oil and gas oil - used on land[6].

Supply Chain/Niches

3.14 Manufacturing is an important part of the air pollution sub-sector representing 37.5% of the value of the sector, reflecting the established nature of the sector. The supply chain for this sub-sector is valued at 32% of the whole subsector[1].

[2] Air Quality Framework Directive (96/62/EC) defra

[3] National Emission Ceilings Directive (2001/81/EC) defra

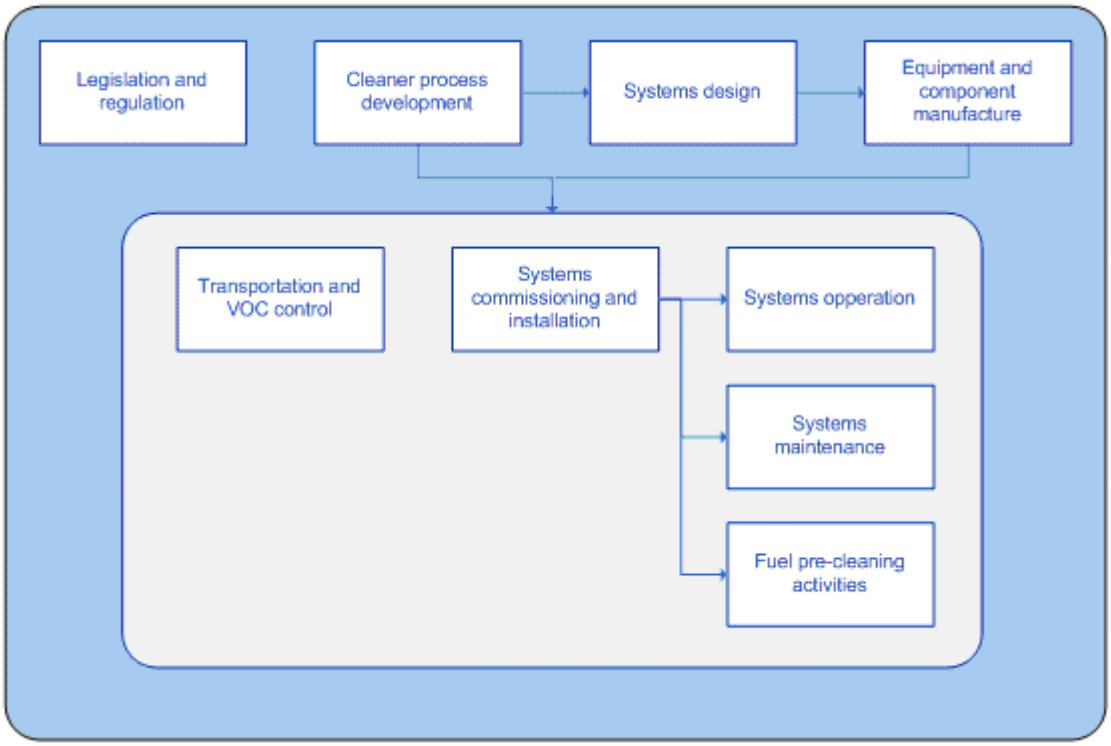
[4] Environmental Permitting, defra 2008

[5] Paints Directive (2004/42/EC) defra

[6] Sulphur Content of Liquid Fuels Directive 1999/32/EC defra

3.15 The UKTI report identified UK strengths in research and development. The report states that overall the sector is poor with a moderate UK relative advantage.

3.16 Energy and Utility Skills have produced a simple supply chain for the air pollution control sector as shown below[7].



Source: Energy and Utility Skills, 2006

East Midlands Supply

3.17 At 5.46% of the GVA for the sector, performance of this sub-sector in the East Midlands is considered to be an average performance[1].

3.18 Findings from the ekosgen research found 79 businesses operating in the sector, with 39 stating that it was their main sector. 38 businesses supplied to the sector.

East Midlands Demand

3.19 Air quality in the East Midlands has improved in cities and industrial areas as environmental health legislation has led to established regulatory regimes. The National Air Quality Strategy of 2000 put in place targets for lowering the levels of the main air pollutants (by 2005) in order to protect health, vegetation and the ecosystem.

3.20 Air pollutants in the region can primarily be linked to two main sources: transport and industry. Particulates, nitrogen oxide and carbon monoxide levels are

[7] Energy and Utility Skills, Sector Skills Mapping in the Environmental Technology Sector, 2006

concentrated along transport corridors such as the A1, M1 and A14 and in urban areas[8].

3.21 Since 1997 local authorities in the UK have been carrying out reviews and assessments of air quality in their area. The aim of the review is to assist authorities in carrying out their statutory duty to work towards meeting the national air quality objectives. If a local authority finds any places where the objectives are not likely to be achieved, it must declare it an Air Quality Management Area (AQMAs)[9], of which there are seven across the region.

Higher Education

3.22 The region is strongly placed for research and development in the environmental technologies sector more generally, and has specific strengths in relation to environmental management, including air quality, as follows:

- Nottingham University - Centre for the Environment includes research into air quality management and pollution
- Loughborough University Business School undertakes environmental Pollution Research (the focus of this research is on managing environmental risks within work organisations)
- University of Derby - Centre for Environmental, Earth and Applied Sciences Research
- University of Lincolnshire and Humberside - Environmental Protection and Management

Skills and Capabilities

3.23 There is very little information regarding specific skills and competencies required by this sub sector. However, it would be expected that a range of engineering, systems design and manufacturing as well as science (research, monitoring etc) based skills would be required, most of these being readily transferable from other sectors. Specialist qualifications in environmental management include elements related to air pollution.

Business Description

3.24 Technologies used in the air pollution control sector include[7]:

- Control of toxic fumes / elements / radiological
- Dust and fume control
- Local air quality management
- NOx control

[8] Air Quality Strategy for England, Scotland, Wales and Northern Ireland

[9] UK Air Quality Archive www.airquality.co.uk

- SO2 and HCL control
- VOC and odour control
- Other air pollution

3.25 Applications for the air pollution control sector include[7]:

- Cleaner process development – the development of burning and chemical processes to reduce pollutant production.
- Air pollution control systems design – the design of fixed equipment to remove pollutants.
- Air pollution control equipment and component manufacture and supply
- Air pollution control systems commissioning and installation – fixed equipment, often as part of a larger system
- Air pollution control systems operation – often as a sub set of wider operation tasks
- Air pollution control systems maintenance
- Fuel pre-cleaning activities – activities to remove pollutants from fuel before burning
- Transportation VOC control – control of Volatile Organic Compounds in transportation fuels
- Air pollution legislation and regulation – regulation, enforcement and compliance activities

3.26 SIC, Yell and Thompson codes identified for each sector have been indentified below. Business classification codes are not always a perfect match to the industrial sector we are trying to identify. Therefore to give some sense of the level of fitness of each code, they have been assigned one of the following codes green – good/near exact fit, orange – moderate fit, red – poor/low fit, X – representing the polluting industry or client industry itself. We would not normally consider manufacturers of refined petroleum to be LCEGS businesses, however, they are likely to be leading the development of cleaner fuels and cleaner processing of fuels.

SIC codes[7]		Thompson codes		Yell codes	
24.15 : Manufacture of fertilisers and nitrogen compounds	X	04420 : Architects		00046 : Science & Research Consultants	
29.52 : Manufacture of machinery for mining, quarrying and construction		82465 Ventilation Contractors		00060 Air Filters and Purification	
11.10 : Extraction of crude petroleum and natural gas	X	57485 : Petrol Filling Stations	X	00097 : Architectural Technologists & Technicians	
74.20 : Architectural and engineering activities and related technical consultancy		03040 Air Purification Equipment		01253 : Chemical Mfrs & Suppliers	X
23.20 : Manufacture of refined petroleum products	X	82470 Ventilators and Ventilation Systems		02389: Dust Extraction and Ventilation	
24.13 : Manufacture of other inorganic basic chemicals	X	59050 : Plant & Machinery Manufacturers		02480 : Architectural Services	
40.11 : Production of electricity	X	28980: Dust Extraction Plant and Equipment		02620 : Petroleum Equipment & Product Mfrs	X
50.50 : Retail sale of automotive fuel	X	04424 : Architectural Technologists		02740 : Paint, Varnish & Lacquer	X
50.51: Wholesale Of Solid, Liquid And Gaseous Fuels And Related Products	X	57580 : Petroleum Products – Manufacturers	X	03393 : Refrigeration Equipment-Commercial	
24.11 : Manufacture of industrial gases	X	17100 : Chemical Manufacturers	X	03452 Filter Manufacturers and Suppliers	
24.14 : Manufacture of other organic chemicals	X	55550 : Paint Manufacturers	X	06020 : Electricity Supply Companies	X
24.30 : Manufacture of paints, varnishes and similar coatings, printing ink and mastics	X	29000: Dust Extraction Systems		06301 Pollution Control	
29.23 : Manufacture of non-domestic cooling and ventilation equipment		64700 : Research Organisations		06635 : Oil Companies	X
73.10 : Research and experimental development on natural sciences and engineering		54050: Oil Fuel distributors	X	06730 : Petrol Filling Stations	X
75.11 : General (overall) public service activities		54150 : Oil & Gas Extraction	X	08130: Oil fuel distributors and suppliers	X
24.12 : Manufacture of dyes and pigments	X	64080 : Refrigeration Equipment Manufacturers & Distributors		08765 : Architects	
24.20 : Manufacture of pesticides and other agro-chemical products	X	30590 : Electricity Generating & Distributing Equipment		09157 Ventilation Services	
		38120: Fuel Dealers	X	09835 Ventilators and Air Vents	

SIC codes[7]		Thompson codes		Yell codes	
		04422 : Architectural Services			
		30586 : Electricity Companies	X		

Business Directories/Trade Associations

- Environmental Industries Commission - www.eic-uk.co.uk
- Institute of Environmental Management and Assessment - www.iema.net
- UK Forum for Environmental Industries - www.ukfei.co.uk

4 Environmental Technologies: Environmental Consultancy

Environmental Consultancy
Rating: High
Whilst it is a relatively small sector both nationally and internationally it has good growth prospects and is identified as important with respect to exporting. The increasing profile of low carbon and environmental issues will impact on this sector as it serves all elements of the LCEGS market. Within the East Midlands, Innovas identified that the East Midlands is showing a relative comparative advantage in this sector , a finding that is supported by this research which found 250 businesses operating in the sector, with 163 of these identifying this as their main sector.

Global Market Situation

4.1 Environmental consultancy covers a wide range of environmental issues, and many companies operating in the consultancy market will also offer services in one or more technologies as well. Defining this sub sector in isolation is therefore difficult. The Innovas report puts the international market value of this subsector at £23.54bn, which represents 0.77% of the total global LCEGS market[10].

National Market Situation

Size of sub-sector	Proportion of UK market	UK share of global market	No. of Businesses	No. of employees
£0.74bn	0.70%	3.15%	375	6,827

4.2 Environmental Consultancy shows a moderate forecast growth rate with a compound growth of 32.3% or £240 million between 2007and 2015[1].

4.3 UKTI identify that UK strengths in EGS are pronounced in environmental consultancy. Rapidly growing opportunities for UK exports and overseas investment exist in this sub-sector[2]. Current exports are low however, at £39 million representing only 5.19% of total sales and making up less than 1% of all LCEGS exports.

Political Drivers in the Subsector

4.4 As the environmental consultancy sector serves all the main technology areas, there is no one regulatory or political driver influencing this sector. The increasing

[10] Low Carbon Goods ands Services: an industry analysis, Innovas Solutions 2009

awareness of environmental issues together with national and international regulation, are adding pressure to companies to ensure their activities have a minimal environmental impact. Few companies have in-house capabilities to address these issues to the high standards required and consultants offer an excellent resource to ensure compliance.

Supply Chain/Niches

4.5 The supply chain for this sub-sector is valued at 53% of the whole subsector[1].

4.6 The UKTI report identified UK strengths in financial & professional services, engineering design & consulting, policy development. The report states that overall the sector is strong with UK relative advantage.

4.7 The Energy and Utilities skills report[11] did not produce a supply chain map for this sector given its position within the supply chain of other sectors.

East Midlands Supply

4.8 At 9.5% of the GVA for the sector, performance of this sub-sector in the East Midlands is considered to be above average performance.

4.9 Findings from the ekosgen research found 250 businesses operating in the sector, with 163 stating that it was their main sector. 155 businesses supplied to the sector.

East Midlands Demand

4.10 There is no reason why the East Midlands region should have a disproportionately high or low demand for environmental consultancy services.

Higher Education

4.11 The region is strongly placed for research and development in the environmental technologies sector.

- Nottingham University - Centre for the Environment
- Loughborough University - Environmental Pollution Research Group & Engineering and Development Centre
- University of Derby - Centre for Environmental, Earth and Applied Sciences Research
- University of Lincolnshire and Humberside - Environmental Protection and Management
- University of Nottingham - Innovative Manufacturing Centre

Skills and Capabilities

[11] Sector Skills Mapping in the Environmental Technology Sector. Energy and Utility Skills. March 2006.

4.12 No reports have been found examining the skills requirements of this sector. However, it is intuitive that technical skills will relate to the area of specialism (covered in the other reports). In terms of generic skills, key skills are likely to be: customer service, report writing, problem solving, selling and presenting.

Business Description

4.13 Environmental Consultancy services involve a wide range of services to assist organisations respond to environmental issues. Examples include pollution control advice audits, environmental risk analysis, environmental impact assessment, product lifecycle assessment, waste minimisation reviews, environmental management systems (ISO14001) implementation and training.

4.14 The table below details the relevant business classification codes for the environmental consultancy sector. Business classification codes are not always a perfect match to the industrial sector we are trying to identify. Therefore to give some sense of the level of fitness of each code, they have been assigned one of the following codes green – good/near exact fit, orange – moderate fit, red – poor/low fit.

SIC codes[7]		Thompson codes		Yell codes	
7414 Business And Management Consultancy Activities		32415 : Environmental Consultants		00354 : Environmental Consultants	
		79960 Training Consultants		08771 : Energy Conservation Consultants	
		61860 Project Management			

Business Directories/Trade Associations

- Environmental Industries Commission - www.eic-uk.co.uk
- Institute of Environmental Management and Assessment - www.iema.net
- UK Forum for Environmental Industries - www.ukfei.co.uk
- Environmental Network Ltd - www.env-net.com

5 Environmental Technologies: Environmental Monitoring

Environmental Monitoring
Rating: Medium
Whilst this is a small sector nationally and internationally, it is perhaps of growing importance in servicing the other sectors, especially given increasing legislation such as the Environmental Liability Directive requiring those responsible to meet the cost of preventative and remedial measures. At the regional level, performance in this sub-sector is considered to be average, with potentially higher levels of demand around contaminated land.

Global Market Situation

5.1 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. This sub sector is inextricably linked to a number of others (such as contaminated land, air pollution and water) and many such companies will undertake monitoring as part of their service. As such it is difficult to analyse this sub sector in isolation.

5.2 According to Innovas the international market value of this subsector stands at £4.35bn, which represents 0.14% of the total global LCEGS market[12].

National Market Situation

Size of sub-sector	Proportion of UK market	UK share of global market	No. of Businesses	No. of employees
£0.15bn	0.14%	3.45%	72	1,376

5.3 Environmental monitoring shows moderate forecast growth rate in the environmental technology sector, as a percentage increase, with a compound growth rate figure of 32.3% or £0.20 billion between 2007 and 2015[1].

5.4 There is some debate as to the value of the sector in UK terms. Reports such as the Environment Research Funders' Forum's (ERFF) Strategic Analysis of UK Environmental Monitoring Activity and the UK Centre for Economic and Environmental Development's (CEED) Emerging Markets in the Environmental Sector place values on the sector ranging from £88.2 million (conservative ERFF

[12] Low Carbon Goods ands Services: an industry analysis, Innovas Solutions 2009

figure, excluding much of the more expensive compliance monitoring costs) to £539M.

5.5 Innovas arrive at a figure of a UK market worth around £150 million accounting for only 0.67% of the environmental sector (which has a total value of £22.28bn)[1]. The sub-sector accounts for 1,376 employees in the UK, which is predicted to grow to 1,900 by 2014/15[1]. The market value of the sub-sector is predicted to grow by 32.31% by 2014/15.

5.6 The export market is comparatively small at £21million (0.20% of total LCEGS exports, the third lowest)[1].The export demand of such services and solutions is likely to grow with the increasing complexity and scale of the environments being measured and the increasing global focus on environmental health and pollution prevention. Indeed, in some areas of the Environmental monitoring market, this export potential is already being realised. The UK CEED report, for example, highlights that 70-80% of UK production of air monitoring equipment is currently exported overseas.

Political Drivers in the Subsector

5.7 The principal legislative drivers influencing the development of the environmental monitoring market stem from the implementation of several European Directives that will require the collection of both greater numbers of, and also a more diverse range of, environmental measurements to inform the assessment and management of the potential associated risks. Undoubtedly the most influential legislative driver is the Water Framework Directive (WFD), due to the far-reaching requirements of the Directive in terms of both the diversity and the accuracy of the measurements required.

5.8 Another significant Directive is the Environmental Liability Directive (ELD), aimed at the prevention and remediation of environmental damage and requiring those responsible to meet the cost of preventive and remedial measures. The ELD's recent transposition into the draft Environmental Damage (Prevention and Remediation) Regulations 2008 for England and Wales, along with similar consultative legislation in Scotland and Northern Ireland, is seen as a likely driver for the development and utilisation of EMF technologies which can determine the source of environmental damage and apportion liability under the directive[13].

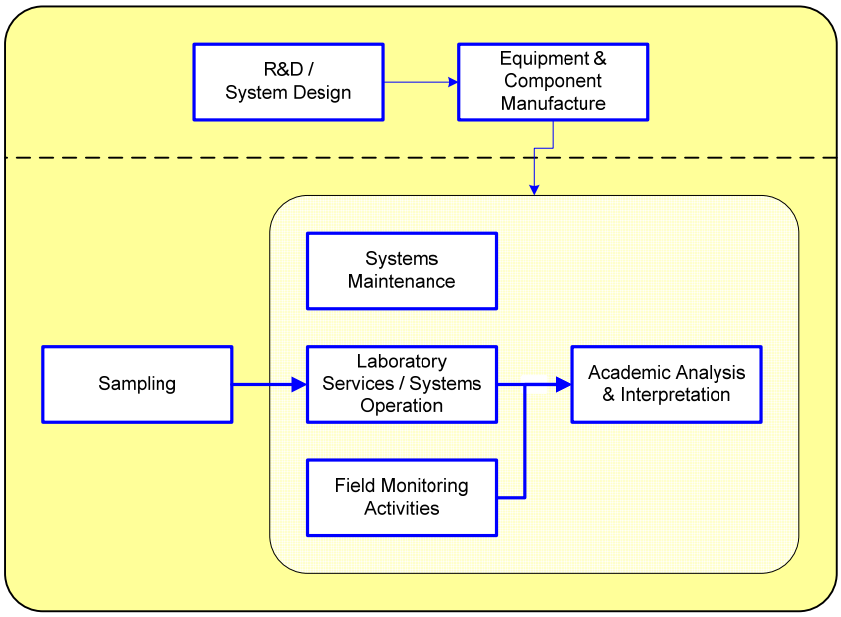
Supply Chain/Niches

5.9 Manufacturing is an important part of the environmental monitoring sub-sector representing 18.5% of the value of the sector. The supply chain for this sub-sector is valued at 20% of the whole subsector[1].

5.10 The UKTI report identified UK strengths in engineering, design & consulting, manufacturing and supply, project development and management and research and development. The report states that overall the sector is strong with a moderate UK relative advantage.

[13] Other important Directives include the Waste Incineration Directive, and the Registration, Evaluation, Authorisation and Restriction of Chemical Substances (REACH) Directive

5.11 Energy and Utility Skills and produced a simply supply chain for the environmental monitoring sector as shown below[14].



Source: Energy and Utility Skills, 2006

East Midlands Supply

5.12 At 5.75% of the GVA for the sector, performance of this sub-sector in the East Midlands is considered to be of average performance.

5.13 Findings from the ekosgen research found 102 businesses operating in the sector, with 59 stating that it was their main sector. 67 businesses supplied to the sector.

East Midlands Demand

5.14 There are some specific needs in the regional context (for instance around contaminated land) but the legislative drivers more generally are universal.

Higher Education

5.15 The region is strongly placed for research and development in the environmental technologies sector, including some with a focus on environmental monitoring and forensics.

- Nottingham University - Centre for the Environment and the School of bio-sciences have undertaken research in co-operation with Rothamsted Research and the British Geological Survey
- Loughborough University - Environmental Pollution Research Group & Engineering and Development Centre

[14] Sector Skills Mapping in the Environmental Technology Sector. Energy and Utility Skills 2006.

- University of Derby - Centre for Environmental, Earth and Applied Sciences Research
- University of Lincolnshire and Humberside - Environmental Protection and Management

Skills and Capabilities

5.16 Environmental monitoring is a multidisciplinary activity that involves the application of a range of scientific disciplines (including measurement and sampling, environmental modelling and software design and management). Similarly, there is a wide array of technologies that can be involved in gathering the environmental data.

Business Description

5.17 The Energy and Utility Skills research identifies the following technologies and applications for businesses in the environmental monitoring sector:

Technologies:

- Air Monitoring Equipment (Ambinet)
- Air Monitoring Equipment (Stack)
- Ecological Monitoring and Analysis
- Laboratory Analytical Services
- Monitoring Services
- Noise Monitoring Equipment
- Radation and Radiological Assessment
- River/Marine Monitoring Equipment
- Soil Monitoring Equipment
- Water (effluent) Monitoring/Analysis
- Water (potable) monitoring/Analysis
- Other Monitoring/Analysis

Applications:

- Monitoring & Analysis Research and Development/Design;

- Monitoring & Analysis Equipment, Component and System Manufacture;
- Monitoring and Analysis Systems Maintenance;
- Monitoring and Analysis Systems Operation/Laboratory Services;
- Sampling Activities;
- Field Monitoring Activities; and
- Academic Analysis and Interpretation.

5.18 The table below identifies business classification codes most relevant to the environmental monitoring sector. Business classification codes are not always a perfect match to the industrial sector we are trying to identify. Therefore to give some sense of the level of fitness of each code, they have been assigned one of the following codes green – good/near exact fit, orange – moderate fit, red – poor/low fit.

SIC codes[3]	Thompson codes	Yell codes
26.15 : Manufacture and processing of other glass including technical glassware	17370 : Chemists - Analytical & Consulting	00046 : Science & Research Consultants
26.24 : Manufacture of other technical ceramic products	32489 : Environmental Engineers	00097 : Architectural Technologists & Technicians
33.20 : Manufacture of instruments and appliances for measuring, checking, testing, navigating and other purposes, except industrial process control equipment	04424 : Architectural Technologists	02480 : Architectural Services
33.40 : Manufacture of optical instruments and photographic equipment	04422 : Architectural Services	02488 : Constructional Engineers
45.12 : Test drilling and boring	31600 : Engineers - General	03642 : Electronic Equipment and Instruments
73.10 : Research and experimental development on natural sciences and engineering	20703 : Computer Systems and Software	05504 : Laboratory Facilities and Services
74.20 : Architectural and engineering activities and related technical consultancy	46705 : Laboratories	05638 : Marine Consultants
743 : Technical testing and analysis	40401 : Glass Products - Manufacturers	08767 : Chemists - Analytical & Research
	16726 : Ceramic Manufacturers, Supplies & Services	09622 : Testing Equipment
	50230 : Measuring, Analysing & Controlling Instruments	02201 - Containers-Glass
	54230 : Optical Goods - Manufacturers	01235 : Ceramic Products & Services
	28380 : Drilling Contractors	08119 : Optical Goods Mfrs & Wh'salers
	64700 : Research Organisations	02371 : Drilling Contractors
	04420 : Architects	08765 : Architects
	30350 : Electrical Testing & Inspecting	

Business Directories/Trade Associations

- Environmental Industries Commission - www.eic-uk.co.uk
- Institute of Environmental Management and Assessment - www.iema.net
- UK Forum for Environmental Industries - www.ukfei.co.uk
- Gambica Association Ltd - www.gambica.org.uk
- Source Testing Association - www.s-t-a.org

6 Environmental Technologies: Noise and Vibration Control

Noise and Vibration Control
Rating: Low
This is a small sector both internationally and nationally, with the UKTI report rating the UK's overall strength in this sector as poor. Despite this the sector is expected to grow significantly to 2014 reflecting the introduction of regulations controlling vibration at work. This research confirmed the Innovas findings that the sector is relatively small, with only 45 businesses operating in the sector.

6.1 Noise and vibration control can be described as products, systems and services for monitoring and reducing noise and vibration. This includes: noise meters; monitoring systems; noise abatement products (acoustic buffers, enclosures, barriers and silencers); noise and vibration consultancy; relevant R&D; and training. The sub-sector is active in both manufacturing and consultancy services[15].

Global Market

6.2 The noise and vibration control sub-sector has a total international market value of £6.35bn, which represents 0.97% of the global environmental sector or 0.21% of the global LCEGS sector[16]. Reflective of the fairly small proportions, UKTI research finds that the UK's relative strengths in LCEGS present fairly limited opportunities for noise and vibration control activities.

National Market

Size of sub-sector	Proportion of UK market	UK share of global market	No. of Businesses	No. of employees
£0.203bn	0.19%	3.20%	104	1,870

6.3 Noise and vibration control has a total UK market value of £0.17bn[17], and this accounts for 0.91% of the UK environmental sector or 0.19% of the LCEGS sector, similar proportions to the international market composition. Forecast data suggests that the market value will increase by 65.11% to £0.28bn over the period 2007/08 to 2014/15.

[15] Definition from Innovas (2009) (p101) and UKTI (2008) (p22) reports

[16] Innovas (2009) Low Carbon Goods ands Services: an industry analysis (all current data = 2007/08)

[17] Alternative estimates in the 2008 UKTI report found the UK sub-sector value to be as high as £0.369bn based on 2005 data (p16)

6.4 The sub-sector is a relatively small employer and employs 1,870 people in the UK[18], 0.01% of the environmental sector or 0.002% of the LCEGS total. Employment is predicted to grow to 3,100 by 2014/15; a growth rate of 65.11% identical to the forecast change in market value.

6.5 The growth rates for both market value and employment are relatively high: the second highest rate of all 23 LCEGS sub-sectors for both market value and employment. Between 2007/08 and 2014/15, the proportion of the LCEGS sector accounted for by noise and vibration control increases marginally by 0.0002 percentage points for both market value and employment.

6.6 UK exports in noise and vibration control amounted to a value of £0.033bn in 2007/08 and this represents 0.003% of all UK LCEGS exports. The £0.033bn exports constitutes 16.47% of the sub-sector's full market value (of £0.203bn), and this proportion is substantially higher than the LCEGS average of 9.74%.

Political Drivers in the Sub-sector

6.7 The principal drivers for this sub-sector are the requirements of the European Directive 2003/10/EC set out in the UK 2005 Control of Noise At Work Regulations[19] adopted in April 2006. This includes: workplace exposure limit of 87dB; the provision of hearing protection and hearing protection zones at 85dB; risk assessment and information provision to employees at 80dB; implementing good practice noise control and risk management procedures; and controlling noise at the source. This opens opportunities for noise monitoring, testing and consultancy services in particular.

6.8 Similarly, the 2005 Control of Vibration at Work Regulations set minimum standards for employers that require workplace assessment and site audits. This is an area that offers the strongest growth for both noise and vibration control monitoring, reflected in the speciality services of the International Institute of Noise Control Engineering and Association of Noise Consultants.

6.9 Research by UKTI into the potential of the noise and vibration management sub-sector assesses the UK policy framework as 'good' (the highest level). In particular, this refers to having explicitly defined national strategies, clear legal and regulatory frameworks and commitments to international treaties.

Supply Chain/Niches

6.10 From a full sub-sector value of £0.2bn, £0.05bn is from supply chain companies and £0.15bn from specialist noise and vibration control companies. In other words, the supply chain accounts for 26% of the sub-sector market value and this compares to the LCEGS average of 55%.

6.11 Similarly, the Innovas research considers what proportion of the sector is made up of manufacturing companies. This finds that manufacturing is an important part of the noise and vibration control sub-sector representing 20.7% of the value.

[18] Of this total, sector network research estimates that there are 900 acoustical engineers in the UK - http://www.navcog.org.uk/default.asp?section=2&article=0

[19] http://www.hse.gov.uk/noise/regulations.htm

However, this is lower than the average for the environmental sector (22.9%) and the LCEGS average (30.8%).

6.12 Regarding international trade, research by UKTI[20] identifies that the UK's vibration and noise control strengths tend to be based around services rather than manufacturing. The sub-sector has strengths in: engineering design and consultancy, in contrast to under-representation in manufacturing and supply. Overall, the outlook for the sub-sector is limited with the UKTI report recognising it as having "poor or limited strengths."

6.13 Forecast growth in noise and vibration control markets is most likely to be centred on the UK and other areas of the EU as greater attention focuses on noise as a pollutant, particularly in urban areas, and as European regulations come into effect. The sub-sector is unlikely to have large export potential because noise and vibration are not high priorities in developing countries.[21]

6.14 Energy and Utility skills in their mapping work have not developed a supply chain illustration for this sector due to its small and underdeveloped nature.

East Midlands Supply

6.15 Findings from the ekosgen research found 45 businesses operating in the sector, with 25 stating that it was their main sector. 25 businesses supplied to the sector.

6.16 Based on research by Innovas, noise and vibration control has a total East Midlands market value of £10m (£0.01bn), and this accounts for 0.88% of the East Midlands environmental sector (£1.14bn) or 0.14% of the regional LCEGS sector (£7.06bn). These proportions are lower than the national averages on both counts (UK average = 0.91% and 0.19% respectively). In absolute terms, the market value of the East Midlands noise and vibration control sub-sector is 10th highest out of the 12 UK regions/nations.

East Midlands Demand

6.17 The majority of noise and vibration control regulations apply at the employer level, which is subject to national rather than regional regulation, although the region's over-representation of employment in manufacturing industries suggests the market will be relatively larger in the East Midlands compared to the national average.

6.18 Regional demand is expressed through some policy tools though, including the East Midlands Regional Environment Strategy last revised in 200222. Policy Statement 14 for the Built Environment notes that the impacts of noise and light pollution should be a factor in Environmental Impact Assessments (EIAs) and the subsequent Strategy Action Plan recognises that planning partners should "work to eliminate noise and light pollution wherever possible."

[20] UKTI (2008) Market opportunities in environmental goods and services, renewable energy, carbon finance and CATs (p16) - http://www.sqwenergy.com/file_download/147

[21] DTI/DFRA/JEMU (2002) Global environmental markets and the UK environmental industry: opportunities to 2010 - http://www.berr.gov.uk/whatwedo/sectors/environmental/archive/environmentreport/page34696.html

[22] http://www.emra.gov.uk/publications/housing-planning-and-transport/environment/regional-environment-strategy - p56/Action Plan p54

6.19 Looking forwards, regional (and national) policy is likely to have fairly limited impacts on this sector with most demand being driven by legislation at the European scale.

Higher Education

6.20 The region is strongly placed for research and development in the environmental technologies sector and R&D in noise and vibration activities is being conducted at the following centres:

- Nottingham University - Centre for the Environment
- Loughborough University - Environmental Pollution Research Group & Engineering and Development Centre
- University of Derby - Centre for Environmental, Earth and Applied Sciences Research (Institute of Acoustics Certificate of Competence in Workplace Noise Assessment; Institute of Acoustics Certificate of Competence in Environmental Noise Measurement)
- University of Lincolnshire and Humberside - Environmental Protection and Management
- University of Nottingham - Innovative Manufacturing Centre

Skills and Capabilities

6.21 Environmental technologies are listed as one of the Employment, Skills and Productivity Partnership's priority sectors, identified as significant in terms of skills, productivity, and employment to the region.

6.22 Specific to the sub-sector, the NAVCOG (Noise & Vibration Control Group) network was formed in November 2005 from a coalition of UK acoustic/vibration equipment manufacturers / designers and the group quickly listed skills shortages in the sub-sector as one of its primary targets to address.

6.23 The sub-sector is already strongly regulated and emerging legislation will continue the need for employees (existing and new) to upgrade skills and competencies. The subsequent introduction of new technology and applications (to meet the legislation) is likely to create further skills gaps.

Business Description

6.24 Businesses in this sector would fall into few business classification codes. The degree to which business in the sector are covered by these codes is shown in the table below - green – good/near exact fit, orange – moderate fit, red – poor/low fit.

SIC codes[7]		Thompson codes		Yell codes	
No suitable codes identified		01550 Acoustic Engineers		02478 Acoustic Engineers	
		01500 Acoustic Consultants		08414 Soundproofing	
				05800 Noise and Vibration Consultants	

Business Directories/Trade Associations

- Environmental Industries Commission - www.eic-uk.co.uk
- Federation of Environmental Trade Associations (FETA) Noise And Vibration Control Group – http://www.navcog.org.uk/default.asp?section=0
- Institute of Environmental Management and Assessment - www.iema.net
- International Institute of Noise Control Engineering - www.i-ince.org
- UK Forum for Environmental Industries - www.ukfei.co.uk
- Association of Noise Consultants - www.association-of-noise-consultants.co.uk
- Institute of Acoustics - founded in 1974 and continues to promote excellence within the profession - http://www.ioa.org.uk/

7 Environmental Technologies: Contaminated Land

Contaminated Land
Rating: Medium
This is a moderately sized EGS sector at national and international level. Opportunities are believed to be significant in former Eastern European countries in the next 10 years as support becomes available to deal with contaminated sites. At the regional level, there is significant demand to remediate derelict and brownfield land associated with coalfields and heavy industrial sites, although the sector remains a relatively modest 49 companies, with only 16 identifying this as their main sector.

7.1 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; decommissioning of nuclear sites; waste collection and containment; regulatory consultancy; relevant R&D; and training. The sub-sector is active in land services, manufacturing and consultancy services[23].

Global Market

7.2 The contaminated land sub-sector has a total international market value of £26.78bn, which represents 4.07% of the global environmental sector or 0.88% of the global LCEGS sector[24]. Reflective of the fairly small proportions, UKTI research finds that the UK's relative strengths in LCEGS present fairly limited opportunities for contaminated land activities.

National Market

Size of sub-sector	Proportion of UK market	UK share of global market	No. of Businesses	No. of employees
£0.906bn	0.85%	3.38%	468	7,920

7.3 Contaminated land has a total UK market value of £0.906bn[25], and this accounts for 4.07% of the UK environmental sector or 0.85% of the LCEGS sector, similar proportions to the international market composition. Forecast data suggests that the market value will increase by 27.08% to £1.15bn over the period 2007/08 to 2014/15.

[23] Definition from Innovas (2009) (p101) and UKTI (2008) (p22) reports

[24] Innovas (2009) Low Carbon Goods ands Services: an industry analysis (all current data = 2007/08)

[25] Alternative estimates in the 2008 UKTI report found the UK sub-sector value to be as high as £8.1bn based on 2005 data (p16)

7.4 The sub-sector is a significant employer and employs 7,920 people in the UK, 4.13% of the environmental sector or 0.90% of the LCEGS total. Employment is predicted to grow to 10,000 by 2014/15; a growth rate of 27.08% identical to the forecast change in market value.

7.5 UK exports in contaminated land amounted to a value of £0.097bn in 2007/08 and this represents 0.90% of all UK LCEGS exports. The £0.097bn exports constitutes 10.66% of the sub-sector's full market value (of £0.906bn), and this proportion is slightly higher than the LCEGS average of 9.74%.

Political Drivers in the Sub-sector

7.6 National contaminated land policy is largely guided by the Contaminated Land (in England) Regulations 2006, an extension to the Environmental Protection Act 1990, and this is supported by additional regulations relating to specific contaminations of oil, radioactivity and protecting wildlife sites. The 2006 regulations act as "an extended statutory regime for the identification and remediation of contaminated land." [26] This has since been translated into subsequent Planning Policy Guidance notes.

7.7 The identification of contaminated land itself, and its level of contamination, is an area of significant research and the Environment Agency estimates that that there may be some 300,000 hectares of land in England and Wales affected to some extent by industrial contamination[27]; whilst recognising that not all of this poses an immediate threat to human health and the environment.

7.8 On the policy front, there are three main ways that businesses are benefiting from political interventions in the contaminated land sector: promoting urban regeneration; promoting R&D into risk assessment and remediation; and working to an appropriate legal and regulatory framework. This includes political interventions from a wide range of public partners working closely with private developers and planners.

7.9 Of relevance to the East Midlands, there are also policy drivers in place relating specifically to the English coalfields. The Coalfields Regeneration Trust and English Partnerships (EP) National Coalfields Programme have been at the centre of this agenda since 1997 and EP currently manages 107 ex-coalfield sites (27 in the East Midlands) working with Regional Development Agencies, the SSC Alliance, Coalfields Regeneration Trust and other key local and private-sector partners[28]. By 2012, which admit to "look[ing] beyond the site remediation process"

7.10 Between 2008 and 2012, it is expected to bring over 1,800 hectares of derelict and contaminated land back into use and secure approximately £1bn of private sector leverage (although these targets may be affected by the economic slowdown).

[26] http://www.defra.gov.uk/environment/land/contaminated/pdf/circular01-2006.pdf

[27] Environment Agency (2005) Indicators for Land Contamination (p8) - http://publications.environment-agency.gov.uk/pdf/SCHO0805BJMD-e-e.pdf

[28] http://www.englishpartnerships.co.uk/coalfields.htm

7.11 Whilst the above legislation largely relates to the reclamation and recovery of industrial land, residential and other public access remediation policy is also covered by the Clean Neighbourhoods and Environment Act 2005 (Order 2006). This will offer opportunities to other niches in the sub-sector.

7.12 Research by UKTI into the potential of the sub-sector assesses the UK policy framework for contaminated land as 'fair' (mid-level). In particular, this refers to having explicitly defined national strategies, clear legal and regulatory frameworks and commitments to international treaties.

Supply Chain/Niches

7.13 From a full sub-sector value of £0.906bn, £0.31bn is from supply chain companies and £0.60bn from specialist contaminated land companies. In other words, the supply chain accounts for 34% of the sub-sector market value and this compares to the LCEGS average of 55%.

7.14 Similarly, the Innovas research considers what proportion of the sector is made up of manufacturing companies. This finds that manufacturing is an important part of the contaminated land sub-sector representing 15.7% of the value. However, this is lower than the average for the environmental sector (22.9%) and the LCEGS average (30.8%).

7.15 Regarding international trade, research by UKTI[29] identifies that the UK's contaminated land strengths tend to be based around services rather than manufacturing. The sub-sector has strengths in: engineering design and consultancy; and project development and management, in contrast to under-representation in manufacturing and supply. Overall, the outlook for the sub-sector is limited with the UKTI report recognising it as having "poor or limited strengths."

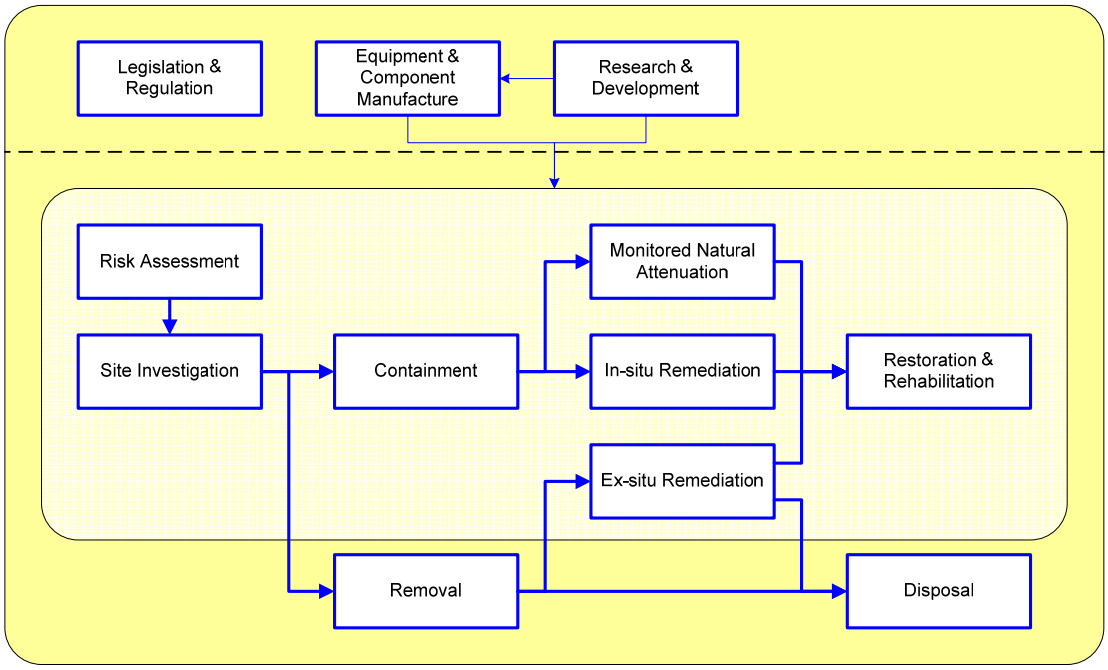
7.16 Due to historical industrial legacies combined with available private/public resource, the core markets for contaminated land are in developed countries, including the UK and EU. In the next ten years, there will be enormous opportunities in Central and Eastern Europe which also have extensive legacies of contaminated land but this is dependent upon the availability of public/private support. Markets in developing countries will be less extensive but there will be particular niches in remediating sites to ensure groundwater quality.[30]

7.17 Energy and Utility Skills have produced a supply chain illustration of the sector shown below[31]:

[29] UKTI (2008) Market opportunities in environmental goods and services, renewable energy, carbon finance and CATs (p16) - http://www.sqwenergy.com/file_download/147

[30] DTI/DFRA/JEMU (2002) Global environmental markets and the UK environmental industry: opportunities to 2010 - http://www.berr.gov.uk/whatwedo/sectors/environmental/archive/environmentreport/page34696.html

[31] Sector Skills Mapping in the Environmental Sector, Energy and Utility Skills, 2006.



Source: Energy and Utility Skills

East Midlands Supply

7.18 Findings from the ekosgen research found 49 businesses operating in the sector, with 16 stating that it was their main sector. 38 businesses supplied to the sector.

7.19 Based on research by Innovas, contaminated land has a total East Midlands market value of £45m (£0.045bn), and this accounts for 3.92% of the East Midlands environmental sector (£1.14bn) or 0.63% of the regional LCEGS sector (£7.06bn). These proportions are lower than the national averages on both counts (UK average = 4.07% and 0.85% respectively).

7.20 In absolute terms, the market value of the East Midlands contaminated land sub-sector actually ranks quite highly; 5th highest out of the 12 UK regions/nations.

7.21 Based on above Innovas data, the East Midlands market appears to be relatively large among other regions/nations yet still shows slight comparative disadvantage, at least based on GVA performance.

East Midlands Demand

7.22 Research by EMRA finds that brownfield land amounts to 1,743Ha across the region, 60% of which is currently categorised as derelict. Linked to this, one of the greatest drivers for demand for the contaminated land sub-sector, over the past twenty years and into the short-medium future, is the remediation of the East Midlands coalfields and associated heavy industry sites. English Partnerships manages 27 sites in the East Midlands region and these are predominantly based in North Nottinghamshire and North Derbyshire.

7.23 Derelict land is defined as land so damaged by industrial or other development as to be incapable of beneficial use without treatment. It is often associated with redundant coal mining areas and railways. With the ever-increasing need for land

for housing, commercial developments, food production and biodiversity, derelict land represents a wasted resource[32].

7.24 In response, there has been a strong emphasis from government and public partners to revitalise areas which are affected by derelict and contaminated land. The East Midlands Regional Plan (Regional Spatial Strategy)[33] finds that the issue is particularly applicable for the Northern sub-region and Policies 19 and 20, for regeneration and employment land respectively, note that employment uses should be considered first on previously developed land. In particular, key opportunities are identified through: "strategic improvements to the quality of the rural environment through the reclamation and re-use of derelict colliery sites and other degraded land." This has subsequent effects on the contaminated land sub-sector.

7.25 Nearly 20% of all brownfield land in the region is currently proposed for redevelopment for housing[34]. For other sites, protection rather than redevelopment may be more appropriate.

Higher Education

7.26 The region is well placed for research and development in the environmental technologies sector and R&D that covers a number of contaminated land activities is being conducted at the following centres:

- Nottingham University - Centre for the Environment
- Loughborough University - Environmental Pollution Research Group & Engineering and Development Centre
- University of Derby - Centre for Environmental, Earth and Applied Sciences Research
- University of Lincolnshire and Humberside - Environmental Protection and Management
- University of Nottingham - Innovative Manufacturing Centre

Skills and Capabilities

7.27 Skills and capabilities in this sub-sector was given specific attention through the Brownfield Skills Strategy published by the Academy for Sustainable Communities (ASC) and EP in 2008[35]. This recommended that a Land Condition Skills Development Framework be developed as a key action for the ASC and that the 'Specialist in Land Condition (SiLC)' qualification be developed as a unifying standard to frame the sub-sector's skills.

7.28 The remediation technologies network (CL:AIRE) argues that: "There is no question that a professional skills vacuum currently exists in the contaminated land arena. Despite operating for several years the SiLC scheme is keen to increase its membership far beyond its current level of approximately 100 members. For many

[32] http://www.emra.gov.uk/files/file409.pdf

[33] (p30) - http://www.gos.gov.uk/goem/planning/regional-planning/

[34] http://www.emra.gov.uk/what-we-do/housing-planning-transport/sustainable-development/environment/land-land-use/developed-derelict-contaminated-land

[35] (p21) - http://www.englishpartnerships.co.uk/brownfieldskills.htm

who work in the field, academic qualifications can be their only evidence of professional standing.[36]"

7.29 Encouragingly for the East Midlands, the identified skills gaps in brownfield skills (by the Brownfield Skills Strategy) are the lowest of all the English regions (29% labour shortage compared to 96% shortage in the South East). The challenge for the East Midlands will be retaining and upskilling these core individuals.

7.30 For the contaminated land sub-sector, over 40% of current opportunities are in the £25,000-£40,000 range suggesting a demand for middle-senior employees with demonstrable experience. Similarly, demand is identified for both technical and generic skills, including project management. Staff retention is a difficulty within the public sector due to competitive pressures from private sector providers attracting higher-skilled staff.

Business Description

7.31 The Energy and Utility Skills report identified the following technologies and applications within the contaminated land sector:

- Technologies: Containment, Remediation – Biological, Remediation – Chemical, Remediation – Thermal, Site Engineering/Contractiing, Site Investigation, Soil testing and flushing and Other contaminated land.

- Applications - Remediation process R&D, Remediation equipment and component manufacture and supply, Risk Assessment, Site Investigation, Containment, Monitored Natural Attenuation, In-site remediation, Ex-situ remediation, Site Engineering/Removal, Contaminated Waste Disposal, Restoration and rehabilitation; and Contaminated Land Legislation and Regulation.

7.32 The table below identifies the relevant business classifcations. Business classification codes are not always a perfect match to the industrial sector we are trying to identify. Therefore to give some sense of the level of fitness of each code, they have been assigned one of the following codes green – good/near exact fit, orange – moderate fit, red – poor/low fit, X – representing he polluting industry or client industry itself.

[36] http://www.claire.co.uk/index.php?option=com_content&task=view&id=163&Itemid=28

SIC codes[14]	Thompson codes	Yell codes
71.32 : Renting of construction and civil engineering machinery and equipment	02690 : Agricultural Services	2488 : Constructional Engineers
743 : Technical testing and analysis	63160 : Radon Gas Detection Services	09981 : Asbestos Removal
28.52 : General mechanical engineering	31600 : Engineers - General	08121 Site Investigations
45.21 : General construction of buildings and civil engineering projects	32980 : Excavation and Groundwork Contractors	04425 : Geologists and Geophysicists
74.20 : Architectural and engineering activities and related technical consultancy	28380 : Drilling Contractors	02371 : Drilling Contractors
45.11 : Demolition and wrecking of buildings; earth moving	64700 : Research Organisations	00046 : Science & Research Consultants
45.12 : Test drilling and boring	40000 : Geological and Geophysical Consultants	
01.41 : Agricultural service activities	21555 : Construction Contractors - General	
29.52 : Manufacture of machinery for mining, quarrying and construction	71250 : Site Investigation Consultants	
73.10 : Research and experimental development on natural sciences and engineering	04970 : Asbestos Surveys and Removal	

Business Directories/Trade Associations

- Contaminated Land: Applications in Real Environments (CL:AIRE) - www.claire.co.uk/
- The Chartered Institute of Wastes Management - www.ciwm.co.uk
- Environmental Industries Commission - www.eic-uk.co.uk
- Association for Organics Recycling - www.organics-recycling.org.uk
- Network for Industrially Contaminated Land in Europe - www.nicole.org
- Institute of Environmental Management and Assessment - www.iema.net
- The Waste Management Industry Training and Advisory Board - www.wamitab.org.uk
- British Cement Association - www.cementindustry.co.uk
- UK Forum for Environmental Industries - www.ukfei.co.uk
- Association of Geotechnical and Geo-environmental Specialists - www.ags.org.uk

8 Environmental Technologies: Waste Management

Waste Management
Rating: Medium
This is firmly established sub-sector with growth being driven by legislation and the need to find innovative ways to manage, and ultimately reduce the negative impacts of waste. The sector is one of the largest, both nationally and regionally, however, growth is relatively small and there is no evidence of regional comparative advantage. The presence of the University of Northampton's Centre for Research into Sustainable Wastes Management specialising in healthcare waste may present a niche for local businesses to capitalise on.

8.1 Waste management is a fairly 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; relevant R&D; and training. The sub-sector is active in facility operation, manufacturing and consultancy services[37].

8.2 It has the distinction of operating with solid wastes whereas water treatment is counted as a separate sub-sector. Similarly, it has a direct (and causal) relationship with the recovery and recycling sub-sector; i.e. in some cases, an increase in recycling throughput can lead to a decrease in waste management.

Global Market

8.3 The waste management sub-sector has a total international market value of £141.23bn, which represents 21.49% of the global environmental sector or 4.64% of the global LCEGS sector[38]. UKTI research finds that the UK's relative strengths in LCEGS present emerging opportunities for waste management activities in particular.

National Market

Size of sub-sector	Proportion of UK market	UK share of global market	No. of Businesses	No. of employees
£4.796bn	4.49%	3.40%	2,462	42,126

8.4 Waste management has a total UK market value of £4.8bn[39], and this accounts for 21.53% of the UK environmental sector or 4.49% of the LCEGS sector, similar

[37] Definition from Innovas (2009) (p101) and UKTI (2008) (p22) reports

[38] Innovas (2009) Low Carbon Goods ands Services: an industry analysis (all current data = 2007/08)

[39] Alternative estimates in the 2008 UKTI report found the UK sub-sector value to be as high as £8.1bn based on 2005 data (p16)

proportions to the international market composition. Forecast data suggests that the market value will increase by 24.47% to £5.97bn over the period 2007/08 to 2014/15.

8.5 The sub-sector is a significant employer and employs 42,126 people in the UK, 21.93% of the environmental sector or 4.78% of the LCEGS total. Employment is predicted to grow to 52,400 by 2014/15; a growth rate of 24.47% identical to the forecast change in market value.

8.6 The growth rates for both market value and employment are relatively low: the third lowest rate of all 23 LCEGS sub-sectors for both market value and employment. Between 2007/08 and 2014/15, the proportion of the LCEGS sector accounted for by waste management actually decreases from: 4.49% to 3.86% for market value; and 4.78% to 4.11% for employment.

8.7 UK exports in waste management amounted to a value of £0.468bn in 2007/08 and this represents 4.33% of all UK LCEGS exports. The £0.468bn exports constitutes 9.76% of the sub-sector's full market value (of £4.8bn), and this proportion is comparable to the LCEGS average of 9.74%.

Political Drivers in the Sub-sector

8.8 The principal drivers for this sub sector are the policies set out in the Waste Strategy for England 2007, which built on the waste strategy of 2000. The landfill tax escalator and the introduction of the Landfill Allowance Trading Scheme (LATS) has created sharp incentives to divert waste from landfill. Additional funding for local authorities, including through the private finance initiative, has led to a major increase in kerbside recycling facilities and new waste treatment facilities.

8.9 European directives are targeting sectors, including vehicles, electrical and electronic equipment and packaging. New delivery arrangements have helped to drive the strategy, including the Waste Implementation Programme (WIP), the Waste and Resources Action Programme (WRAP) and the Business Resource Efficiency and Waste (BREW) programme.

8.10 Research by UKTI into the potential of the waste management sub-sector assesses the UK policy framework as 'good' (the highest level). In particular, this refers to having explicitly defined national strategies, clear legal and regulatory frameworks and commitments to international treaties.

Supply Chain/Niches

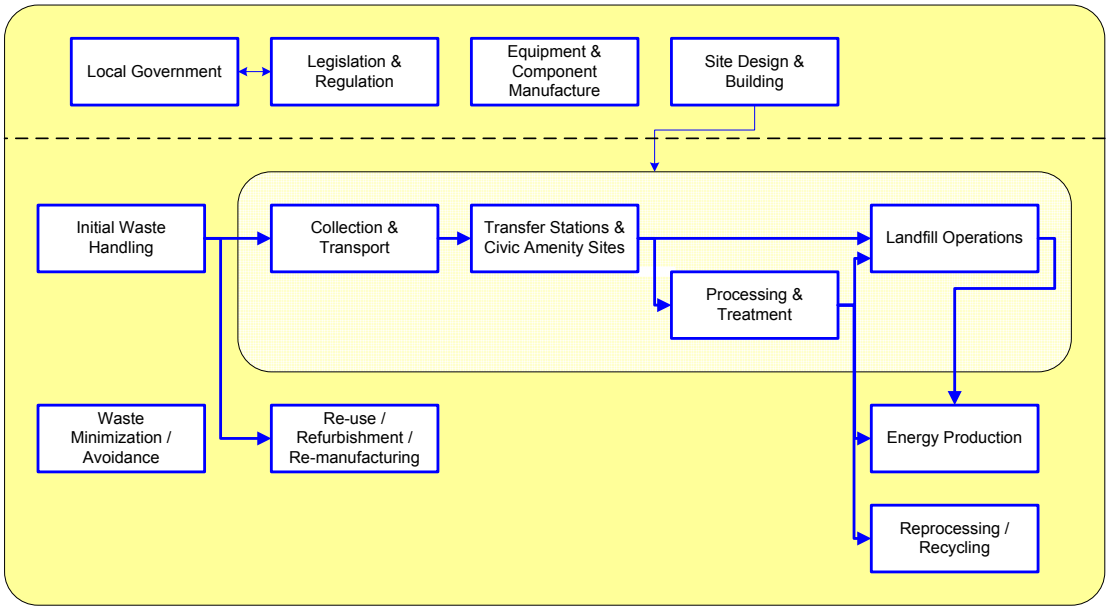
8.11 From a full sub-sector value of £4.8bn, £2.59bn is from supply chain companies and £2.21bn from specialist waste management companies. In other words, the supply chain accounts for 54% of the sub-sector market value and this compares to the LCEGS average of 55%.

8.12 Similarly, the Innovas research considers what proportion of the sector is made up of manufacturing companies. This finds that manufacturing is an important part of the waste management sub-sector representing 21.8% of the value. However, this is lower than the average for the environmental sector (22.9%) and the LCEGS average (30.8%).

8.13 Regarding international trade, research by UKTI[40] identifies that the UK's waste management strengths tend to be based around services rather than manufacturing. The sub-sector has strengths in: engineering design and consultancy; and project development and management, in contrast to under-representation in manufacturing and supply. Overall, the outlook is very good for the sector though with the UKTI report recognising it as having "distinctive and comprehensive strengths."

8.14 Considerable growth is forecast in waste management markets in regions such as Central and Eastern Europe, SE Asia, Latin America, China, the Middle East and India. Opportunities for UK suppliers include consultancy work in the development of [waste management] sectors in 'developing' countries, management of [waste management] service contracts (concessions in partnership with overseas public and private sector organisations) and supply of high value [waste management] technologies in areas such as recycling, re-use and incineration.[41]

8.15 Energy and Utility Skills have produced a simple supply chain for the waste management sector as shown below[42].



Source: Energy and Utility Skills, 2006.

East Midlands Supply

8.16 Findings from the ekosgen research found 223 businesses operating in the sector, with 160 stating that it was their main sector. 168 businesses supplied to the sector.

[40] UKTI (2008) Market opportunities in environmental goods and services, renewable energy, carbon finance and CATs (p16) - http://www.sqwenergy.com/file_download/147

[41] DTI/DFRA/JEMU (2002) Global environmental markets and the UK environmental industry: opportunities to 2010 - http://www.berr.gov.uk/whatwedo/sectors/environmental/archive/environmentreport/page34696.html

[42] Energy and Utility Skills, Sector Skills Mapping in the Environmental Technology Sector, 2006

8.17 Based on research by Innovas, waste management has a total East Midlands market value of £293m (£0.293bn), and this accounts for 25.66% of the East Midlands environmental sector (£1.14bn) or 4.14% of the regional LCEGS sector (£7.06bn). These proportions present a mixed picture when compared to the national averages. Whereas the 4.14% is lower than the national average (4.49%), 25.66% is higher than the equivalent national average of 21.53%.

8.18 In absolute terms, the market value of the East Midlands waste management sub-sector is 8th highest out of the 12 UK regions/nations.

8.19 The East Midlands does not show either comparative advantage or disadvantage for this sector based on GVA performance indicated in the Innovas report.

East Midlands Demand

8.20 Recent work for the Regional Assembly[43] found that the waste management capacity of the region in 2007 was approximately 112 million tonnes including landfill. Should all the waste management sites granted planning permission obtain an environmental permit and become operational this will increase to 115 million tonnes.

8.21 Looking forwards, the waste management capacity available in the East Midlands exceeds the capacity requirements in each sub-region in 2010, 2015 and 2020 for each sub-region except Leicestershire. As a whole, the region will have an over-provision in excess of 4.3 million tpa of capacity by 2020. If sites with planning permission become operational this will increase to 5.6 million tpa.

Higher Education

8.22 The region is strongly placed for research and development in the environmental technologies sector and R&D in waste management activities is being conducted at the following centres:

- 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) – Hosted 'Tackling Waste 2008' – national conference organised by the Waste and Resources Management Network (WARMNET), a network of universities involved in waste management research and education.
- Loughborough University - Environmental Pollution Research Group & Engineering and Development Centre
- University of Derby - Centre for Environmental, Earth and Applied Sciences Research
- University of Lincolnshire and Humberside - Environmental Protection and Management
- University of Nottingham - Innovative Manufacturing Centre

[43] A Study into Waste Management Capacity in the East Midlands to inform the Regional Waste Planning Process August 2009

Skills and Capabilities

8.23 The waste management sub sector is typified by the diversity of processes used in waste treatment which calls for a wide range of skills and occupations. Since 2008 Energy & Utility Skills (EU Skills) has been involved in tackling an in depth review of National Occupational Standards that define competence for working in the waste management industry. This work has become more complex as the industry moved towards a new regime in environmental permitting and as the vocational education sector changed its focus and began to invest in qualification and credit frameworks designed to support flexible learning.

8.24 In a sector that is already heavily regulated, whenever new legislation is introduced, there will be a need to upgrade the skills and competence of existing employees. This tends to be an on-going requirement. There are many examples where the introduction of new technology will impact on skills and again this will have an underlying effect on employers. Two examples are the *Increase in the numbers of incinerator and waste to energy plants (*This is likely to create skills shortages because the sector will no longer be able to benefit from transferring skilled workers from redundant power plants) and *Increasing use of Information Technology (*There is likely to be a significant investment in new IT systems to improve operational planning and implementation of waste collection services. These and other applications are likely to create skills gaps for existing workers.[44]

Business Description

8.25 Energy and Utility Skills have identified a number of technologies and applications within this sector:

- Technologies: Composting systems, Hazardous and Special Waste Disposal/Treatment, Incineration Equipment, Landfill site Design/Management, Landfill Site Equipment, Life Cycle Assessment, Municipal Waste Disposal/Treatment, Process Plant and Recovery, Radioactive Waste Management, Recycling Equipment, Sustainable Product Design, Waste Handling/Processing, Waste Management/Avoidance, Waste Minimisation, Other Waste Management.

- Applications: Waste Management Equipment and Component Manufacture and Supply, Waste Management Site Design, Commissioning and Building, Initial Waste and Recyclables Collection and Transport, Transfer Stations and Civic Amenity Sites, Waste Processing and Treatment, Landfill Operations, Energy from Waste Production, Reprocessing/Recycling, Waste Minimisation/Avoidance, Re-use, refurbishment/remanufacturing, Local Government, Waste Management Legislation and Regulation.

8.26 Businesses in this sector would fall into few business classification codes. The degree to which business in the sector are covered by these codes is shown in the table below - green – good/near exact fit, orange – moderate fit, red – poor/low fit, X – representing the polluting industry or client industry itself.

[44] Skills Intelligence for Waste Autumn 2005

SIC codes[7]		Thompson codes		Yell codes	
2921 : Manufacture of furnaces and furnace burners		83380 : Waste Disposal Services		09826 : Waste Disposal Services	
4521 : General Construction of buildings and civil engineering works		83640 : Waste Processing Machinery		07905 : Waste processing machinery	
5157 : Wholesale of waste and scrap		70787 : Shredding Equipment and Services		08086 : Shredding Equipment	
7470 Industrial Cleaning		50375 : Medical Waste disposal		01137 : Can Mfrs & Suppliers	
9002: Collection and Treatment of other waste		83500 : Waste Merchants		06794 : Plastics-Extrusion Mfrs	
9003 Sanitation, remediation and similar activities		83610 : Waste Paper Merchants & Collectors		03112 : Furnaces-Industrial	
		13450 : Car Breakers & Dismantlers		06628 : Oil-Waste Disposal	
		68680 : Scrap Metal Merchants		06260 : Salvage & Reclamation	
		24582 : Demolition & Dismantling Contractors		08327 : Scrap Metal Merchants	
		66355 : Salvage Dealers		01160 : Car & Commercial Vehicle Dismantlers	
		81210 : Tyre Disposal		09826 : Waste Disposal Services	
				09631 : Textile Waste	

Business Directories/Trade Associations

- Environmental Industries Commission - www.eic-uk.co.uk
- The Waste Management Industry Training and Advisory Board - www.wamitab.org.uk
- Institute of Environmental Management and Assessment - www.iema.net
- International Solid Waste Management Association - www.iswa.org
- UK Forum for Environmental Industries - www.ukfei.co.uk
- Environmental Services Association - www.esauk.org
- Chartered Institution of Wastes Management - www.ciwm.co.uk
- Association for Organics Recycling - www.organics-recycling.org.uk
- Chartered Institution of Water and Environmental Management - www.ciwem.org
- British Metals Recycling Association - www.recyclemetals.org
- Container Handling Equipment Manufacturers Association - www.chem.uk.com

9 Environmental Technologies: Water and Waste Water

Water and Waste Water
Rating: Medium
This is a large sector both nationally and internationally, but with relatively low levels of growth. Politically the most significant interest is with respect to water efficiency. Regionally, the sector contains 243 businesses operating within it, although there is no evidence of comparative advantage, although the University of Nottingham's Green Chemical and Water technologies research theme may provide opportunities for regional businesses to capitalise on.

Global Market Situation

9.1 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.

9.2 Supplying water of adequate quality and in sufficient quantities is one of the major challenges facing the global market. Development of the water market is being shaped by four megatrends (population growth, run down infrastructure, higher standards and climate change) which will intensify the pressure to manage existing water resources far more efficiently in the years ahead.

9.3 The international market value of this subsector stands at £236.65bn, which represents 7.77% of the total global LCEGS market[45].

National Market Situation

Size of UK sub-sector	Proportion of UK LCEGS market	UK share of global market	No. of Businesses	No. of employees	Total Exports
£7.93bn	7.43%	3.35%	4090	68771	£1.229bn

9.4 Innovas estimate that market value for the water and waste water subsector will grow by a compound growth rate of 14.06% or £9.04 billion between 2008/2015[1]. Water and waste water are an identified UK strength[46] and water treatment and distribution is forecast as a sector with high levels of growth in market value[47].

[45] Low Carbon Goods ands Services: an industry analysis, Innovas Solutions 2009

[46] Market opportunities in environmental goods and services, renewable energy, carbon finance and CATs, UKTI 2008

9.5 The environmental sector has a total value of £22.28bn, water and waste water accounting for 7.93% of this (nearly 36%). The sub-sector accounts for 68,771 employees in the UK, the highest among the environment sector, and is predicted to grow to 78,500 by 2014/151 (a substantial proportion of which will be employees of the utility companies). The market value of the sector is predicted to grow by 14.06% by 2014/15, the lowest predicted growth (in percentage terms) of all the LCEGS sub-sectors, however the size of the sub sector means that this growth is worth £1.17billion.

9.6 With exports worth £1.229billion, exports account for over 15% of the market (one of the highest sub sectors) and the sub-sector accounts for 11.75% of total LCEGS exports, the third highest export[48].

Political Drivers in the Subsector

9.7 The Water Act 2003 allows new entrants into the water industry to supply water to a limited group of consumers. More competition in the water industry will encourage more efficient use of water resources and drive down prices. New water suppliers will be permitted to supply water to large scale water users only, approximately 2,200, and not household users.[49]

9.8 The Urban Waste Water Treatment Directive was adopted by member states in May 1991 and transposed into legislation across the UK by the end of January 1995. Its objective is to protect the environment from the adverse effects of sewage discharges. It sets treatment levels on the basis of sizes of sewage discharges and the sensitivity of waters receiving the discharges. By the end of 1998 the UK had stopped all disposal of the sewage sludge left over from treatment processes at sea or to other surface waters in accordance with its requirements.[50]

9.9 The Government has established a National Water Conservation Group and introduced incentives for water efficiency such as free metering for domestic consumers, tax breaks for businesses for the purchase of water-efficient equipment, and Water Efficiency Awards[51].

Supply Chain/Niches

9.10 Manufacturing is an important part of the water and waste water sub-sector representing 20% of the value of the sector, reflecting the established nature of the sector. The supply chain for this sub-sector is valued at 62% of the whole subsector[52].

9.11 The UKTI report identified UK strengths in financial and professional services, engineering design and consulting, project development and management, policy development. The report states that overall the sector is strong with UK relative advantage.

47 [47]Building Britain's Future. HM Government June 2009

48 Low Carbon Goods ands Services: an industry analysis, Innovas Solutions 2009

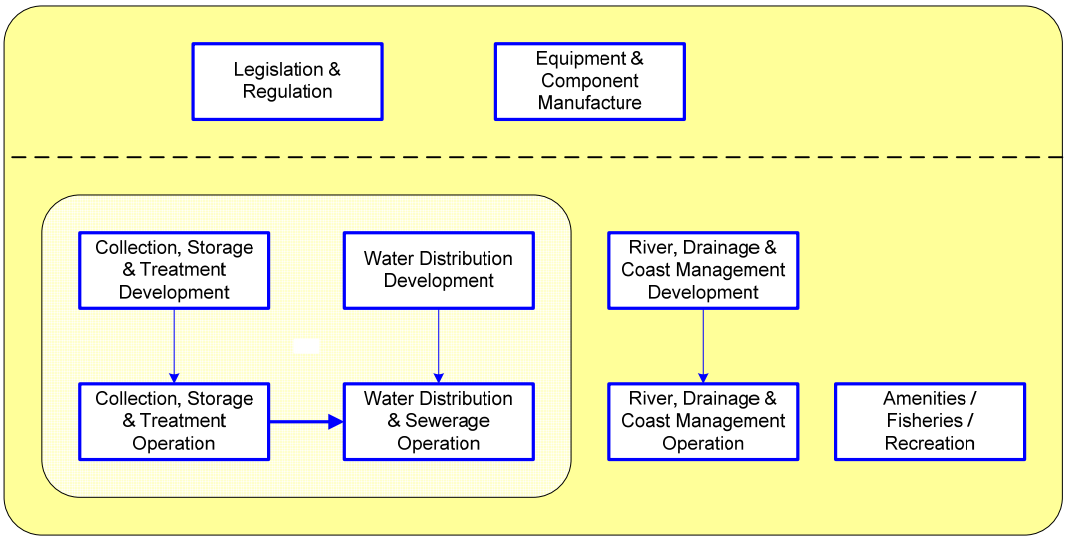
49 http://www.environment-agency.gov.uk/business/sectors/32393.aspx

50 http://www.defra.gov.uk/environment/water/quality/uwwtd/default.htm

51 Chartered Institution of Water and Environmental Management. Recommendations for a Sustainable Water Future

52 Low Carbon Goods ands Services: an industry analysis, Innovas Solutions 2009

9.12 Energy and Utility Skills have produced a simple supply chain for the water and waste water sector as shown below:



East Midlands Supply

9.13 At 4.16% of the GVA for the sector, the Innovas research found that performance of this sub-sector in the East Midlands is considered to be below average performance.

9.14 Findings from the ekosgen research found 243 businesses operating in the sector, with 165 stating that it was their main sector. 226 businesses supplied to the sector.

East Midlands Demand

9.15 The East Midlands has a larger than average manufacturing sector within the UK and being more competitive is essential. The East Midlands benefits from various regional initiatives to advise business on the opportunities to save money through saving energy and water and reducing waste. However a recent survey carried out by Envirowise found that 70% of East Midlands businesses are not currently measuring or monitoring their water use at all, and 85% do not have any water reduction targets in place[53].

9.16 The Regional Assembly have published a number of reports around the theme of waste and water in response to the urgent need to understand the England's water resources. The Water Resources Strategy for the East Midlands identifies the region as one of the driest in the country. It is intended the strategy which will cover the next 25 years will inform plans and policies developed by the stakeholder organisations in order to achieve its objective "enough water for all human uses with an improved water environment".

9.17 The population in the East Midlands is forecast to grow by about 400,000 by 2025, with this in mind the demand for water could increase across the region. The

[53] http://www.envirowise.gov.uk/uk/Press-Office/Press-Releases/East-Midlands/East-Midlands-businesses-are-sitting-on-untapped-cost-savings-of-almost-1-million-per-day.html

Strategy presents a number of scenarios to predict future demand. Depending which scenario is applied water demand could range between a 40% decrease and a 25% increase. Climate change is also a factor which needs to be considered when assessing the demand for water resources in the region[54].

Higher Education

9.18 The University of Nottingham, the Green Chemical and Water Technologies theme, is working on ways to alleviate the growing water crisis by designing new and more efficient water purification techniques, both for decontaminating freshwater and for desalinating seawater. The work includes the incorporation of a wider range of chemistry and engineering expertise in clean technologies and water processing, fluid mechanics and process modelling. For water technologies, the overall direction of the research focuses on multi-disciplinary research activities in (i) drinking water treatment, (ii) waste-water treatment and re-use and (iii) Process water treatment and re-use[55].

Skills and Capabilities

9.19 The Energy and Utility Sector Skills Council (EU SKILLS) have identified a significant shortage in supply-side training provision and capacity. The Council found that East Midlands employers are prepared to invest in new people and to up-skill their existing workforce however they require a more flexible approach to qualifications that will give employers a wider range of options into the future. Although the water industry has the greatest presence in the East Midlands, there is evidence of potential future problems with an aging workforce in management and specifically in senior and professional grades across all industries.

9.20 Particular concerns among the employers as found in the research are: up-skilling, Level 2 and above, graduate and/ higher level skills development, leadership and management skills, basic skills and attracting people into the sector, in particular young people. EU Skills research found that there is very limited training provision in the sector, where provision exists it is quite often very academic and general in its content. The development of qualifications and training courses is a key requirement for the industry. Here the sector requires industry specific skill's qualifications and frameworks[56].

Business Description

9.21 The Energy and Utility Skills Report identifies the following technologies and applications used in the Water and Waste Treatment sub-sector:

- **Technologies**: Drainage Management, Primary Wastewater Treatment, Remediation of Contaminated Groundwater (Mining etc.), River Basin Management, Secondary Wastewater Treatment, Sludge Handling/ Treatment, Tertiary Wastewater Treatment, Water Quality Monitoring, Water Treatment, Water/ Wastewater Control Systems, Other Water Treatment

[54] http://www.emra.gov.uk/publications/housing-planning-and-transport/environment, 2001

[55] http://www.nottingham.ac.uk/chemenv/research/green-chemical.php

[56] http://www.euskills.co.uk/water/

- **Applications**: Equipment & Component Manufacture, Collection, Storage & Treatment Development, Water Distribution Development, Water Distribution & Sewerage Operation, River, Drainage and Coastal Management Development, River, Drainage and Coastal Management Operation, Amenity / Fisheries / Recreation, Legislation & Regulation

9.22 The table below details the relevant business classifications codes for the water and waste water environmental technologies sector. Each code has been assigned a colour rating to match their level of fit with the sector as follows: green – good/near exact fit, orange – moderate fit, red – poor/low fit.

SIC codes[13]	Thompson codes	Yell codes
29.12 : Manufacture of pumps and compressors	62580 : Pump Manufacturers	03331 : Pumps & Pumping Eqpt
41.00 : Collection, purification and distribution of water	83675 : Water Authorities	06030 : Water Suppliers
74.20 : Architectural and engineering activities and related technical consultancy	83682 : Water Companies	09830 : Water Treatment
743 : Technical testing and analysis	84085 : Water Treatment Equipment & Service	08765 : Architects
45.21 : General construction of buildings and civil engineering projects	04420 : Architects	02480 : Architectural Services
60.30 : Transport via pipelines	04422 : Architectural Services	00097 : Architectural Technologists & Technicians
90.01 : Collection and treatment of sewage	04424 : Architectural Technologists	02488 : Constructional Engineers
90.03 : Sanitation, remediation and similar activities	31600 : Engineers - General	03353 : Water Engineers
05.01 : Fishing	83900 : Water Engineers	08341 Surveyors Land and Hydrographic
05.02 : Operation of fish hatcheries and fish farms	35200 : Filtration Systems and Services	2488 : Constructional Engineers
4524 : Construction of water projects	21555 : Construction Contractors - General	06775 : Pipe Line Consultants
	58750 : Pipelines	06777 : Pipe Work Contractors
	58755 : Pipes & Fittings	00092 : Pipes & Fittings-Metal
	58761 : Pipework Contractors	00093 : Pipes & Fittings-Plastic
	31600 : Engineers - General	00094: Pipes & Fittings-Flexible
	84085 : Water Treatment Equipment & Service	00096 : Pipe & Fitting Stockholders
	69430 : Sewage Disposal - Equipment & Service	03334 : Pipe Work Engineers
	00002 : Flood Control	07927 : Sewage Consultants
	27730 : Drainage Contractors	05016 : Drainage Consultants
	36135 : Fishmongers & Fishmonger Services & Suppliers	00593 : Water Conservation and Management

				00031 : Fishermen	
				03474 : Fisheries Consultants	
				03467 : Fish Farms & Hatcheries	

Business Directories/Trade Associations

- British Water www.britishwater.co.uk
- Chartered Institution of Water and Environmental Management www.ciwem.org
- Domestic Water treatment Association www.dwta.org.uk
- Environmental Industries Commission www.eic-uk.co.uk
- Institute of Environmental Management and Assessment www.iema.net
- International Water Association www.iwahq.org
- The Chartered Institute of Wastes Management www.ciwm.co.uk
- The Waste Management Industry Training and Advisory Board www.wamitab.org.uk
- UK Forum for Environmental Industries www.ukfei.co.uk
- United Kingdom Water Treatment Association www.ukwta.org
- Water UK www.water.org.uk
- Society of British Water and Wastewater Industries www.sbwwi.co.uk

10 Environmental Technologies: Recovery and Recycling

Recovery and Recycling
Rating: Medium
This is a large and established sector both internationally and nationally. There are high levels of political interest in this area reflecting the need to increase recycling levels across the board. Regionally, this is a large sector, but currently there is no evidence to suggest any sort of comparative advantage.

10.1 The recovery and recycling sub sector has considerable overlap with the waste management sub sector with which it shares a wide range of features, skills needs and competencies. Many waste management companies are transferring considerable resources to reduction, recovery and recycling.

Global Market Situation

10.2 The international market value of this subsector stands at £186.68bn, which represents 6.13% of the total global LCEGS market[57].

10.3 The principal destination for UK exports of recovered paper and plastics for recycling is China[58]. In 2008, 55% of recovered paper and 80% of recovered plastics exported from the UK were destined for China.

National Market Situation

Size of sub-sector	Proportion of UK market	UK share of global market	No. of Businesses	No. of employees
£6.48bn	29.08%	3.47%	3,346	53,270

10.4 There is some disparity in the figures provided for this sub sector. While WRAP states that the UK recycling industry has a current annual turnover of £17 billion[59], the Innovas report sets the size of the whole sub sector at £6.48 billion (the former presumably including the "recycling arms" of large waste management companies). Recovery and recycling shows, as a percentage increase, with a compound growth rate figure of 28.2% or £8.31 billion by 2015[1].

10.5 Recovery and recycling account for 29% of the environmental sector and accounts for 53,270 employees in the UK, the highest among the environment sector, which is predicted to grow to 68,800 by 2014/15[1]. The market value of the sector of

[57] Low Carbon Goods ands Services: an industry analysis, Innovas Solutions 2009

[58] http://www.wrap.org.uk/downloads/China_survey_report.c29392e7.6972.pdf

[59] http://www.wrap.org.uk/recycling_industry/market_information/why_invest.html

£6.48bn is predicted to grow by 28.2% by 2014/15 (the lowest forecast growth rate in the environmental technology sector). The sub-sector accounts for 5.26% of total exports[1].

Political Drivers in the Subsector

10.6 There are a number of European Policies which will have an impact on recovery and recycling activities within the East Midlands. These include the Landfill Directive (99/31/EC)[60] which aims to prevent the negative impacts of landfill through four key measures: 1) To reduce the proportion of biodegradable waste landfilled to 75% of that produced in 1995 by 2010; 50% of that produced in 1995 by 2013; 35% of that produced in 1995 by 2020. 2) Banning the co-disposal of hazardous wastes with non-hazardous material from 2004, and requiring the re-classification of all landfills to receive hazardous, non-hazardous or inert wastes only. 3) The banning of whole tyres from 2003 and shredded tyres from 2006 and 4) Banning the landfilling of liquid wastes and certain hazardous materials (such as certain clinical wastes).

10.7 In 2006 European Directive set targets for End of Life Vehicles of 95% reused or recovered (including energy recovery) and 85% reused or recycled by 2015[61]. The recycling of battery and accumulator directive which came into effect in 2006 has to reach the following levels by 26 September 2011: at least 65% by average weight of lead-acid batteries and accumulators, including the recycling of the lead content to the highest degree that is technically feasible; 75% by average weight of nickel-cadmium batteries and accumulators, including the recycling of the lead content to the highest degree that is technically feasible; at least 50% by average weight of other battery and accumulator waste.

10.8 At a national level the WEEE Regulations for England and Wales 2006 implement the producer responsibility requirements under the EU Waste Electrical and Electronic Equipment (WEEE) Directive 2003. The Directive aims to minimise the impact of electrical and electronic goods on the environment, by increasing re-use and recycling and reducing the amount of WEEE going to landfill[62].

Supply Chain/Niches

10.9 Manufacturing is an important part of the recovery and recycling sub-sector representing 29.4% of the value of the sector. The supply chain for this sub-sector is valued at 44% of the whole subsector[1].

10.10 The two largest sources of waste in the UK economy are construction, demolition and excavation waste at some 120 million tonnes per year (mt/y); and retail and its supply chain (including wholesale, food and drink) at some 20 mt/y[63].

10.11 The Retail Innovation Fund was set up in response to the increasing levels of food and packaging waste. Research has shown that as much as 50% of household waste, which ultimately ends up in landfill, has come from a purchase from the top

[60] http://www.emra.gov.uk/files/file612.pdf

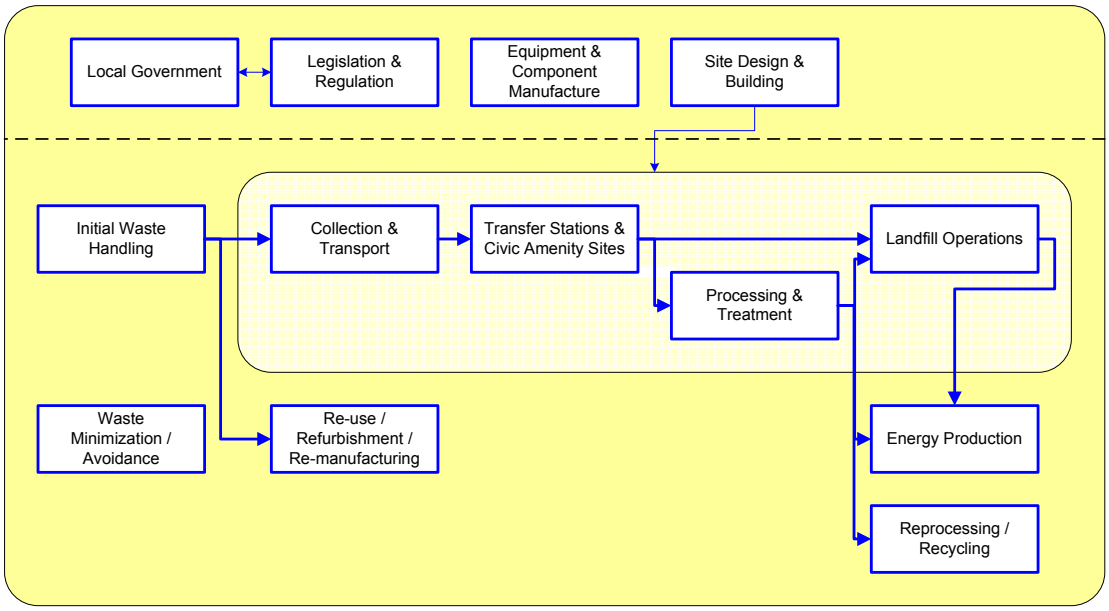
[61] http://epp.eurostat.ec.europa.eu/portal/page/portal/waste/data/wastestreams/elvs

[62] http://www.eef.org.uk/UK/whatwedo/environment/features/uk/How+to+comply+with+WEEE/WEEE_Guide.htm

[63] http://www.wrap.org.uk/retail/supply_chain/index.html

five retail supermarket chains. The fund supports the retail supply chain in research and development projects, including packaging design, prototyping and piloting in order to reduce the level of household waste[64].

10.12 Energy and Utility Skills have produced a simple supply chain for the waste management sector as shown below[65].



Source: Energy and Utility Skills, 2006.

East Midlands Supply

10.13 At 4.31% of the GVA for the sector, performance of this sub-sector in the East Midlands is considered to be below average performance.

10.14 Findings from the ekosgen research found 552 businesses operating in the sector, with 330 stating that it was their main sector. 325 businesses supplied to the sector.

East Midlands Demand

10.15 More efficient use of energy by East Midland's businesses could increase profitability by £250M-£300M per year with minimal levels of investment[66]. The East Midlands has a larger than average manufacturing sector within the UK and being more competitive is essential. The East Midlands benefits from various regional initiatives to advise business on the opportunities to save money through saving energy and water and reducing waste. There are also opportunities for business growth to support a more productive business sector, for example through the development of energy service companies (ESCos)[5].

[64] http://www.wrap.org.uk/retail/about_us/about_the.html

[65] Energy and Utility Skills, Sector Skills Mapping in the Environmental Technology Sector, 2006

[66] East Midlands Regional Energy Viewpoints document and National REWARD study

10.16 The East Midlands Region produces over 25 million tonnes of waste per year. If the amount of waste produced continues to increase, it is expected that the area may need to manage up to 39 million tonnes of waste every year by 2021. Even if the Region achieves all the targets which have been set for the reduction, recycling and recovery of wastes, the total arisings are predicted to increase to a minimum of 27 million tonnes per annum in 2021.[67]

10.17 1.16 The East Midlands has a 35.6% household recycling/composting rate slightly more than that nationally and 41.2 municipal recover rate in line with the national rate (figure as at 2006/07).[68]

Higher Education

10.18 The region is strongly placed for research and development in the environmental technologies sector.

10.19 Nottingham University's Centre for the Environment Department of Chemical and Environmental Engineering offers students the opportunity to develop the skills required to support the ever changing environmental world whether it be in waste management, environmental engineering or providing solutions for contaminated land or polluted water.[69]

10.20 University of Derby, Centre for Environmental, Earth and Applied Sciences Research offers a vocational and postgraduate environmental management course in response to the need to environmental officers.[70]

Skills and Capabilities

10.21 Social enterprises have a role to play in providing products and services within the energy efficiency and small renewables sector. The development of Social enterprises could offer opportunities to build the skills base and capacity of the region in this and other areas.[71]

10.22 There are currently 141,000 people employed in the UK waste management industry.[72] There are many examples where the introduction of new technology will impact on skills. One example being an increase in the numbers of incinerator and waste to energy plants.[73]

Business Description

[67] http://www.emra.gov.uk/files/file612.pdf

[68] http://www.defra.gov.uk/environment/statistics/waste/kf/wrkf07.htm

[69] http://www.nottingham.ac.uk/chemenv/undergrad/environ-eng.php

[70] http://www.derby.ac.uk/environmental-management-msc-incorporating-pg-cert-pg-dip

[71] Priority 3, Business Performance East Midlands Energy Challenge

[72] http://www.euskills.co.uk/waste/

[73] http://www.euskills.co.uk/home/resources/88/Occupational+and+Functional+Map+of+the+UK+Waste+Management+Sector

10.23 The table below details the relevant business classification codes. As previously discussed, business classification codes are not always a perfect match to the industrial sector we are trying to identify. Therefore to give some sense of the level of fitness of each code, they have been assigned one of the following codes green – good/near exact fit, orange – moderate fit, red – poor/low fit, X – representing he polluting industry or client industry itself.

SIC codes[7]		Thompson codes		Yell codes	
2921 : Manufacture of furnaces and furnace burners		38450 : Furnaces		03112 : furnaces – Industrial	
4521 : General Construction of buildings and civil engineering works		21555 : Construction Contractors - General		2488 : Constructional Engineers	
5157 : Wholesale of waste and scrap		04420 : Architects		08765 : Architects	
7470 Industrial Cleaning		04422 : Architectural services		02480 : Architectural Services	
9002: Collection and Treatment of other waste		04424 : Architectural Technologist		00097 : Architectural Technologists and Technicians	
9003 Sanitation, remediation and similar activities		31600 : Engineers - General		03409 : Factory Cleaning and Maintenance	
3710: Recycling of metal waste and scrap		19120 : Cleaning Services Commercial		06020 : Electricity Supply Companies	
3720 Recycling of non-metal waste and scrap		83380 : Waste Disposal Services		09826 : Waste Disposal Services	
2111: Manufacture of pulp		73550 : Steel Manufacturers		07905 : Waste processing machinery	
2611 Manufacture of flat glass		63920 : Recycling Centres		08086 : Shredding Equipment	
2710 Manufacture of basic iron and steel and of ferro-alloys		59500 : Plastics Raw Materials		01137 : Can Mfrs & Suppliers	
5250 Retail of second hand goods in stores		10000 : Bottle Mfrs and Suppliers		06794 : Plastics-Extrusion Mfrs	
3410 : Manufacture of Motor Vehicles		83640 : Waste Processing Machinery		04912 : Rubber Mfrs & Merchants	
7420 : Architectural and engineering activities and related technical consultancy		70787 : Shredding Equipment and Services		08025 : Recycling	
4021 : Manufacture of Gas		50375 : Medical Waste disposal		03110 : Iron & Steel Mfrs	
		83500 : Waste Merchants		03112 : Furnaces-Industrial	
		83610 : Waste Paper Merchants & Collectors		06628 : Oil-Waste Disposal	
		63455 : Reclaiming - Waste Products		01838 : Tyre Recycling & Disposal	
		85660 : Wood Pulp Agents		01839 : Car Recycling	
		10370 : Boxes & Cartons		06260 : Salvage & Reclamation	

		13450 : Car Breakers & Dismantlers		04631 : Glass Mfrs	
		55080 : Packaging Materials Manufacturers & Suppliers		08327 : Scrap Metal Merchants	
		55100 : Packaging & Wrapping Equipment & Supplies		01160 : Car & Commercial Vehicle Dismantlers	
		68680 : Scrap Metal Merchants		09631 : Textile Waste	
		24582 : Demolition & Dismantling Contractors			
		65620 : Rubber & Plastic Products - Manufacturers			
		66355 : Salvage Dealers			
		40401 : Glass Products - Manufacturers			
		81210 : Tyre Disposal			
		54160 : Oil Recycling & Disposal Services			
		56000 : Paper & Pulp Mills			
		20648 : Computer Recycling and Disposal			
		60845 : Precious Metal Recovery			
		63458 : Reclamation Centres			
		13000 : Can Manufacturers			

Business Directories/Trade Associations

- Environmental Industries Commission - www.eic-uk.co.uk
- British Metals Recycling Association - www.recyclemetals.org
- Institute of Environmental Management and Assessment - www.iema.net
- WRAP - www.wrap.org.uk
- Container Handling Equipment Manufacturers Association - www.chem.uk.com
- Remade Network UK - www.remadenetwork.org.uk
- UK Forum for Environmental Industries - www.ukfei.co.uk
- National Oil Recyclers Association - www.noranews.org
- Association for Organics Recycling - www.organics-recycling.org.uk
- Textiles Recycling Association - www.textile-recycling.org.uk

11 Renewable Energy: Hydro

Hydro
Rating: Low
Hydro is a relatively mature renewable energy sub-sector, predicted to experience a relatively slow growth rate. However, the UK renewable Energy Strategy highlights a small role in meeting the UK's renewable energy targets, particularly for micro and small scale developments. Only 11 businesses were identified as operating in this sector in the East Midlands, with just 3 claiming that this was their main sector. For this reason this sector is of low importance to the region.

Global Market Situation

11.1 Hydro energy is one of the most established sources of renewable energy and produces almost 20% of the world's electricity. Significant markets include Turkey, China and the U.S while the UKTI reports notes that the hydro market in Brazil is particularly large.

11.2 The international market value of this subsector stands at £12.75bn, which represents 0.42% of the total global LCEGS market[74].

11.3 Hydro global growth markets have not been included in the Innovas report because they do not fall within the top 25% of the LCEGS sub sectors.

National Market Situation

Size of sub-sector	Proportion of UK market	UK share of global market	No. of Businesses	No. of employees
£0.5bn	1.6%	3.92%	261	4,839

11.4 Hydro is a relatively mature sub sector but one that is predicted to experience a slow growth rate, both in absolute terms and as a relative increase, with a compound growth rate figure of 24.95% or £0.12bn by 2015. The Innovas report shows that the UK hydro sector makes a relatively small contribution to total UK LCEGS exports (£0.054bn, 0.52% total exports) [1].

11.5 The UK Renewable Energy Strategy has stated that more than 30% of electricity must be generated from renewables by 2020, while wind energy is earmarked to provide much of this the strategy states that hydro power has a role also[75]. The UK

[74] Low Carbon Goods ands Services: an industry analysis, Innovas Solutions 2009

[75] The UK Renewable Energy Strategy. HM Government July 2009

generated 568GWh from small scale hydro power and 4,600GWh from large scale in 2008[76], around 40% of the UK's renewable energy.

11.6 The strategy also states that while it is a mature sector, there remain good opportunities to exploit hydropower resources, for micro and small-scale hydro development.

Political Drivers in the Subsector

11.7 While hydro power has been advocated to some degree in the UK Renewable Energy Strategy, other means of renewable generation have been granted a greater role. The UK Low Carbon Transition Plan similarly does not place as greater emphasis on hydro generation in comparison to wind energy or nuclear[77]. This is partly due to the restricted geographical spread of available resource for large scale hydro.

Supply Chain/Niches

11.8 The hydro supply chain represents 26% of the subsector's UK market value. This is relatively low compared to other renewables[1].

11.9 The UK has engineering capabilities that could be transferred to the development of marine energy devices. A range of UK manufacturers have world-class capabilities in technologies which could be applied to the hydro sub sector. For example, Rolls Royce are global market leaders in turbines[78].

Investment Trends

11.10 There has been a relatively small amount of venture capital invested in hydro power over the period 2003 to 2006[79].

East Midlands Supply

11.11 Findings from the ekosgen research found 11 businesses operating in the sector, with 3 stating that it was their main sector. 7 businesses supplied to the sector.

11.12 Innovas estimate that East Midlands does not have a regional comparative advantage in this sub sector, with 8.48% of GVA for the sector, although it is not considered one of the regions with below average performance[1]. The British Hydropower Association (BHA) has one member in the region.

11.13 Energy and Utility Skills have produced a demonstration of the large scale renewables supply chain as shown below[80].

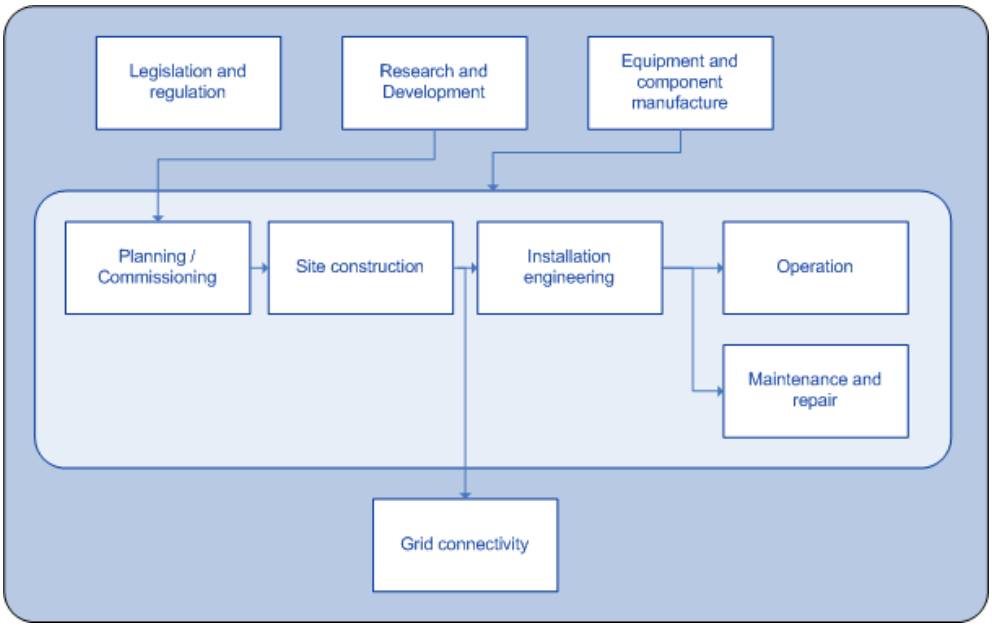
[76] http://stats.berr.gov.uk/energystats/dukes7_4.xls

[77] UK Low Carbon Transition Plan, DECC 2009

[78] Delivering the low-carbon economy – Business opportunities for UK manufacturers, EEF 2008

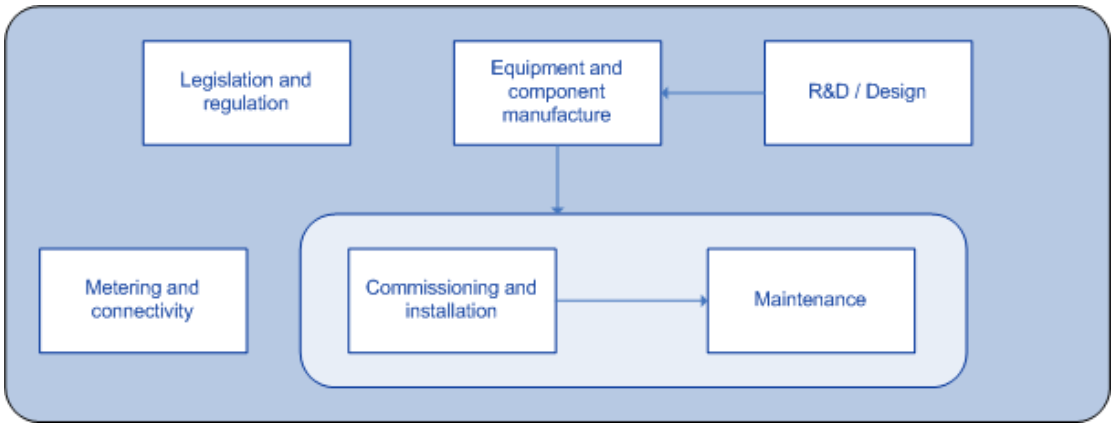
[79] Investment Trends in European Clean Energy, Carbon Trust, June 2007

[80] Energy and Utility Skills, Sector Skills Mapping in the Environmental Technology Sector, 2006



Source: Energy and Utility Skills, 2006

11.14 The Energy and Utility Skills report similarly illustrates a small scale renewables supply chain as shown below[7].



Source: Energy and Utility Skills, 2006

East Midlands Demand

11.15 The potential for hydropower is extremely limited in the East Midlands due to the terrain and most installations will typically be relatively low capacity at 10's or 100's of kW. The East Midlands Renewable Energy Strategy suggests that there are a number of sites suitable for small hydro generation[81].

11.16 The BHA records 11 hydro installations in the region, the bulk of which are in Derbyshire, although the largest single installation, generating 1.67 MW is on the

[81] The East Midlands Energy Challenge; The Regional Energy Strategy Part 1

Trent at Beeston Weir. Total current operational capacity in the region is 3.5 MW with a further 3.2 MW either in construction or consented. Assuming that the installations planned or consented are built by the end of 2010, there is still a remaining 16.2 MW of capacity available by 2050, mostly in Nottinghamshire and Derbyshire.

Higher Education

11.17 The region is well placed in terms of research and development in the sector generally, with the CREST centre at Loughborough and the Energies Technology Research Institute at Nottingham University. Regarding the hydro sub sector, neither of these institutions currently has a research specialism in the sector.

The Energy Technology Institute

11.18 The ETI does not currently have a Technology Programme in this sub sector.

Skills and Capabilities

11.19 The key occupations[82] in the hydro sector are engineers (mechanical, electrical and Electronic), civil engineers (construction) and low skilled manual workers. Particular skills required relate to hydraulics and compressor design application, and engineering construction, planning and technical advice, and project management. It is noted that the rural nature of many installations is a barrier to higher level skill recruitment, particularly in relation to civil engineers. While general engineering skills are relatively transferable there is a lack of specific graduate vocational experience in this area.

Business Description

11.20 The table below details the relevant business classification codes for the hydro renewables sector. Those SIC codes relevant to the small scale renewables supply chain are also incorporated into the table. As previously discussed, business classification codes are not always a perfect match to the industrial sector we are trying to identify. Therefore to give some sense of the level of fitness of each code, they have been assigned one of the following codes green – good/near exact fit, orange – moderate fit, red – poor/low fit, X – representing the polluting industry or client industry itself.

[82] Occupational and functional map for the renewable energy sector, Energy and Utility Skills, 2005

SIC codes[7]		Thompson codes		Yell codes	
Research and Development					
73.10 : Research and experimental development on natural sciences and engineering		64700 : Research Organisations		00046 : Science & Research Consultants	
74.20 : Architectural and engineering activities and related technical consultancy		04420 : Architects		08765 : Architects	
29.12 : Manufacture of pumps and compressors		04422 : Architectural Services		02480 : Architectural Services	
29.11 : Manufacture of engines and turbines, except aircraft, vehicle and cycle engines		04424 : Architectural Technologists		00097 : Architectural Technologists & Technicians	
29.52 : Manufacture of machinery for mining, quarrying and construction		31600 : Engineers - General		02488 : Constructional Engineers	
31.20 : Manufacture of electricity distribution and control apparatus		62580 : Pump Manufacturers		03345 : Structural Engineers	
31.10 : Manufacture of electric motors, generators and transformers		31520 : Engine Manufacturers & Distributors		03331 : Pumps & Pumping Equipment	
743 : Technical testing and analysis		59050 : Plant & Machinery Manufacturers		02474 : Engine Mfrs & Suppliers	
45.11 : Demolition and wrecking of buildings; earth moving		30590 : Electricity Generating & Distributing Equipment		05618 : Machinery Mfrs	
4524 : Construction of water projects		29600 : Electric Motor Manufacturers		02415 : Electricity Generating Equipment	
45.34 Other building installation		48865 : Lubrication services		03353 : Water Engineers	
45.31 Installation of electrical wire and fittings		62590 : Pump sales, servicing and repair		05005 : Electricians & Electrical Contractors	
40.12 : Production of electricity		30350 : Electrical Testing & Inspecting		03345 : Structural Engineers	
		31600 : Engineers - General		06020 : Electricity Supply Companies	
		83900 : Water Engineers			
		30580 : Electricians & Electrical Contractors			

SIC codes[7]		Thompson codes		Yell codes	
		30586 : Electricity Companies			

Business Directories/Trade Associations

11.21 The British Hydropower Association acts as the trade association for the sector and represents the interests of all those involved in the hydropower industry. Formerly the National Association of Water Power Users, members include manufacturers of all kinds of equipment used in the industry, civil, mechanical and electrical consulting engineers, utility companies, academic institutions, and developers.

11.22 The British Hydropower Association website has a directory of all its members, these are categorised as equipment suppliers, electricity generators, consultants / contractors, developer / owner and other. Similarly the Renewable Energy Centre website holds a database of businesses in the hydro sector.

11.23 At the international scale there is the European Small Hydropower Association and the International Hydropower Association.

12 Renewable Energy: Wave and Tidal

Wave and tidal
Rating: Low
This is a relatively small low value sector at present, but is forecast to offer longer-term opportunities as commercialisation takes place. The UK is forecast to be a dominant player in the wave power over the next five years as a result of a number of advances in wave technologies, combined with the UK's tidal resource and engineering capabilities. The East Midlands however, has a relatively small presence in this sector and therefore overall the sector is of med-low importance to the region.

Global Market Situation

12.1 The World Offshore Renewable Energy Report 2004-2008[83], released by the DTI, suggests that while 3000GW of tidal energy is estimated to be available, less than 3% is located in areas suitable for power generation whilst the economically recoverable wave resource for the UK is estimated at 25% (of current demand).

12.2 The international market value of this subsector stands at £1.98bn, which represents 0.06% of the total global LCEGS market[84].

12.3 The Innovas report does not identify the wave and tidal sub sector as an area of high global market growth. The report similarly does not mention major export markets due to the relatively low value of exports compared to other sub sectors. However, offshore renewables is one of the fastest growing sectors of the renewable energy industry. While wind is the dominant sector at present wave and tidal energy offers longer-term opportunities to which existing offshore and manufacturing experience can be applied and the UK is forecast to be a world leader in these sectors.

National Market Situation

Size of sub-sector	Proportion of UK market	UK share of global market	No. of Businesses	No. of employees
£0.07bn	0.24%	3.70%	33	629

12.4 The Wave and Tidal sub sector is at the early stages of development and commercialisation compared to other renewables and conventional energy generation. Optimal designs have yet to be converged upon and while a few large-scale prototypes have been built and tested, no commercial projects have been

[83] The World Offshore Renewable Energy Report 2004-2008, DTI, 2009

[84] Low Carbon Goods ands Services: an industry analysis, Innovas Solutions 2009

completed to date. Over the last year significant progress has been made towards the commercialisation of tidal energy; with three devices having been installed that each have substantial commercial potential.

12.5 While the growth rate is high the market value of this growth is amongst the lowest in the LCEGS market. The sub sector is predicted a compound growth rate figure of 56.78% or £0.04bn by 2015. The Innovas report shows that the UK wave and tidal sector does not comprise a large amount of the UK exports (£0.008bn, 0.08% total LCEGS exports), a reflection of the immaturity of the market.

12.6 The UK Renewable Energy Strategy states that while this technology is still in development, it has most potential in the future, contributing to 20% of UK energy resources in 2020-2050. Current wave power capacity is very small, with just 2MW of installed capacity in the UK[85] representing just 0.05% of all contracted renewables capacity.

12.7 The UK is forecast to be the dominant player in wave power over the next five-years, with a forecast capacity of 14.7 MW - a result of a number of advanced wave technologies that have good prospects together with a growing number of prototype devices. The United Kingdom also has one of the world's best tidal energy resources coupled with a base of substantial engineering skills and abilities

12.8 The Renewables Innovation Review demonstrates that now is a crucial time for tidal energy in the UK because of the number of devices that are at, or close to, the demonstration phase. Recent successes such as Marine Current Turbine's technology are very encouraging. These devices need to be proven both technically and commercially viable. The Review foresees the phased development of grid-connected farms within six years after which the industry would enter into a commercial phase. This timeline is dependent upon financing options outlined within the Review, and even at the commercial level, market entry is likely to require further capital grants equivalent to the UK's round one of offshore wind farms.

Political Drivers in the Subsector

12.9 The Government is currently considering confirmation of a scheme to generate energy from the Severn Estuary. This will lead to a decision next year on whether to seek to harness the potential of Severn tidal power to supply up to 5% of the UK's electricity needs.

12.10 Similarly, the Government plans to launch the Marine Action Plan and are increasing investment by up to £60 million to help accelerate development and deployment in wave and tidal generation.

12.11 This includes supporting the world's leading testing and demonstration facilities in the New and Renewable Energy Centre (NaREC), the European Marine Energy Centre (EMEC) in Orkney and the proposed Wave Hub off Cornwall.

12.12 Additional means for wave and tidal energy being supported by the Government, outlined in the UK Renewable Energy Strategy include:

[85] The UK Renewable Energy Strategy. HM Government July 2009

- Providing funding for research and development;
- Providing funding for infrastructure, standards development and demonstration activities, through the Marine Renewables Deployment Fund (MRDF);
- Amending the Renewables Obligation in April 2009 to allow an enhanced level of support – 2 ROCs per MWh of electricity generated. Separate enhanced banding levels operate under the Scottish Renewables Obligation where tidal energy technologies will receive 3 ROCs and wave energy technologies are banded at 5 ROCs per MWh; and
- Developing a Strategic Environmental Assessment for wave and tidal energy in English and Welsh waters.

12.13 There are still gaps in the Government's support to allow commercial deployment, while include, these will be addressed by the Marine Action Plan:

- A gap for technology development between support for applied research and support for demonstration;
- A sharp drop in support after the demonstration stage which will act as a brake on development and deployment of commercial scale marine energy projects, particularly in England and Wales; and
- A need within the marine energy sector for strong leadership.

Supply Chain/Niches

12.14 The wave and tidal supply chain represents 15% of the subsector UK market value. This is relatively low compared to other renewables.

12.15 The UKTI report[86] classifies all UK LCEGS sectors on their relative strengths in terms of the following functions: Financial and professional services, engineering design and consultancy, manufacturing and supply, and project development and regulation. This is summarised with an overall indication of strength. Wave and tidal was rated as strong in all these areas, except manufacturing and supply.

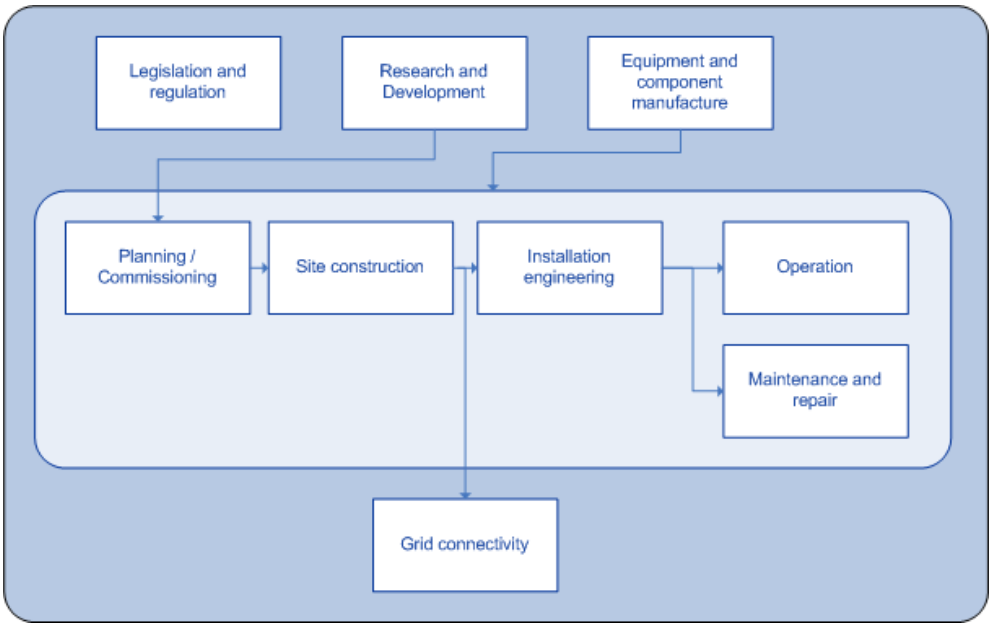
12.16 A range of UK manufacturers have world-class capabilities in technologies which could be transferred to the development of marine energy devices. For example, Rolls Royce and Converteam are market leaders in marine propulsion systems[87].

12.17 Energy and Utility Skills have produced a demonstration of the large scale renewables supply chain as shown below[88].

[86] Market Opportunities in Environmental Goods and Services, Renewable Energy, Carbon Finance and CATs – Overview Report. UKTI, October 2008.

[87] Delivering the low-carbon economy – Business opportunities for UK manufacturers, eef

[88] Energy and Utility Skills, Sector Skills Mapping in the Environmental Technology Sector, 2006



Source: Energy and Utility Skills, 2006

Investment Trends

12.18 Finance and market incentives are extremely important to the developing wave and tidal industry. Although there are a huge number of concept devices being planned worldwide, the only ones that have made any real strides towards a commercial end product are those that have had significant funding through shareholders or government grants. The Carbon Trust anticipate that the wave and tidal sub sector will have a significant venture capital requirement over the next five years89. A separate Carbon Trust publication suggests that European and US generation companies and project developers are increasingly taking interest in the sub sector. However as the development of the sector stands, due to this early stage, the cost of generation is high and it will take fast step change cost reductions to make this competitive for reasonable amounts of investment. Availability of finance for technology and project development is cited as a potential barrier to the growth of the sub sector[6].

12.19 The Renewables Innovation Review found that a number of possible mechanisms for supporting wave (and tidal) projects at a pre-commercial level exist, including capital grants, fixed power purchase type arrangements and amendments to the Renewables Obligation system. Compatibility with the existing Renewables Obligation was found to be an issue for any option other than a capital grants system. Adopting a long-term view of the sector, a capital grants scheme may be required to fully stimulate wave and tidal market entry.

East Midlands Supply

12.20 Innovas estimate that East Midlands does not have a regional comparative advantage in this sub sector, with 4.68% of GVA for the sector and is considered one of the regions with below average performance.

12.21 Findings from the ekosgen research found 6 businesses operating in the sector, with 2 stating that it was their main sector. 8 businesses supplied to the sector.

East Midlands Demand

12.22 The renewable energy and efficiency targets for the East Midlands do not include targets for this sub sector which suggests there is little regional demand[90]. The inshore waters of Lincolnshire will be a focus for offshore wind rather than wave or tidal power generation.

Higher Education

12.23 The region is well placed in terms of research and development in the renewable energy sector generally, with the CREST centre at Loughborough and the Energies Technology Research Institute at Nottingham University. Regarding the wave and tidal sub sector, the CREST centre has a research specialism in turbine technology, although this is focused on wind energy generation. The group at Nottingham University similarly do not specialise in wave and tidal energy.

The Energy Technology Institute

[89] Investment Trends in European Clean Energy, Carbon Trust, June 2007

[90] Reviewing Renewable Energy and Energy Efficiency Targets for the East Midlands

12.24 The ETI have identified areas within the sector for funding to accelerate the deployment of wave and tidal stream energy. The main focus of ETI funding is expected to be the: design, development, installation and deployment and testing of prototypes under relevant conditions ready for further testing, this potentially would be at EMEC, Wave Hub or NaREC.

Skills and Capabilities

12.25 The UK has strengths that are relevant to this sub sector stemming from a range of transferable skills and capabilities in the oil and gas, shipbuilding and power generation sectors[91], with particular skills transferable from the offshore wind industry.

Business Description

12.26 The table below details the relevant business classification codes for the wave and tidal sector. As previously discussed, business classification codes are not always a perfect match to the industrial sector we are trying to identify. Therefore to give some sense of the level of fitness of each code, they have been assigned one of the following codes green – good/near exact fit, orange – moderate fit, red – poor/low fit, X – representing he polluting industry or client industry itself.

[91] Delivering the low-carbon economy – Business opportunities for UK manufacturers, eef

SIC codes[7]	Thompson codes	Yell codes
73.10 : Research and experimental development on natural sciences and engineering	64700 : Research Organisations	00046 : Science & Research Consultants
3162 : Manufacture of other electrical equipment not elsewhere classified	30710 : Electronic Component Manufacturers & Distributors	05638 : Marine Consultants
31.20 : Manufacture of electricity distribution and control apparatus	30590 : Electricity Generating & Distributing Equipment	02456 : Electronic Components
29.12 : Manufacture of pumps and compressors	36860 : Flow Measurement Systems - Mnfs	02415 : Electricity Generating Eqpt
29.11 : Manufacture of engines and turbines, except aircraft, vehicle and cycle engines	49600 : Marine Electrical & Electronic Equipment Manufacturers	03503 : Flow Control Eqpt Mfrs
73.20 : Research and experimental development on social sciences and humanities	62580 : Pump Manufacturers	05929 : Marine Electronics
743 : Technical testing and analysis	62590 : Pump sales, servicing and repair	03331 : Pumps & Pumping Eqpt
74.20 : Architectural and engineering activities and related technical consultancy	31520 : Engine Manufacturers & Distributors	02474 : Engine Mfrs & Suppliers
45.21 : General construction of buildings and civil engineering projects	80920 : Turbine Manufacturers	08765 : Architects
45.34 Other building installation	49700 : Marine Engineering Equipment Manufacturers	02480 : Architectural Services
45.31 Installation of electrical wire and fittings	64700 : Research Organisations	00097 : Architectural Technologists & Technicians
40.11 : Production of electricity	30350 : Electrical Testing & Inspecting	08342 : Surveyors-Marine
40.11 : Transmission of electricity	04420 : Architects	2488 : Constructional Engineers
	04422 : Architectural Services	05005 : Electricians & Electrical Contractors
	04424 : Architectural Technologists	03702 : Marine Engineers
	31600 : Engineers - General	06020 : Electricity Supply Companies
	49810 : Marine Surveyors	

		21555 : Construction Contractors - General			
		30580 : Electricians & Electrical Contractors			
		49800 : Marine Services			
		49640 : Marine Electrical Services			
		49780 : Marine Equipment & Supplies			
		30590 : Electricity Generating & Distributing Equipment			
		30586 : Electricity Companies			

Business Directories/Trade Associations

12.27 The Renewable Energy Centre website holds a database of businesses in the wave and tidal sector, which includes system designers and consultants, equipment suppliers and operators.

13 Renewable Energy: Biomass

Biomass
Rating: High
The biomass sector is important both internationally and nationally, with its global value standing at approximately £140bn. It is a relatively diverse sector, covering several different types of technology and fuel, as well as a diverse supply chain covering agriculture as well as food and drink. This research found 45 companies operating in this sector in the East Midlands employing 2,724 people. The presence of the CREST centre at Loughborough, with its research into biomass CHP and the Energy Technology Research Institute at Nottingham University which focuses on the optimisation of crops to be used in energy production may present an important opportunities for the region's businesses. Therefore this sub-sector has been rated of high importance of the region.

13.1 Biomass covers the process, via a biomass power plant, of producing electricity or heat by combustion. Biomass is also known as biofuels or bioenergy. The sub-sector may utilise perennial crops for use as fuel in biomass power plants to provide heat and power. Forestry waste can also be utilised. Energy from waste incineration and the tapping of landfill gas are also part of the sub-sector. Waste-to-energy is becoming widely acknowledged as an important energy source within the renewable energy sector.

Global Market Situation

13.2 In terms of existing capacity, The Renewables Global Status Report92 places the USA top in terms of existing capacity, with Brazil, the Philippines and Germany, Sweden and Finland the next largest. The international market value of this subsector stands at £140.14bn, which represents 4.6% of the total global LCEGS market[93].

13.3 In terms of proportion of the energy mix, the UKTI reports notes that biomass contributes to a high proportion of the renewable energy consumption in Australia, Turkey and Brazil. The main UK biomass export markets in 2007/08 were Malaysia (£0.039bn), France (£0.025bn) and Japan (£0.021bn)[94].

13.4 The growth markets for this subsector, at Level 3 (biomass energy systems), include China, India, Malaysia and South Korea. Level 4 growth markets in biomass energy systems software include China, India, Thailand, France, Hong Kong, Malaysia, South Korea, Taiwan. The growth market in biomass component suppliers includes China, India and Malaysia.

National Market Situation

[92] Renewables Global Status Report, 2009 update, REN21, 2009

[93] Low Carbon Goods ands Services: an industry analysis, Innovas Solutions 2009

[94] Market Opportunities in Environmental Goods and Services, Renewable Energy, Carbon Finance and CATs – Overview Report. UKTI, October 2008.

Size of sub-sector	Proportion of UK market	UK share of global market	No. of Businesses	No. of employees
£4.95bn	15.92%	3.53%	2,531	45,849

13.5 The Uk Biomass Strategy states that biomass has significant potential to contribute to renewable electricity and carbon abatement and currently biomass accounts for half of renewable energy generation[95]. Biomass generated 9.315GWh in the UK in 2008[96].

13.6 The biomass growth rate is average relative to the rest of the sub sectors, with a compound growth rate figure of 49.90% or £2.47bn by 2015. The UK biomass sector performs well in terms of UK exports in relation to other renewables (£0.692bn, 13.97% total exports) [1].

13.7 The UK Renewable Energy Strategy states that biomass has an important role and that 12% of our heat could come from sustainable biomass amongst other renewables. The first large biomass fired plant is under construction in Port Talbot. With a generating capacity of 350 MW, it could provide electricity for half the homes in Wales by 2010[97].

Political Drivers in the Subsector

13.8 A final Progress Report on Implementation of the Government Response to the Biomass Task Force Report was published in June 2009. This report sets out in detail achievements on the 61 actions contained in the Government Response, and explains how continuing and planned future activities will help build a competitive and sustainable biomass sector.

13.9 There is Government financial support available to progress this type of renewables. Electricity generated from biomass is eligible for support under the Renewables Obligation (RO). DTI and the big lottery fund have provided support through the Bioenergy Capital Grants Scheme for the establishment of dedicated biomass power stations, such as those in Lockerbie and Wilton.

13.10 The UK Biomass Strategy states that there is support for co-firing power stations have the potential to play a long term role in this context. Co-firing biomass stations will aid the establishment of biomass supply chains[4].

13.11 The strategy similarly states that biomass Combined Heat and Power (CHP) is of growing importance, having set the target of 10GW of Good Quality CHP[98] by 2010. The cost of generating electricity using CHP is often higher than conventional

[95] UK Biomass Strategy, May 2007

[96] http://stats.berr.gov.uk/energystats/dukes7_4.xls

[97] The UK Renewable Energy Strategy. HM Government July 2009

[98] Good Quality CHP denotes schemes that have been certified as meeting the energy efficiency criteria prescribed by the UK's CHP Quality Assurance Programme (CHPQA). Such schemes are entitled to certain financial benefits. Further information on the programme can be found at www.chpqa.com.

Programme (CHPQA). Such schemes are entitled to certain financial benefits. Further information on the programme can be found at www.chpqa.com.

means, in spite of the financial gains from the heat that is sold. The strategy introduces several support mechanisms to encourage the uptake of this low carbon option:

- Favourable allowance allocations under phase II of the EU ETS;
- Exemption from the Climate Change Levy;
- Business rates exemption;
- Enhanced capital allowances for plant and equipment with plans to expand eligibility to support SRF combustion capacity; and
- ROC eligibility for the biomass element of wastes used in conventional energy from waste plants that utilise CHP.

13.12 The UK Renewable Energy Strategy[99] has stated measures to increase the supply and use of biomass for heat, power and transport while ensuring sustainability and protecting the environment by:

- **Increasing supply** through bringing more woods back into management; incentivising energy crops and researching new ones; and making better use of biomass waste.
- **Ensuring sustainability** through better accounting for the sustainability of biomass and biofuels; developing robust sustainability criteria with the EU and internationally (including pressing for criteria relating to indirect sustainability impacts); and researching new opportunities for sustainable production.
- **Enabling the use of bioenergy** by ensuring improved fuel quality standards, protecting air quality, overcoming barriers to using biogas and developing the capability of road and other transport to use higher levels of biofuels.
- **Indentifying new applications and sectors for bioenergy** through enabling the injection of renewable gas into the gas grid and looking at other transport sectors where biofuels could be used such as rail, aviation and shipping.

13.13 There are several instances of guidance being produced for the sub sector. DTI has published the revised guidance for power station developers which includes industrial heat maps. Defra will produce guidance for the public and private sector to ensure that anyone replacing a mid-sized furnace as part of a boiler plant (over 400kW) is aware of the potential for CHP.

13.14 At the international level, the European Commission is due to produce a report by the end of 2009 on requirements for a sustainability scheme for biomass.

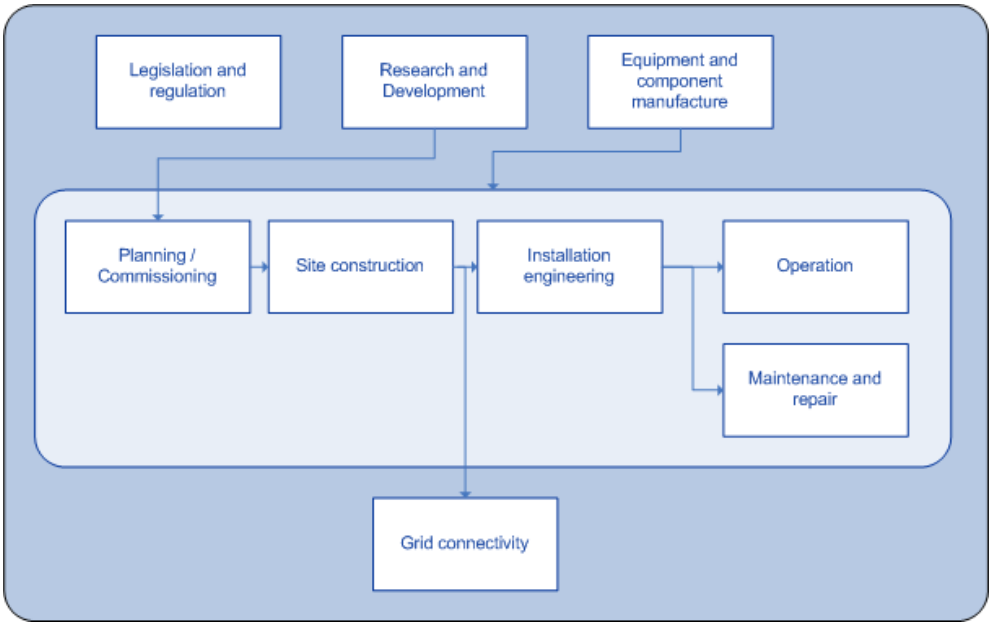
Supply Chain/Niches

13.15 The biomass supply chain represents 48% of the subsector UK market value. This is relatively high compared to other renewables.

[99] UK Renewable Energy Strategy, DECC 2009

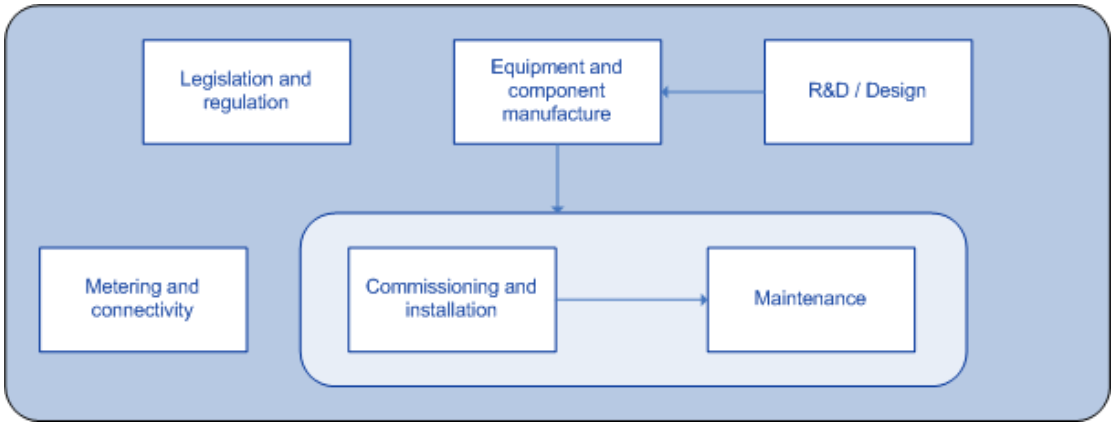
13.16 The UKTI report classifies all UK LCEGS sectors on their relative strengths in terms of the following functions: Financial and professional services, engineering design and consultancy, manufacturing and supply, and project development and regulation. This is summarised with an overall indication of strength. Biomass was rated as strong in finance and professional services and as moderate or patchy strengths in all other areas and overall[100].

13.17 Energy and Utility Skills have produced a demonstration of the large scale renewables supply chain as shown below[101].



Source: Energy and Utility Skills, 2006

13.18 The Energy and Utility Skills report similarly illustrates a small scale renewables supply chain as shown below[7].



Source: Energy and Utility Skills, 2006

Investment Trends

[100] Market Opportunities in Environmental Goods and Services, Renewable Energy, Carbon Finance and CATs – Overview Report. UKTI, October 2008

[101] Energy and Utility Skills, Sector Skills Mapping in the Environmental Technology Sector, 2006

13.19 The Carbon Trust report on investment trends in clean energy does not mention biomass, suggesting that there is not a large amount of activity within the sub sector[102].

East Midlands Supply

13.20 Innovas estimate that East Midlands does not have a regional comparative advantage in this sub sector, with 7.21% of GVA for the sector, although it is not considered one of the regions with below average performance[1].

13.21 Findings from the ekosgen research found 45 businesses operating in the sector, with 17 stating that it was their main sector. 30 businesses supplied to the sector.

13.22 The East Midlands Renewable Energy Strategy states that biomass from wood, forestry residues and crops is a major resource in the region and as the market conditions improve, is likely to be increasingly developed[103].

East Midlands Demand

13.23 The report Reviewing Renewable Energy and Energy Efficiency Targets for the East Midlands indicates that there will be a significant demand for biomass within the region, and in most cases biomass fuel will need to be imported from other regions or even internationally unless the resource available within the region can be increased. However further increases could have an impact on the food production potential for the region with a requirement for further land to grow energy crops[104].

13.24 The East Midlands Renewable Energy Strategy states that biomass offers significant opportunities for rural diversification. Farms are well placed to gain some benefit from local small scale generation[10].

Higher Education

13.25 The region is well placed in terms of research and development in the sector generally, with the CREST centre at Loughborough and the Energies Technology Research Institute at Nottingham University. The CREST centre has a specialism in renewables and the built environment. This includes research into effective biomass CHP. The Nottingham research group's expertise focuses on the production and conversion processes surrounding this type of energy. Biotechnologists and agronomists have particular expertise in the optimisation of crops to be used in energy production, e.g. sugar beet, wheat, barley, oilseed rape, palm-oil, bamboo and maize.

The Energy Technology Institute

13.26 The ETI does not currently have a Technology Programme in this sub sector.

Skills and Capabilities

[102] Investment Trends in European Clean Energy, Carbon Trust, June 2007

[103] The East Midlands Energy Challenge; The Regional Energy Strategy Part 1

[104] Reviewing Renewable Energy and Energy Efficiency Targets for the East Midlands. East Midlands Regional Assembly. June 2009.

13.27 The key occupations[105] in the sector are "rate of burn" technologists, electrical/instrumentation technicians and mathematical modelling within IT skills, while there is also a need for logistics and transport skills for the supply of biomass. There is a need for multi-skilled employees at all technical levels to work in project team approach. A potential shortage of engineering graduates may affect biomass design and modelling. Existing HE courses are seen as adequate and Linkage with HEIs is strong and recruitment is made through this linkage with relevant departments.

Business Description

13.28 The table below details the relevant business classifications for the biomass sector.. As previously discussed, business classification codes are not always a perfect match to the industrial sector we are trying to identify. Therefore to give some sense of the level of fitness of each code, they have been assigned on of the following codes green – good/near exact fit, orange – moderate fit, red – poor/low fit, X – representing he polluting industry or client industry itself.

[105] Occupational and functional map for the renewable energy sector, Energy and Utility Skills, 2005

SIC codes[7]		Thompson codes		Yell codes	
Research and Development					
73.10 : Research and experimental development on natural sciences and engineering		64700 : Research Organisations		00046 : Science & Research Consultants	
29.12 : Manufacture of pumps and compressors		62580 : Pump Manufacturers		03331 : Pumps & Pumping Eqpt	
29.11 : Manufacture of engines and turbines, except aircraft, vehicle and cycle engines		31520 : Engine Manufacturers & Distributors		02474 : Engine Mfrs & Suppliers	
29.21 : Manufacture of furnaces and furnace burners		38450 : Furnaces		03112 : Furnaces - Industrial	
31.20 : Manufacture of electricity distribution and control apparatus		30590 : Electricity Generating & Distributing Equipment		02415 : Electricity Generating Eqpt	
31.10 : Manufacture of electric motors, generators and transformers		29600 : Electric Motor Manufacturers		08765 : Architects	
73.20 : Research and experimental development on social sciences and humanities		30350 : Electrical Testing & Inspecting		02480 : Architectural Services	
743 : Technical testing and analysis		04420 : Architects		00097 : Architectural Technologists & Technicians	
74.20 : Architectural and engineering activities and related technical consultancy		04422 : Architectural Services		2488 : Constructional Engineers	
45.21 : General construction of buildings and civil engineering projects		04424 : Architectural Technologists		05005 : Electricians & Electrical Contractors	
45.34 Other building installation		31600 : Engineers - General		03345 : Structural Engineers	
45.31 Installation of electrical wire and fittings		21555 : Construction Contractors - General		06020 : Electricity Supply Companies	
40.12 : Production of electricity		30580 : Electricians & Electrical Contractors			
01.11 : Growing of cereals and other crops not yet classified		30590 : Electricity Generating & Distributing Equipment			
40.11 : Transmission of electricity		30586 : Electricity Companies			

Business Directories/Trade Associations

13.29 The Bio Energy Group East Midlands is a partnership of private, public and not-for-profit organisations in the region working to increase the use of biomass fuels in the region. The main focus of the group is currently on wood fuels, mainly woodchip and wood pellet; however the group will also aim to promote other forms of bioenergy in the future.

13.30 The Biomass Energy Centre (BEC) is owned and managed by the UK Forestry Commission, via Forest Research, its research agency. A steering group oversees the BEC, comprised of representatives from the biomass industry and related sectors.

13.31 The aim of the BEC is to draw together information from existing sources into one easy to use service based around this website and an information enquiry service to UK individuals, companies, local authorities and other UK organisations.

13.32 The Renewable Energy Centre website holds a database of businesses in the biomass and biofuels sub sector.

14 Renewable Energy: Wind

Wind
Rating: High
Both on and offshore wind represent growing sectors worldwide. The onshore wind sector is relatively mature with established highly consolidated supply chains. The UK has an existing presence in this supply chain and the East Midlands shows existing comparative advantage here, with specialists in the manufacture of small wind turbines and a total of 35 businesses operating in the sector, employing 5,392. The offshore sector is still in the development phase and there are considerable opportunities in developing this sector. The East Midlands has a growing local market for both offshore and onshore wind and this could be an opportunity for local businesses. The knowledge base is strong in the East Midlands with the presence of both the Energy Technology Institute and Loughborough University's CREST centre, both undertaking research into the wind sector.

Global Market Situation

14.1 The international market value of this subsector stands at £140.14bn, which represents 11.5% of the total global LCEGS market[106]. Denmark occupies the leading position with 38.5% of the market for wind turbines, developed through considerable government intervention in recent decades[107].

14.2 The Clean Development Mechanism[108] and Joint Implementation Framework provides an indication of countries' engagement in international and low carbon markets. UK exports in the wind sector are valued at £1.462bn, the largest of all UK LCEGS subsectors. Key markets that the UK exports into are China (£0.165bn), South Korea (£0.076bn), India (£0.041bn) as well as USA (£0.028bn), Japan (£0.049bn) and Germany (£0.037bn)[1].

14.3 The Innovas report identifies the following level 3 markets forecasting high levels of growth in value including: Large Windfarm Systems, Large Wind Turbines, Small Wind Turbines.

National Market Situation

Size of sub-sector	Proportion of UK market	UK share of global market	No. of Businesses	No. of employees

[106] Low Carbon Goods ands Services: an industry analysis, Innovas Solutions 2009

[107] Commission on Environmental Markets and Economic Performcne. November 2007. BERR.

[108] The Clean Development Mechanism allows emission –reduction projects in developing countries to earn certified emission reduction credits (CER). The credits can be traded and used by industrialised coutrneies to meet a part of their emission reduction targets under the Kyoto protocol.

Size of sub-sector	Proportion of UK market	UK share of global market	No. of Businesses	No. of employees
£11.46bn	37%	3.26%	5,841	87,486

14.4 Wind energy shows the highest forecast growth rate in the Low Carbon sector, both in absolute terms and as a percentage increase, with a compound growth rate figure of 79.22% or £8.97 billion by 2015[1]. UK net exports equate to £800m[109].

14.5 The UK Renewable Energy Strategy has stated that more than 30% of electricity must be generated from renewables by 2020, two thirds of this will be from wind power (20%), both on and offshore[110]. Currently wind power accounts for just 1.8% of UK electricity generation[111].

14.6 The UK geography provides favourable conditions for wind energy, making it the largest single market for offshore wind[112]. A recent Strategic Environmental Assessment of UK offshore energy concluded that there is potential for some 25GW of additional offshore wind generating capacity in English and Welsh territorial waters and the UK Renewable Energy Zone, up to 60m depth, by 2020. The crown estate is now proceeding with its Round 3 Leasing Competition, expected to be complete by end 2009.

Political Drivers in the Subsector

14.7 Up to £120 million has been pledged by Government in the recent Low Carbon Industrial Strategy[6] to support the development of a British based offshore wind industry. This includes:

- Funding for new offshore wind energy manufacturing facilities in the UK;
- Investment in the development of next-generation and near-market offshore wind technologies through large scale demonstration;
- Improving the UK's capability in integrated offshore wind testing, including through dedicated testing facilities.

14.8 Proposed changes in the level of the Renewables Obligation Certificates for Offshore Wind, are expected to inject around £2-3bn of support to help improve the profitability of many projects[6]. Likewise, reforms to the Town and Country Planning System are designed to support more effective and proactive planning by local and regional authorities so that they are better able to capitalise on the renewable opportunities available to them[6].

Supply Chain/Niches

[109] BIS Economic Paper No. 1 – Towards a Low Carbon Economy – Economic Analysis and Evidence for a Low Carbon Industrial Strategy. July 2009.

[110] The UK Renewable Energy Strategy. HM Government July 2009

[111] Energy Trends – June 2009. National Statistics

[112] UK Low Carbon Industrial Strategy. HM Government July 2009.

14.9 Manufacturing is an important part of the wind sub-sector representing 45%[1], a reflection of the developed nature of the technology. Although there are no major UK owned wind turbine manufacturers, there are key foreign owned companies in the UK, such as VESTAS and GE, as well as UK based companies within the supply chain. The recent decision by VESTAS to close its plant on the Isle of Wight due to a lack of demand will be a blow to this emerging industry in the UK.

14.10 The UKTI report[113] classifies all UK LCEGS sectors on their relative strengths in terms of the following functions: Financial and Professional services, engineering design and consultancy, manufacturing and supply, and project development and regulation. This is summarised with an overall indication of strength. Offshore wind was rated as strong in all these areas, except Manufacturing and supply – which was rated as poor/limited strengths, thus leading the sectors overall rating as moderate/patchy. The EEF has found that UK manufacturers have had some success in the supply of the structural components (e.g. towers, cables and piles) for wind turbines, but far less success in the higher value mechanical and electrical components[114]. UK producers face significant challenges in breaking into well-established global supply chains dominated by German, Danish, Spanish and American Manufacturers, which have highly consolidated supply chains, usually close to production facilities.

14.11 In developing offshore wind, significant technological advances are expected in new generation turbine design (direct drive, new generation low cost HTS wire), foundations, connection, installation and Operation and Maintenance[115]. The supply chains for the next generation turbines are not yet fully established – success will depend on the ability of UK manufacturers to respond to this rapidly growing market[9].

14.12 Opportunities do exist for the application of specialist technologies developed in other industries to wind turbines e.g. Variable Transmission Systems and Motor Control Systems developed in the automotive sector may have an application in the wind sector.

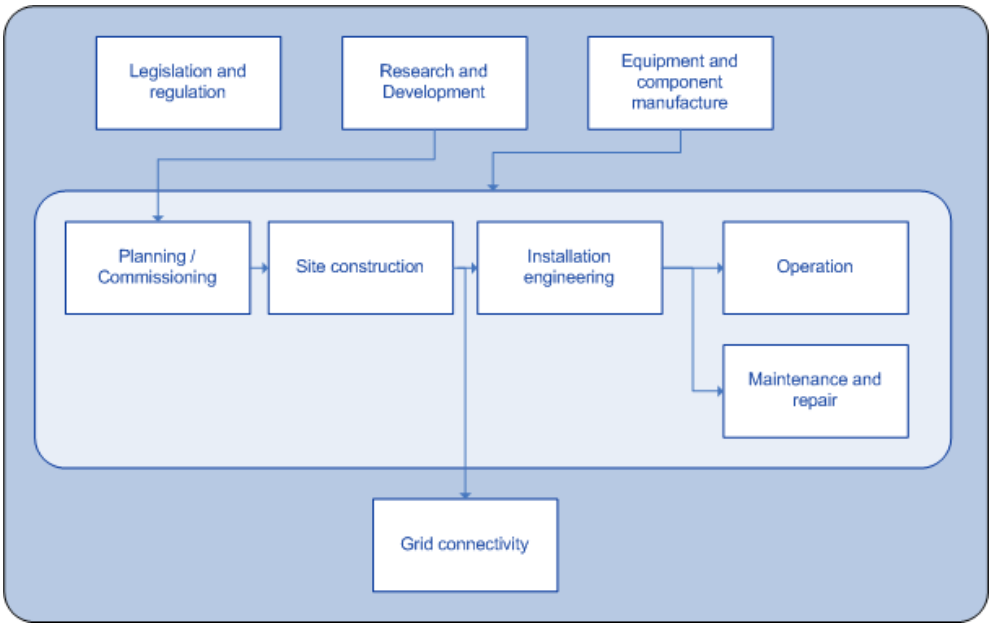
14.13 Energy and Utility Skills have produced a demonstration of the large scale renewables supply chain as shown below[116].

[113] Market Opportunities in Environmental Goods and Services, Renewable Energy, Carbon Finance and CATs – Overview Report. UKTI, October 2008.

[114] Delivering the low-carbon Economy – Business Opportunities for UK manufacturers. EEF January 2008

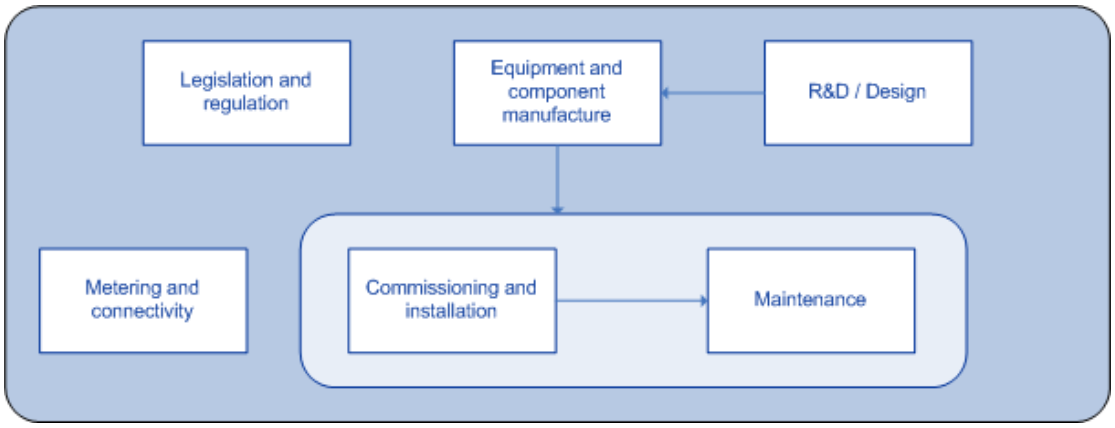
[115] Offshire Wind Power: Big Challenge, Big Opportunity. Maximising the environmental, economic and security benefits. Carbon Trust . October 2008

[116] Energy and Utility Skills, Sector Skills Mapping in the Environmental Technology Sector, 2006



Source: Energy and Utility Skills, 2006

14.14 The Energy and Utility Skills report similarly illustrates a small scale renewables supply chain as shown below[7].



Source: Energy and Utility Skills, 2006

Investment Trends

14.15 At the European scale, there is no one country that is dominating investment in this sector. Wind farms are now usually financed using project finance – the venture capital here is typically employed to back companies with technologies serving the wind power sector such as improved turbine blades or gear-box systems.[117]

East Midlands Supply

14.16 The findings from the ekosgen survey show 35 businesses operating in the sector of which 13 identified wind as their main sector. 35 business supplier the sector.

[117] Investment Trends in European Clean Energy, Carbon Trust, June 2007

14.17 Innovas estimate that East Midlands has regional comparative advantage in this subsector[1], with 9.77% of the UK GVA for the sector. This may well reflect the presence of Evance wind turbines (previously Iskra Wind Turbines) who specialise in the manufacture of Small Wind turbines in Loughborough.

East Midlands Demand

14.18 Although the East Midlands has a lower wind resource than other parts of the UK, it still has better average windspeeds than Germany or Denmark and improving market competitiveness of wind power means that there are a variety of sites in the East Midlands now suitable for wind. The Lincolnshire coast forms part of one of the Government's strategic areas for offshore development.[118]

14.19 Existing onshore capacity is estimated to be approximately 102.2MW – mainly in Lincolnshire and Northamptonshire[119]. Continuing on the existing growth trajectory suggests an installed capacity of 397MW by 2031 and a high growth scenario of 776MW by 2031 from onshore wind alone.

14.20 Offshore wind capacity is currently 162MWe, with a further 32MW installed but not yet operational. Growth has been slower than expected for a number of reasons and the region is expected to fall short of its RSS target to achieve 400MW by 1010. The revised forecast for 2031, is therefore for 1,220MW installed capacity. In achieving this and continued growth in offshore wind, there is a strong need case for reinforcement of the Electricity distribution system at the Lincolnshire Coast to allow the potential Round 3 offshore projects to be connected.

Higher Education

14.21 The region is strongly placed for research and development in the sector. The Centre for Renewable Systems and Technology (CREST) at Loughborough University includes a research group that specialise in wind power systems. CREST's research is focused on electricity generation from wind and solar energy and its integration into networks and systems. Systems integration often involves the application of advanced power electronic interfaces where the Department of Electronic and Electrical Engineering has considerable expertise. Research within this group covers:

- Wind forecasting and integration of wind energy
- Energy storage technology
- Wind resource modelling
- Condition monitoring of wind turbines
- Control and system integration of wind turbines
- Structural dynamics of wind turbines
- Wind turbine aerodynamics and design

The Energy Technology Institute

14.22 The ETI has been active in this sector announcing a £40M initiative to cut the costs of offshore wind power and accelerate its deployment around the UK. EOIs were received and projects are now in development phase and are in the process of

[118] The East Midlands Energy Challenge; The Regional Energy Strategy Part 1

[119] Reviewing Renewable Energy and Energy Efficiency Targets for the East Midlands. East Midlands Regional Assembly. June 2009.

being commissioned, three projects in Offshore Wind have been announced. Areas of focus include

- Design and demonstration of novel offshore systems, including technologies that are fundamentally different to those currently being deployed. This includes offshore-specific wind turbine designs - possibly integrated within alternative overall wind farm configurations (e.g. using centralised power conversion) - and systems for deep-water installation.
- Improvements to existing technologies, to enable large-scale deployment and improve wind farm design, construction (e.g. foundation structures) and operation (e.g. access methods) – including reliability. While perhaps less radical than the first category, such developments are vitally needed in the short-to-medium term for incorporation in wind farms to be built in the next 5 years; and.
- Supporting studies on other issues critical to deployment, for instance, mapping offshore wind resources, improved environmental impact assessment methods and construction health and safety.

Skills and Capabilities

14.23 The Carbon Trust report identified the following supply chain segments for the offshore market, an asterisk identifies those areas where there are shortages in supply or bottlenecks: Blades, Gearboxes*, Forgings*, Generators, Towers*, Foundations, Cables*, Offshore cable laying and installation*, Substations*, Substation installation. Turbine installation.

14.24 The Carbon Trust found that skill shortages are a key barrier to capacity growth in the sector and recommended that the UK should invest in training and skills to complement the employment opportunities created in RD&D, manufacturing, installation and O&M.

Business Description

14.25 The table below details the business classifications relevant to the wind renewables sector. As previously discussed, business classification codes are not always a perfect match to the industrial sector we are trying to identify. Therefore to give some sense of the level of fitness of each code, they have been assigned one of the following codes green – good/near exact fit, orange – moderate fit, red – poor/low fit.

SIC codes[7]	Thompson codes	Yell codes
Research and Development		
73.10 : Research and experimental development on natural sciences and engineering	64700 : Research Organisations	00046 : Science & Research Consultants
74.20 : Architectural and engineering activities and related technical consultancy	04420 : Architects	08765 : Architects
3162 : Manufacture of other electrical equipment not elsewhere classified	04422 : Architectural Services	02480 : Architectural Services
31.20 : Manufacture of electricity distribution and control apparatus	04424 : Architectural Technologists	00097 : Architectural Technologists & Technicians
29.11 : Manufacture of engines and turbines, except aircraft, vehicle and cycle engines	31600 : Engineers - General	02488 : Constructional Engineers
743 : Technical testing and analysis	30710 : Electronic Component Manufacturers & Distributors	03345 : Structural Engineers
45.21 : General construction of buildings and civil engineering projects	30590 : Electricity Generating & Distributing Equipment	02456 : Electronic Components
45.34 Other building installation	31520 : Engine Manufacturers & Distributors	02415 : Electricity Generating Eqpt
45.31 Installation of electrical wire and fittings	80920 : Turbine Manufacturers	02474 : Engine Mfrs & Suppliers
40.11 : Production of electricity	84700 : Windmills and Wind power Equipment	09866 : Wind turbines and windmills
45.21 : General construction of buildings and civil engineering projects	30350 : Electrical Testing & Inspecting	2488 : Constructional Engineers
40.11 : Transmission of electricity	21555 : Construction Contractors - General	05005 : Electricians & Electrical Contractors
	30580 : Electricians & Electrical Contractors	06020 : Electricity Supply Companies

		30590 : Electricity Generating & Distributing Equipment			
		30586 : Electricity Companies			

Business Directories/Trade Associations

14.26 The BWEA website has a national directory of all wind farms including those under construction and operational projects.

14.27 The national trade association is the British Wind Energy Association (BWEA).

14.28 The European Wind Energy Association acts as a trade association for this sector.

15 Renewable Energy: Geothermal / Heat Pumps

Geothermal / Heat Pumps
Rating: Low
The Geothermal/Ground Source sector is estimated to have a global value of approximately £9.22bn, but is predicted to grow strongly. In the UK, ground source heat is given a substantial role in meeting the UK Renewable Energy Strategy target of 12% heat from renewables by 2020. Political drivers include £6m for the exploration of deep geothermal power in the UK and the inclusion of ground source heat pump technology in the Code for sustainable homes. The industry has a large supply chain which contributes to the value of the sector. This research has found 26 businesses operating in this sector in the East Midlands.

Global Market Situation

15.1 While the Innovas report focuses on geothermal energy as a subsector, it is not clear whether this includes Ground Source Heat Pumps, and the terms are often used interchangeably. Strictly geothermal refers to energy derived from thermal sources within the Earth, and its effective use is limited to particular locations, such as Iceland for instance. For the sake of this profile, therefore we have widened the definition to include heat pumps (basically heat exchange technology using the ground, water or air as a source of heat), where most opportunities lie. Our view is that the number of businesses operating in this sector, as outlined by Innovas, would point to it including heat pump technology.

15.2 The international market value of this subsector stands at £276.39bn, which represents 9.07% of the total global LCEGS market[120]. The global growth markets in Level 4 of the geothermal sub sector (suppliers of geothermal energy systems) include China, India and Romania.

National Market Situation

Size of sub-sector	Proportion of UK market	UK share of global market	No. of Businesses	No. of employees
£9.22bn	29.63%	9.22%	4,793	75,798

15.3 The geothermal sub sector is predicted a compound growth rate figure of 51.89% or £4.78bn by 2015[1], which is relatively high compared to the total LCEGS sector. Amongst the renewables sector, with the exception of hydro and renewable consulting, this is the lowest growth rate. The Innovas report shows that the UK geothermal sector has the lowest level of UK exports of all renewables comprises (£0.871bn, 9.45% total LCEGS exports).

[120] Low Carbon Goods ands Services: an industry analysis, Innovas Solutions 2009

15.4 The UK Renewable Energy Strategy has stated that more than 12% of heat must be generated from renewables by 2020. Ground source heat is given a substantial role in meeting this target[121].

Political Drivers in the Subsector

15.5 The Government has stated it will commit up to £6 million to explore the potential for deep geothermal power in the UK, which will be used for scoping viable sites. Deep geothermal power uses the natural heat from deep underground to drive turbines at the surface, providing a renewable and non-intermittent source of electricity and heat.

15.6 The sub sector has received political attention in Scotland. Scottish Ministers are aiming for a tenfold increase in heat energy from renewables, such as biomass and ground source heat pumps – increasing from 1% to 11% by 2020. A Renewable Heat Action Plan will be a mandatory provision within the Scottish Climate Change Bill.

15.7 In April 2007 the Code for Sustainable Homes came into operation as the national standard for sustainable new build homes. New homes are designed and assessed against the Code which include, where appropriate, small-scale renewable energy systems. The current standard for publicly-funded housing (Code level 3) includes air or ground source heat pumps.

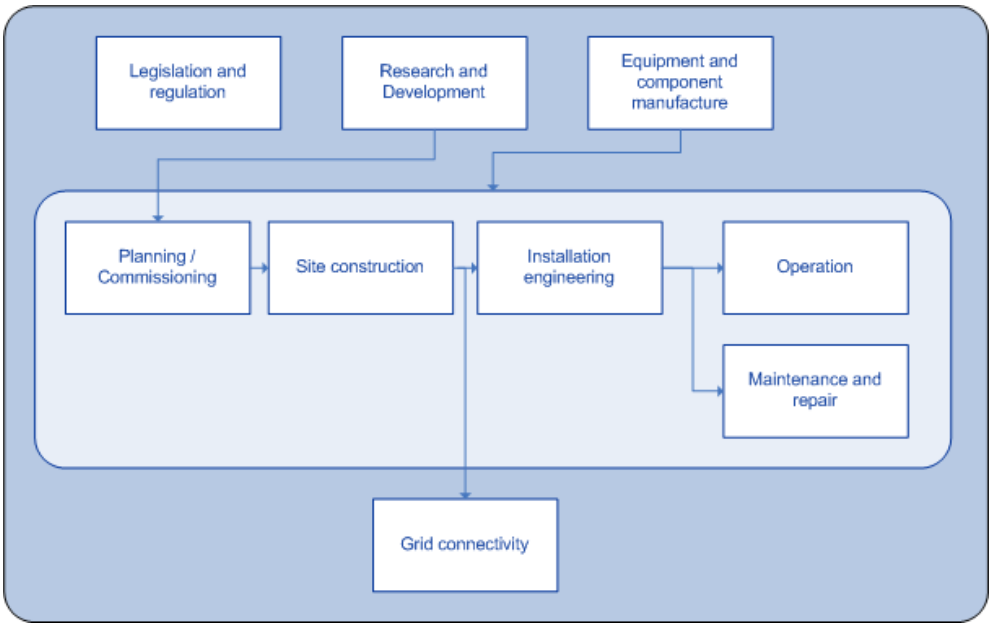
Supply Chain/Niches

15.8 Geothermal, with nearly 30% of the value of the sector, includes pipes, pumps and heat exchangers as well as ground source heat pumps. The industry has a large supply chain contribution, with 62% additional market value uplift due to the supply chain, this is relatively high compared to other renewables[1].

15.9 Energy and Utility Skills have produced a demonstration of the large scale renewables supply chain as shown below[122].

[121] The UK Renewable Energy Strategy. HM Government July 2009

[122] Energy and Utility Skills, Sector Skills Mapping in the Environmental Technology Sector, 2006



Source: Energy and Utility Skills, 2006

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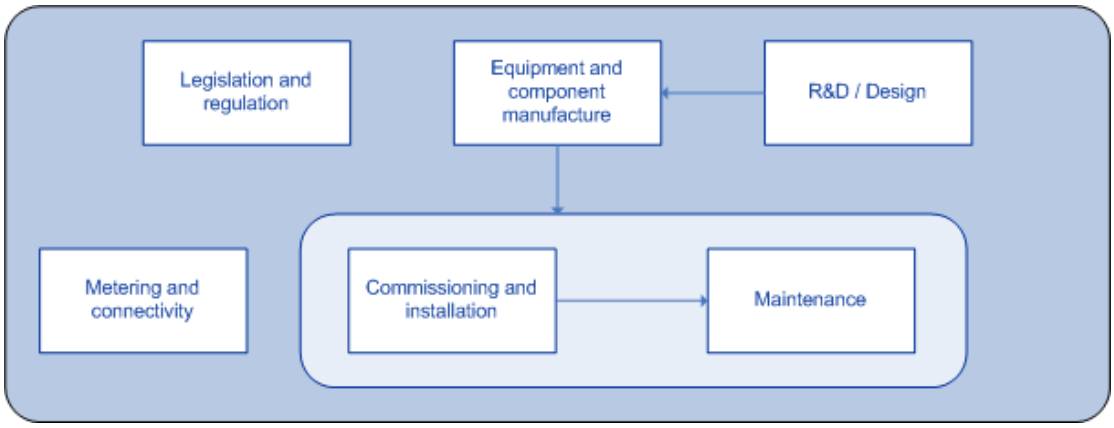


Source: Energy and Utility Skills, 2006

Investment Trends

15.11 The Carbon Trust report on LECGS investment trends does not include this subsector, suggesting that there has been limited activity[123].

East Midlands Supply

15.12 The ekosgen survey found 26 businesses operating in the sector, of which 11 identified this as their main sector. 18 business supply to the sector.

15.13 Innovas estimate that East Midlands does not have a regional comparative advantage in this sub sector, with 6.24% of GVA for the sector, although this is not considered one of the regions with below average performance. The Ground

[123] Investment Trends in European Clean Energy, Carbon Trust, June 2007

Source and Heat Pump Association has 44 members that are based in, or serve, the East Midlands (many of which provide a number of micro renewable services including solar). The Renewable Energy Association also has a member directory with records of companies operating in different technologies and in different regions.

15.14 The East Midlands Energy Strategy recognises the need to promote heat producing renewable technologies, through building market demand, supporting supply chains and addressing barriers to the further development of these technologies but makes no other mention of this sub sector.

East Midlands Demand

15.15 The universal nature of heat pump technology means that demand in the region is likely to be similar to other locations. There is little information regarding levels of installation, both in terms of domestic and public sector or commercial installations.

Higher Education

15.16 The region is well placed in terms of research and development in the sector generally, with the CREST centre at Loughborough and the Energies Technology Research Institute at Nottingham University. Neither the CREST centre or the group at Nottingham University have a specialism in this sub sector.

The Energy Technology Institute

15.17 The ETI have a Buildings Technology Programme, which looks to address the carbon produced by domestic homes. It is unclear whether there is potential for the geothermal sub sector, in particular ground source heat pumps, to engage with this programme.

Skills and Capabilities

15.18 The key competencies required for this micro generation sub sector are electrical engineers, electricians, and skills in pipe and systems laying. The Occupational and Functional Map of the UK Renewable Energy Sector states that employees with multi skilled and flexible approaches are required by this sub sector (presumably down to the relatively small scale of installations which require a single contractor). Design and manufacture of heat pumps, control systems and components requires easily transferable engineering, design and electrical skills.

Business Description

15.19 Business classification codes are not always a perfect match to the industrial sector we are trying to identify. Therefore to give some sense of the level of fitness of each code, they have been assigned on of the following codes green – good/near exact fit, orange – moderate fit, red – poor/low fit.

SIC codes[7]		Thompson codes		Yell codes	
Research and Development					
73.10 : Research and experimental development on natural sciences and engineering		64700 : Research Organisations		00046 : Science & Research Consultants	
29.12 : Manufacture of pumps and compressors		62580 : Pump Manufacturers		03331 : Pumps & Pumping Eqpt	
29.11 : Manufacture of engines and turbines, except aircraft, vehicle and cycle engines		31520 : Engine Manufacturers & Distributors		02474 : Engine Mfrs & Suppliers	
31.20 : Manufacture of electricity distribution and control apparatus		30590 : Electricity Generating & Distributing Equipment		02415 : Electricity Generating Eqpt	
31.10 : Manufacture of electric motors, generators and transformers		29600 : Electric Motor Manufacturers		08765 : Architects	
73.20 : Research and experimental development on social sciences and humanities		30350 : Electrical Testing & Inspecting		02480 : Architectural Services	
743 : Technical testing and analysis		04420 : Architects		00097 : Architectural Technologists & Technicians	
45.21 : General construction of buildings and civil engineering projects		04422 : Architectural Services		2488 : Constructional Engineers	
45.34 Other building installation		04424 : Architectural Technologists		05005 : Electricians & Electrical Contractors	
45.31 Installation of electrical wire and fittings		31600 : Engineers - General		03345 : Structural Engineers	
40.12 : Production of electricity		21555 : Construction Contractors - General		06020 : Electricity Supply Companies	
40.11 : Transmission of electricity		30580 : Electricians & Electrical Contractors		04525 : Heat Exchangers	
75.11 : General (overall) public service activities		31600 : Engineers - General			
		30590 : Electricity Generating & Distributing			

		Equipment			
		30586 : Electricity Companies			

Business Directories/Trade Associations

15.20 The Ground Source and Heat Pump Association is the trade association for the sub sector. The organisations provide benefits to members, share best practice and encourage excellence, and represent the industry to influence Government policy.

16 Renewable Energy: Solar/ Photovoltaic

Solar/Photovoltaic
Rating: High
Solar/Photovoltaic – This sector is one of the fastest growing globally, with a 70% increase in capacity in 2008 and an international market value of £141bn. The UK has a 3.12% share of this market and PV exports represent ¼ of all LCEGS exports from the UK. There is political drive for further installations in the UK, principally through the domestic sector through both solar thermal and photo-voltaic. This research found 60 businesses operating in the sector in the East Midlands, with a total of 640 people in employment. Both the CREST research centre at Loughborough University and the Energy Technology Research Institute at Nottingham University have research groups examining thin film PV, PV materials and devices, low cost manufacturing processes and passive solar technologies. This body of research is an important opportunity for sector development in the region.

Global Market Situation

16.1 Grid connected solar photovoltaic (PV) has been the fastest growing power generation technology globally with a 70% increase in existing capacity in 2008 (up to 13 GW)[124] and with a sixfold increase since 2004. Spain has become the clear market leader with 2.6 GW of new capacity installed in 2008, surpassing Germany (the previous global leader, and still with most total installed capacity). Other leading markets include the USA, South Korea, Italy and Japan. The international market value of this subsector stands at £141.98bn, which represents 4.66% of the total global LCEGS market.

16.2 The main export markets for UK companies include China (£0.156bn), Spain (£0.051), S. Korea (£0.050bn), Malaysia (£0.055bn), and India (£0.037bn). The main competing markets include the U.S.A (£0.037bn), Germany (£0.037), France (£0.040bn). The global growth markets for Level 3 photovoltaic include China, Hong Kong, Malaysia, Pakistan and S. Korea[125].

National Market Situation

Size of sub-sector	Proportion of UK market	UK share of global market	No. of Businesses	No. of employees
£4.43bn	14.23%	3.12%	2,262	38,007

[124] Renewables Global Status Report, REN 21, 2009

[125] Low Carbon Goods ands Services: an industry analysis, Innovas Solutions 2009

16.3 The sub sector is predicted a compound growth rate figure of 66.55% or £2.95bn by 2015[1]. The Innovas report shows that the UK photovoltaic sector contributes to just over a quarter of the UK LCEGS exports (£1.143bn, 25.83%)[1].

16.4 The UK Renewable Energy Strategy has stated that that the UK has significant solar resources and that photovoltaic panels can generate energy for on-site use or for export to the grid. However, while the strategy sets a target of more than 30% of electricity to be generated from renewables by 2020, it does not suggest that a significant proportion of this will be provided by photovoltaic[126]. The current level of energy generated from solar photovoltaics is low compared to other renewables (17GWh in 2008)[127].

Political Drivers in the Subsector

16.5 The Renewable Energy Strategy[128] states that the UK has significant solar resource. Government attention on this sub sector has been focused on small scale and domestic or community uses rather than large scale grid connected installations. The 2008 Energy Act introduced the Clean Energy Cash-Back scheme, which includes Feed-In Tariffs (FITs). Theses are designed to support micro-and small-scale renewable electricity projects where generation takes place either on-site or locally, which would be well suited to a small photovoltaic system.

16.6 In April 2007 the Code for Sustainable Homes came into operation as the national standard for sustainable new build homes. New homes are designed and assessed against the Code which include, where appropriate, small-scale renewable energy systems. The current standard for publicly-funded housing (Code level 3) includes solar thermal or photo voltaic panels.

Supply Chain/Niches

16.7 The photovoltaic supply chain represents 35% of the subsector UK market value[1]. Key components of the supply chain include PV cell production, thin film production and the manufacture and supply of electronic and electrical components and chemicals.

16.8 The UKTI report classifies the UK photovoltaic sectors on the relative strengths in terms of the following functions: Engineering design and consultancy, manufacturing and supply, and project development and regulation. This is summarised with an overall indication of strength. Photovoltaic was rated as strong in manufacture and supply, and research and development. The remaining classified as moderate or patchy strengths, including the overall rating[129]. The UK (along with most of the EU) lags behind the major producers which include China, Japan, Germany, Taiwan and the USA. India has recently emerged as an aspiring producer of solar PV.

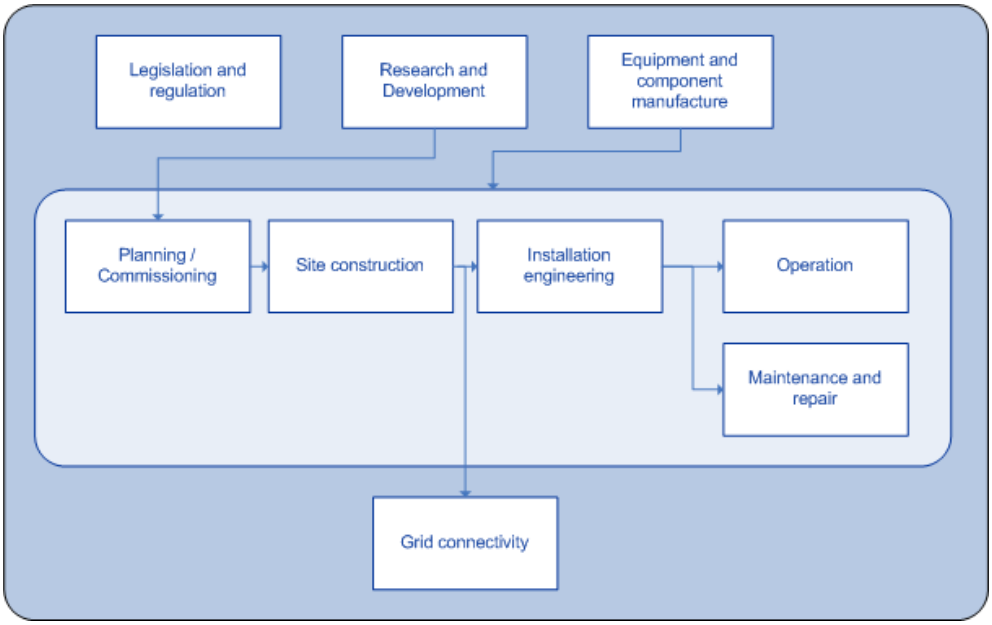
[126] The UK Renewable Energy Strategy. HM Government July 2009

[127] http://stats.berr.gov.uk/energystats/dukes7_4.xls

[128] The UK Renewable Energy Strategy, 2009

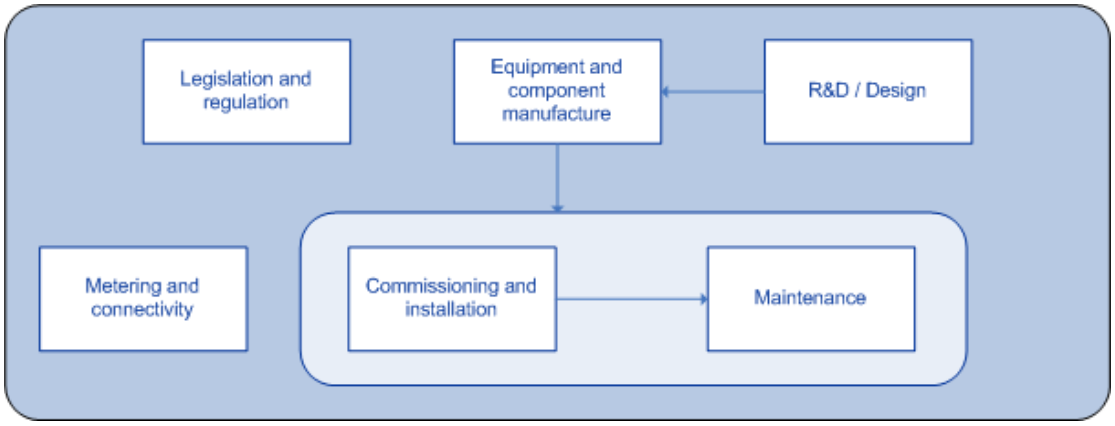
[129] Market Opportunities in Environmental Goods and Services, Renewable Energy, Carbon Finance and CATs – Overview Report. UKTI, October 2008.

16.9 Energy and Utility Skills have produced a demonstration of the large scale renewables supply chain as shown below[130].



Source: Energy and Utility Skills, 2006

16.10 The Energy and Utility Skills report similarly illustrates a small scale renewables supply chain as shown below[7].



Source: Energy and Utility Skills, 2006

Investment Trends

16.11 The Carbon Trust report on investment trends does not mention the sub sector, which suggests that activity has been limited[131]. However, globally there has been significant recent investment from the private sector in PV (in 2008 exceeding $15

[130] Energy and Utility Skills, Sector Skills Mapping in the Environmental Technology Sector, 2006

[131] Investment Trends in European Clean Energy, Carbon Trust, June 2007.

billion), including large flows of equity and venture capital investment, at least until the late 2008 market crash.[132]

East Midlands Supply

16.12 Innovas estimate that East Midlands does not have a regional comparative advantage in this sub sector, with 7.46% of GVA for the sector, although it is not considered one of the regions with below average performance. London accounts for over a quarter of GVA in this subsector (25.17%)[1].

16.13 The ekosgen survey of businesses showed 60 businesses operatin gin the sector, of which 37 identified it as their main sector. 48 business supply to the sector.

East Midlands Demand

16.14 The East Midlands current photovoltaic capacity (off grid) stands at 0.6MW (2008/09), whereas the current target set by BFF is 2MW[133]. As well as PV, solar thermal is an increasingly important part of the domestic market.

Higher Education

16.15 The region is well placed in terms of research and development in the sector, both generally and specifically in photovoltaics, with the CREST centre at Loughborough and the Energies Technology Research Institute at Nottingham University.

16.16 The CREST centre has two research groups of relevance to the sub sector. The applied PV systems group have first class outdoor photovoltaic test facilities and facilities for controlled laboratory investigations. The topics currently being investigated emphasise the performance of PV from a long-term systems perspective. The research focuses on thin-film PV and its integration into buildings. Thin-film materials are currently of lower efficiency and shorter guaranteed lifetime but have a significant potential for cost reduction through mass production and integration into building elements, and have future potential.

16.17 The second CREST centre research group's focus is on PV materials and devices, developing lightweight and flexible solar cells with applications for both building integration and space exploration.

16.18 The Energies Technology Research Institute at Nottingham University similar has two research groups of relevance. Photovoltaic is an emerging area within the renewable energy production research group, with physicists considering the fundamentals of and materials for solar cells, and materials engineers investigating low cost manufacturing processes for flexible photovoltaic applications.

16.19 The energy efficiency in the built environment research group at Nottingham University focus on the development of technologies making use of renewables for building applications. This includes solar-driven cooling system, solar louvre building-integrated collector, building integrated PV and wind turbines, solar metal roofing, thermal diode cladding wall, light pipe, integrated solar system for lighting,

[132] Renewables Global Status Report, REN 21, 2009

[133] Reviewing Renewable Energy and Energy Efficiency Targets for the East Midlands. East Midlands Regional Assembly. June 2009.

ventilation and heating, hybrid fuel cell heat pump system, and rainwater-ground source heat pump.

The Energy Technology Institute

16.20 The ETI does not have a technology programme in this sub sector.

Skills and Capabilities

16.21 In terms of installation of PV systems (mainly at a micro level) the skills required include engineering skills (mechanical, electrical and thermal technology), and qualified electrician skills. Installation and maintenance skills at craft level are increasingly required.

Business Description

16.22 The table below identifies the relevant business classification codes for the sector. As previously discussed, business classification codes are not always a perfect match to the industrial sector we are trying to identify. Therefore to give some sense of the level of fitness of each code, they have been assigned one of the following codes green – good/near exact fit, orange – moderate fit, red – poor/low fit.

SIC codes[7]	Thompson codes	Yell codes
Research and Development		
73.10 : Research and experimental development on natural sciences and engineering	64700 : Research Organisations	00046 : Science & Research Consultants
3162 : Manufacture of other electrical equipment not elsewhere classified	30710 : Electronic Component Manufacturers & Distributors	02456 : Electronic Components
31.20 : Manufacture of electricity distribution and control apparatus	30590 : Electricity Generating & Distributing Equipment	02415 : Electricity Generating Eqpt
24 : Manufacture of Chemicals Products	17100 : Chemical Manufacturers	1253 : Chemical Mfrs & Suppliers
73.20 : Research and experimental development on social sciences and humanities	64700 : Research Organisations	00046 : Science & Research Consultants
743 : Technical testing and analysis	30350 : Electrical Testing & Inspecting	08765 : Architects
74.20 : Architectural and engineering activities and related technical consultancy	04420 : Architects	02480 : Architectural Services
45.21 : General construction of buildings and civil engineering projects	04422 : Architectural Services	00097 : Architectural Technologists & Technicians
45.34 Other building installation	04424 : Architectural Technologists	2488 : Constructional Engineers
45.31 Installation of electrical wire and fittings	31600 : Engineers - General	00335 : Solar Energy
40.12 : Production of electricity	21555 : Construction Contractors - General	05005 : Electricians & Electrical Contractors
40.11 : Transmission of electricity	72110 : Solar Energy Equipment - Suppliers & Installers	06020 : Electricity Supply Companies
	30580 : Electricians & Electrical Contractors	
	30586 : Electricity Companies	

Business Directories/Trade Associations

16.23 The Renewable Energy Centre website holds a database of businesses in the solar and photovoltaic sub sector, which includes manufacturers and suppliers, mobile and off-grid system suppliers and companies involved with photovoltaic for transport.

16.24 The Solar Trade Association (STA) the act to regulate the activities and standards of its members. The STA also act as an enquiry centre for the public, industry and governmental bodies. It provides information to promoting greater understanding of the advantages of solar energy systems. Membership is made up of the companies that produce of solar collectors and associated equipment and also those that install systems in the UK. The association acts as a lobbying body for the sub sector.

17 Emerging Low Carbon: Alternative Fuels – Vehicles

Alternative Fuels - Vehicles
Rating: Med
This sector includes both alternative fuels and alternative vehicles such as hybrid and electric vehicles, making it a globally important sector. Nationally it is proposed that the UK is poorly placed to make any significant contribution to the challenges of a technology shift towards low carbon power trains – largely because the relevant R&D is being conducted in the OEM home markets i.e outside the UK. However, it is considered that it will be possible to attract R&D to the UK through a long term large scale demand side intervention. Politically, there is considerable support for growth of this sector, with a package of measures to strengthen the sector introduced in 2009. Within the region, this research identified 21 companies employing 1,560 people. The region does however have a strong presence within transport equipment and therefore this might present an important niche opportunity. The presence of CENEX, the UK's first Centre of Excellence of low carbon and fuel cell technologies at the University of Loughborough and the Energy Technology Institute's Plug in Vehicle Economics and Infrastructure project may provide important opportunities for the sector. Therefore, this is small but strategically important sub-sector for the region.

17.1 This sector includes both alternative fuels for use within the traditional internal combustion engine, as well as ultra low carbon vehicles such as battery electric (EV), plug in electric (PHEV), hybrid electric and fuel cell vehicles. Hybrid electric vehicles combine petrol or diesel engines with powertrains providing electric assistance varying from mini and mild hybrids to full and plug-in hybrids.

Global Market Situation

17.2 The international market value of this subsector stands at £340.13bn, which represents 11.17% of the total global LCEGS market[134]. Currently, countries like Japan and Germany are leading R&D in terms of batteries, hybrid, fuel-cell and hydrogen power chains[135].

17.3 Several major car manufacturers have been producing full hybrids for a number of years (e.g. Toyota has been producing its Prius since 1997). Whilst the market penetration of HEV and EVs is increasing, their share of the car market is small[136].

[134] Low Carbon Goods ands Services: an industry analysis, Innovas Solutions, 2009

[135] An Independent Report on the Future of the Automotive Industry in the UK. New Automotive Innovation and Growth Team (NAIGT), May 2009

[136] Delivering the low Carbon economy – Business opportunities for UK manufacturers, EEF, January 2008

This market is being driven by ambitious regulatory standards coupled with penalties and incentives at an EU level. The recently adopted EU CO_2 target for cars is 130g/km by 2015 (averaged across a manufacturer's sales) and 95g/km by 2020[137].

17.4 On 17 December 2008 the European Parliament and Council found an agreement on the Climate and Energy Package. As a result, the Renewable Energy Directive (Directive 2009/28) entered into force on 25 June 2009 and is going be transposed to the national legislation December 2010. The Renewable Energy Directive will shape the future biofuel policies of the EU Member States. Its core elements are the 10% binding target for renewables in transport and the introduction of a comprehensive and unparalleled set of sustainability criteria that biofuels need to fulfill to be counted towards the target.

17.5 The Renewable Energy Directive was discussed within a legislative package also containing the Fuel Quality Directive (Directive 2009/30). This Directive sets technical specifications for fuels, together with a target for the reduction of life cycle greenhouse gas emissions. Entered into force in June 2009, the Fuel Quality Directive will be transposed into national legislation by December 2010 at the latest.

17.6 Likewise in the US, the Obama-Biden comprehensive New Energy for America plan aims to put 1 million Plug-In Hybrid cars on the road by 2015, as a result of this it is expected that there will be a step change in the US market in the next few years.

National Market Situation

Size of sub-sector	Proportion of UK market	UK share of global market	No. of Businesses	No. of employees
£12.61bn	11.82%	3.71%	6521	104,578

17.7 Alternative Fuels for Vehicles shows a high forecast growth rate in the Low Carbon sector, with a compound growth rate figure of 46.16% or £8.51 billion by 2015[1].

17.8 The automotive industry is a pivotal part of the UK manufacturing sector adding value of £9.5bn to the UK economy and directly employing around 180,000 people[138]. The King Review suggested that the development of hybrid and electric vehicle technologies could result in cars emitting 50% less CO_2 than today's equivalent models[139]. Whilst car production from UK owned companies has collapsed, the UK remains a key location for car manufacturers from around the world. A flexible and skilled manufacturing workforce has led to significant levels of inward investment in automotive related engineering across the UK.

17.9 UK sales of alternative vehicles increased more than twenty fold between 2000 and 2006, but still represents less than 0.5% of new registrations in 2006

[137] http://ec/europa.eu/environment/air/transport/co2/co2_home.htm

[138] Ultra-low carbon Vehicles in the UK. HMG April 2009

[139] Professor King (2007), the King Review of Low Carbon Cars – Part 1. HM Treasury

17.10 NAIGT have stated that the UK is poorly placed to make any significant contribution to the challenges of a technology shift towards low carbon power trains – largely because the relevant R&D is being conducted in the OEM[140] home markets i.e. outside the UK. However, it is NAIGT's view that it is possible to attract some of this R&D activity into the UK through a long-term, large scale demand side intervention i.e. the UK needs to become a leading market for such low-carbon vehicles[2].

17.11 Growth of transport bio-fuels in the UK has shown a rapid growth in the last three years, growing from 264million litres in 2006, 499million litres in 2007[141] and 1,250million litres for 08/09[142]. 82% of this was biodiesel, the remainder bio-ethanol, with a small amount of biogas (0.4m kg, less than 1%). 92% of biofuels were imported into the UK, with the USA being the highest contributor at 32%.

Political Drivers in the Subsector

17.12 In April 2009, the Government set out in *Ultra-low carbon vehicles in the UK*[143] a package of policy measures to strengthen Britain's capacity as a site for the development and production of ULCVs and drive their phased update by the British Public.

17.13 This includes the following investment activity[144]:

- The Low Carbon Vehicles Innovation Platform worth £140m – looking to accelerate the market introduction of low carbon road transport vehicles. This includes:
- The Low Carbon Vehicle Demonstrator Programme – trialling 340 ULCVs across Britain, worth £25m;
- £10m to support for the installation of electric vehicle charging infrastructure in a number of UK cities through the Plugged in Places Framework, with an additional £10m for accelerated deployment from 2010 onwards
- Government funding worth £230m will be made available from 2011 to reduce the price of electric and plug-in hybrid cars by around £2,000 - £5,000.

17.14 The UK Government introduced the Renewable Transport Fuel Obligation to reduce carbon emissions from road transport by setting long term targets for increasing the use of renewable fuels in the UK. Most fossil fuel used for road transport in the UK is refined or imported by one of 15 suppliers, and the RTFO puts an obligation on these companies. In 2008/09, the obligation was to supply 2.5% biofuel. The trade association for the sector describe opportunities for the biofuels market as follows:

[140] Original Equipment Manufacturer

[141] UK Report to the European Commission under Article 4 of the Biofuels Directive (2003/30/EC). Promotion and Use of biofuels in the UK during 2007

[142] Annual Report and Accounts 2008/09 Renewable Fuels Agency

[143] Ultra-low Carbon Vehicles in the UK. HMG (2009), www.berr.gov.uk/files/file51017.pdf

[144] The UK Low Carbon Industrial Strategy. HMG July 2009

'The Renewable Transport Fuel Obligation had a turbulent first year, with US subsidies, scaled back targets and serious errors in the legislation. Despite this, UK-produced biofuels are notching up impressive results on GHG savings and sustainability, with new plant entering production over the next 12 months. The longer term looks much better. The Renewable Energy Directive will require 10% of transport energy to be renewable by 2020 – and biofuels will have the lion's share of this as the only technology likely to be available on the required scale[145]*'.*

Supply Chain/Niches

17.15 Manufacturing is an important part of the alternative fuels for vehicles sector sub-sector representing 40%[1], a reflection of the developed nature of the technology. The supply chain for this sub-sector is valued at 66% of the whole subsector[1].

17.16 EEF have identified two significant opportunities for UK industry in the hybrid sector, namely: 1) Development and manufacture of hybrid powertrains[146], 2) Niche electric vehicles.

17.17 Hybrid Powertrains:

- The development of a single hybrid powertrain including technologies such as control systems and electric drivetrains.
- The development of diesel hybrid technology targeted at the European market also represents an important opportunity.

17.18 Niche Electric Vehicles

- The market for electric urban delivery vehicles is set to expand as market conditions make them more favourable. The UK automotive's industries expertise in electric powertrain technology and its significant production of commercial vehicles makes it ideally placed to take advantage of this emerging market.

17.19 Biofuels:

- As stated above, 92% of biofuels are imported. Under World Trade Organisation rules, the UK Government is not able to favour UK producers, however, it has set in place an element of market certainty which will favour investment.

Investment Trends

17.20 Between 2003 and 2006, significant amounts of venture capital funding went into hydrogen based generation/fuel cell companies with €149m invested [147].

East Midlands Supply

[145] Personal Communication, Renewable Energy Association

[146] The powertrain refers to the group of components in a motor vehicle that generate power and transfer and convert it into motion i.e. the engine, transmission, driveshafts, differentials and the final drive.

[147] Investment Trends in European Clean Energy 2003-2006 - What Bubble or Carbonated Fizz? A study commissioned by Carbon Trust Investments and carried out by Cleantech Advisors LLC

17.21 Findings from the ekosgen survey of businesses found 21 businesses operating in the sector, of which 10 identified it as their main sector. 16 busineses supply to the sector.

17.22 Innovas estimate that GVA for the sector in the East midlands is 3.51% of the GVA for the sector, and therefore below average performance. However, this goes against other evidence which identifies the transport equipment sector is of regional significance[148]. The presence of companies such as Caterpiller who occupy a niche vehicle market may represent an important opportunity in this sector.

17.23 A recent feasibility study into the implementation of a large scale anaerobic digestion facility in the East Midlands found that a 40kT facility could produce enough vehicle fuel for application such as 105 dual fuel buses or 350 local taxis. The report also found that there was sufficient demand from regional transport and logistical companies for such fuel.

17.24 The region is an important supplier of both sugar beet and oilseed rape, with 22% and 25% of England's overall production of these crops. This is especially significant given that the region possesses just 13% of England's total farmland[149]

East Midlands Demand

17.25 Between 19966 and 2006, the number of people with no car in the East Midland fell from 28% to 19%, compared to 29% to 24% for England overall. The East Midlands therefore has one of the highest levels of car ownership of all the English regions[150].

Higher Education

17.26 Based at the University of Loughborough, Cenex is the UK's first Centre of Excellence for low carbon and fuel cell technologies. By encouraging the early market adoption of low carbon and fuel cell technologies in automotive applications, Cenex will assist UK industry to develop a supply chain capable of competing in global markets, as well as showcasing UK expertise to encourage inward investment. The Centre offers the potential for innovation targeting lower carbon emissions from vehicles of all types, from cars, vans and buses through to trucks, trains and non-road mobile machinery.

The Energy Technology Institute

17.27 The Energy Technologies Institute (ETI) has launched an ambitious Plug-in Vehicle Economics and Infrastructure project, committing £3m to the first stage. This project will enable the potential role and economics of plug in vehicles as one component of future low carbon transport to be evaluated under numerous different scenarios.

Skills and Capabilities

17.28 Automotive employers have identified four major workforce skills development issues[151]:

[148] Regional Economic Strategy. Evidence Base

149 https://statistics.defra.gov.uk/esg/datasets/RegCountUA_08.xls

150 http://www.dft.gov.uk/adobepdf/162469/221412/221541/224511/439977/regtransportstats2008.pdf

- Team leader training
- B-IT and lean techniques
- Top and senior organisational management
- Levels 3, 4 and 5 occupational skills

151 SEMTA Sector Skills Agreement, January 2006

Business Description

17.29 There are three main areas of business activity:

- Drive chains and Batteries
- Electric Vehicles
- Low Carbon Vehicle Infrastructure
- Biofuels

17.30 The table below details the relevant business classification codes for the alternative fuel vehicles sector. Those SIC codes relevant to the small scale renewables supply chain are also incorporated into the table. As previously discussed, business classification codes are not always a perfect match to the industrial sector we are trying to identify. Therefore to give some sense of the level of fitness of each code, they have been assigned one of the following codes green – good/near exact fit, orange – moderate fit, red – poor/low fit, X – representing the polluting industry or client industry itself.

SIC codes[7]		Thompson codes		Yell codes	
Research and Development					
34.10 : Manufacture of motor vehicles		20615: Computer Aided Design		01165 : Vehicle Manufacturers	
29.52 : Manufacture of machinery for mining, quarrying and construction		31520 : Engine Manufacturers & Distributors		02474 : Engine Mfrs & Suppliers	
31.10 : Manufacture of electric motors, generators and transformers		59050 : Plant & Machinery Manufacturers		05618 : Machinery Mfrs	
31.40 : Manufacture of Accumulators, Primary Cells and Primary Batteries		29600 : Electric Motor Manufacturers		02436 : Electrical component manufacturers	
31.61 : Manufacture of electrical equipment for engines and vehicles not elsewhere classified		06940 : Battery suppliers		02433 : Electric vehicles	
29.14 : Manufacture of bearings, gears, gearings and driving elements		13460 : Car component manufacturers		03567: Fuel Mfrs	
3120 : Manufacture of Electricity Distribution and Control Apparatus		15832 : Battery manufacturers and suppliers		08131: Oil Fuel Distributors and Suppliers	
5112 : Agents involved in the sale of fuels, ores, metals and industrial chemicals		30710 : Electronic component manufacturers and distributors		06629: Oil and Gas Exploration Companies	
5151 : Wholesale of solid, liquid and gaseous fuels and related products		31500 : Engine component manufacturers		06634: Oil Cleaners and Purifiers	
		29905 : Electric vehicles		06635: Oil Companies	
		30590 : Electricity Generating and Distributing Equipment		06636: Oil and Gas Fuel Services/Supplies	
		38120 : Fuel Dealers			
		54000 : Oil Companies			
		38120 : Fuel Dealers			

		54050 : Oil Fuel Distributors			
		54125 : Oil and Gas Exploration Supplies and Services			

Business Directories/Trade Associations

- Society of Motor Manufacturers and Traders (SMMT)
- Low Carbon Vehicle Partnership (LowCVP)
- UK Petroleum Industries Association (UKPIA)
- Renewable Energy Association

18 Emerging Low Carbon: Additional Energy Sources (fuel Cells)

Additional Energy Sources (Fuel Cells)
Rating: Medium
Fuel cells commercialisation is developing rapidly across the world, with a recent DTI/Carbon Trust report estimating that the global market potential will reach £14bn by 2011. The sector currently small in the UK, but expertise spans the length of the value chain from R&D to systems integration, financing and maintenance. The region has significant HEI capabilities in this area, including the home of Cenex, the UK's first national centre for low carbon and fuel cell technologies at Loughborough University, represents significant capacity for the region. This research found 6 businesses operating in the sector, including 2 for which this is their main sector. This sector is therefore small but strategically important sub-sector to the region.

18.1 The Innovas report describes this sub-sector as future sources of energy currently in development. Whilst a full definition is unavailable it covers technologies that are not yet widely commercially exploited including hydrogen pyrolysis, hydraulic accumulators, compressed air energy storage, molten salt batteries and fuel cells.

18.2 Of these, the most significant are hydrogen by pyrolysis and fuel cells. Hydrogen by pyrolysis uses high temperatures to break down waste materials in the absence of oxygen. The waste is broken down producing a gas known as Syngas (85% hydrogen) which can be used for combustion. This technology is used in Japan and some parts of Europe but with little interest in the UK. The environmental benefits are unclear[152] and this paper focuses on opportunities associated with fuel cells.

Global Market Situation

18.3 The international market value of this subsector stands at £36.16bn. This represents 1.19% of the total global LCEGS market[153].

18.4 Fuel cell commercialisation is developing rapidly across the world. Between 2002 and 2006 the number of units deployed has expanded by up to 70% each year[154]. Only 0.2% of this market was in the UK. This is substantially lower than the Innovas estimate that the UK's share of the global market value is 3.3%. The worlds leading countries in fuel cell development are Japan, Germany, USA and Canada which all dedicate substantial and sustained government support towards fuel cell development[155]. A recent report for the DTI and Carbon Trust estimated the global

[152] Briefing, Pyrolysis, Gasification and Plasma, Friends of the Earth, January 2009

[153] Low Carbon Goods ands Services: an industry analysis, Innovas Solutions, 2009

[154] Fuel Cells UK

[155] UK Fuel Cell Development and Deployment Roadmap, Fuel Cell UK, 2005

market potential for fuel cells at £14 billion by 2011, with significant growth thereafter as the technology becomes more widespread[156].

National Market Situation

Size of sub-sector	Proportion of UK market	UK share of global market	No. of Businesses	No. of employees
£1.19bn	1.12%	3.3%	607	10,284

18.5 Innovas estimate that market value for the Additional Energy Sources subsector will grow by a compound growth rate of 36.71% or £0.44 billion between 2008/2015[1].

18.6 Currently there are over 100 UK companies contributing to the creation of the global fuel cell industry. This is lower than the Innovas estimate of 607 companies, however, this is likely is some part to a wider definition adopted by Innovas that includes much more of the supply chain. The knowledge and expertise of the UK industry spans the length of the commercial value chain from R&D to systems integration with expertise also in financing and maintenance[157].

18.7 There are three potential markets for fuel cells[158]:

- Passenger cars led by motor manufacturers, as well as other forms of transport;
- Stationary power markets including: 1) commercial and residential distributed generation and combined heat and power systems, 2) remote power for rural and non-grid connected sites, 3) uninterruptible power supply (UPS) and back-up power for critical services.
- Portable Power Markets include batteries and portable generators.

18.8 The most suitable applications for market stimulation are within stationary fuel cells, since the UK has relevant supply side capabilities and could develop other strengths in servicing and maintenance.

Political Drivers in the Subsector

18.9 Fuel cells represent an opportunity to reduce carbon dioxide emissions and improve urban air quality. UK Government support for fuel cell activity is part of the wider DTI Technology Programme as well as the DTI Automotive unit.

18.10 The Fuel Cells and Hydrogen Joint Technology Initiative has launched its second call for proposals. It is looking to fund projects with a value of 140m Euros. The funding is allocated to five specific areas: Transport and refuelling infrastructure, Hydrogen production and distribution, Stationary Power generation and CHP, Early markets and Cross Cutting Issues.

[156] Renewables Innovation Review. Carbon Trust and DTI, 2005

[157] UK fuel cell development and depoloyment Roadmap, Fuel Cells UK. 2005.

[158] Review of UK Fuel Cell Commercial Potential. Carbon Trust February 2003.

Supply Chain/Niches

18.11 Manufacturing is an important part of the additional energy sources sub-sector representing 39.9%[1], the supply chain for this sub-sector. Within component manufacturing, UK strengths are in fuel cell stacks, fuel systems, power electronics and balance of plant and CHP interface. Likewise for systems manufacturing, strengths are in SOFC and PEMFC fuel cell stacks and fuel systems. With limited activity in different types of stack, control systems and service and maintenance.

18.12 Within R&D activity, UK strengths can be found within fuel cell stacks (SOFC, PEMFC), fuel systems (delivery and storage at point of use), with limited activity in other areas such as different stacks, reformers and catalysts, power electronics and systems engineering.

Investment Trends

18.13 Between 2003 and 2006, 149 m Euros of venture capital investment went into hydrogen based generation or fuel cell companies based predominantly in the UK or Germany[159].

East Midlands Supply

18.14 Findings the ekosgen survey of businesses found 6 businesses operating in the sector of which 2 identified it as their main sector. 4 businesses supplied to the sector.

18.15 Innovas identified that the East Midlands has regional comparative advantage in this subsector[1], with 7.71% of the UK GVA for the sector. The Fuel Cells UK website lists two companies with a significant presence in the East Midlands:

- Rolls Royce Fuel Cells Systems Limited – developing megawatt scale Solid Oxide Fuel Cells (SOFC) hybrid systems for stationary power generation;
- Intelligent Energy Holdings Plc – a fuel cell power systems and hydrogen generation development company. Technologies include an advanced PEM fuel cell, distributed hydrogen generation and de-sulpherisation technologies.

18.16 In addition to this the East Midlands is home to CENEX, the UK's national centre of excellence for low carbon and fuel cell technologies. It supports innovation through a Knowledge Transfer Network dedicated to low carbon and fuel cell technologies and through brokering a programme of activities focused on technology demonstration, targeting early market adoption and supply chain development in the automotive sector.

East Midlands Demand

18.17 Fuel Cells UK state that *emda* is keen to assist the commercialisation of large stationary SOFC and mobile PEMFC applications through help with location of premises, formation of energy parks and facilitation of distributed generation projects.

[159] Investment Trends in European Clean Energy 2003-2006. What bubble or carbonated fizz? A study commissioned by Carbon Trust Investments and carried out by Cleantech Advisors LLC. June 2007.

Higher Education

18.18 The table below outlines the main HEI institutions with capabilities with respect to fuel cells.

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

Skills and Capabilities

18.19 The Occupational and Functional maps for hydrogen and fuel cells[160] show that as well as generic skills such as entrepreneurial and management skills, team working, problem solving and customer service, there are various technical skills required as follows:

Level 5-8	Level 4	Level 3
Directors Design Engineer Production Engineer Project Engineer Control and Electronics Engineer Project Manager	Research Engineers Fuel Cell Technical Engineer Operational Managers Electricians	Technical/Assemblers/production Fuel Cell Technician Hydrogen Storage Technician Sales Staff (internal and field) Accounts and Administrative Assistants

Business Description

18.20 Fuel cell companies are likely to be operating in the following areas:

- Fuel Cell Systems

[160] Occupational and Functional Map – Renewable Energy Sector. energy and Utility Skills March 2007

- Test and Sensor Equipment
- Materials and Components
- Services
- Fuel Storage
- Fuel Systems
- Systems Integration
- Hybrid Engines
- Control Systems

18.21 The table below details the relevant business classification codes for the additional energy sources sector. Those SIC codes relevant to the small scale renewables supply chain are also incorporated into the table. As previously discussed, business classification codes are not always a perfect match to the industrial sector we are trying to identify. Therefore to give some sense of the level of fitness of each code, they have been assigned one of the following codes green – good/near exact fit, orange – moderate fit, red – poor/low fit, X – representing the polluting industry or client industry itself.

SIC codes[7]		Thompson codes		Yell codes	
Fuel Cell Systems					
3140 : Manufacture of Accumulators, Primary Cells and Primary Batteries		77490 : Testing, Inspection & Calibration Equipment Manufacturers		03313 : Engineers-Inspecting & Testing	
74.30 : Technical testing and analysis		77510 : Testing, Inspection & Calibration Services		09622 : Testing Eqpt	
3320 : Manufacture of Instruments And Appliances For Measuring, Checking, Testing, Navigating And Other Purposes, Except Industrial Process Control Equipment		17250 : Chemicals & Allied Products		01253 : Chemical Mfrs & Suppliers	
5112 : Agents Involved in the Sale of Fuels, Ores, Metals and Industrial Chemicals		17100 : Chemical Manufacturers		01254 : Chemical Plant & Eqpt	
2411 : Manufacture of Industrial Gases		17120 : Chemical Plant & Equipment		02485 : Chemical Engineers	
40.11 : Production of electricity		31588 : Engineering Materials		06020 : Electricity Supply Companies	
3120 : Manufacture of Electricity Distribution and Control Apparatus		17080 : Chemical Engineers		08764 : Engineers-Consulting	
		30590 : Electricity Generating & Distributing Equipment		02495 : Electrical Engineers	
		31589 : Engineering Services		02490 : Engineers-Design & Development	
		31590 : Engineers - Consulting		02433 : Electric vehicles	
		29905 : Electric vehicles			
		21800 : Control System Equipment			

Business Directories/Trade Associations

- Fuel Cells UK

19 Emerging Low Carbon: Carbon Capture and Storage

Carbon Capture and Storage
Rating: Important
This is a new and potentially globally important sector. The International Energy Agency estimates that CCS will need to be installed on the equivalent of 630 coal-fired power plants by 2030 in order to meet global carbon dioxide reduction targets. If the technology is proven, the sector has significant growth potential in the UK. Significant opportunities exist for UK suppliers of capital goods to the power generation industry. The UK has a strong manufacturing and R&D base in the sector and the capability to supply a number of the major systems, subsystems and components of an advanced coal fired plant. The East Midlands is home to 30% of the UK's coal fired power station output and may be the home of one of the first demonstration projects (Killingholme). The region has significant HEI capacity in this area being the home to the Centre for Innovation in Carbon Capture and Storage at the University of Nottingham. This research found 8 companies operating in this sector. This sector has been rated important to the region.

19.1 Carbon Capture and Storage (CCS) is the removal, transport and storage of the carbon dioxide emissions from a coal plant. Carbon dioxide is 'captured' either before or after combustion, compressed for transportation and injected into a storage site in a suitable geological formation[161].

Global Market Situation

19.2 CCS has the potential to capture up to 90% the carbon dioxide that would otherwise be emitted from large combustion fossil fuel power stations and industrial processes and has the potential to contribute to CO_2 abatement globally. However CCS has not yet been fully demonstrated at commercial scale on a power station[162].

19.3 Estimate for the scale of this market vary significantly as follows:

- The International Energy Agency (IEA) estimates that CCS will need to be installed on the equivalent of 630 coal-fired power plants by 2030 in order to meet global carbon dioxide emissions reduction targets. The IEA value this as a market of approximately $40bn/year. However, the Advanced Power Generation Technology Forum (APGTF) values this new capacity at $1400bn in 2004 prices[1].

[161] Delivering the low-carbon economy – Business opportunities for UK manufacturers. EEF January 2008

[162] Market Opportunities in Environmental Goods and Services, renewable energy, Carbon Finance and CAT. Overview Report. October 2008.UKTI

- Innovas estimate that the international market value of this subsector stands at 13.28bn, which represents 0.44% of the total global LCEGS market[163].

- For this sub-sector the Innovas estimate is probably the most reliable as growth figures are estimated using multiple sources.

National Market Situation

Size of sub-sector	Proportion of UK market	UK share of global market	No. of Businesses	No. of employees
£0.46bn	0.87%	3.48%	234	4,575

19.4 Innovas estimate that market value for the Carbon, Capture and Storage subsector will grow by a compound growth rate of 33.95% or £0.44 billion between 2008/2015[1]. This is mid range forecast compared with other UK LCEGS sectors.

19.5 The value to the UK of new coal-fired power stations, including those fitted or retrofitted with CCS, could potentially reach £1-2 billion a year by 2020. Projections suggest that this could rise to £2-4 billion per year by 2030, equating to £20–40 billion in value in total between 2010 and 2030. Based on this analysis, this level of activity could sustain between 30,000 and 60,000 jobs in the UK, of which around 50% would be jobs associated with existing carbon abatement technologies business activities (such as boiler and steam turbines design and manufacture) and 50% would be jobs associated with CCS services (such as design and manufacture of capture, transport and storage facilities)[1].

19.6 CCS is in the early stages of demonstration, with growth likely to increase significantly once technologies are proven and economically viable[1]. The UK's ability to exploit this sector is less than certain. We have clear strengths in financial and professional services, engineering, design and consulting, project development and management, policy development and a well developed regulatory environment[2]. However, UK has a clear lack of manufacturing and supply capability within the capture and transportation technologies. This suggests that emerging supply chains are potentially weaker in the UK compared to other countries.

19.7 Opportunities for the UK fall into two main categories:

- Supply of capital goods for advanced plant; and

- Licensing of gasification and capture technologies to third parties[1].

19.8 The UK has a world-class manufacturing, R&D and skill base in power, process and offshore engineering. These industries form the basis of the supply of equipment, technologies and skills for clean coal technologies. The infrastructure and depleted

[163] Low Carbon Goods ands Services: an industry analysis, Innovas Solutions 2009

fields of the North Sea oil and gas industry give the UK a competitive advantage in developing the foundations for a CCS system[1].

19.9 The UK has strengths in project management, engineering and financial and legal services which could penetrate the global market[2]. Overall this sub-sector is considered to be a strong sector with moderate UK relative advantage[2].

Political Drivers in the Subsector

19.10 The Climate Change Act 2008 has committed the UK to a legally binding target to reduce greenhouse gas emissions by 80% by 2050 from a 1990 baseline. CCS is the only technology with the potential to substantially reduce emissions from power stations.

19.11 Coal is the most carbon intensive of fossil fuels. In 2006, CO_2 emissions from coal equated to 42% of global energy related emissions, and the IEA estimates that by 2030, this will have risen to 46%. If energy demand rises to the levels predicted total global carbon dioxide emissions could increase by as much as 55% on today's levels. Recognising that coal is abundant and forecast to remain a significant part of global energy systems for the foreseeable future, urgent action is needed to address its significant contribution to global carbon dioxide emissions[164].

19.12 By the end of 2015, at least six of the UK's nineteen coal stations will have closed under the requirements of air quality legislation the EU Large Combustion Plant Directive. It is anticipated that the successor to the LCPD, the Industrial Emissions Directive will close more of the UK's coal capacity in the years after 2015. Other power stations are closing over the period. New coal power stations could prove to be an important way of maintaining diversity in the UK's energy mix and security of supply, particularly with the development of Carbon Capture and Storage technology[2].

Supply Chain/Niches

19.13 The CCS technology chain has three key areas; capture, transport and storage. The supply chain for this sub-sector is valued at 32% of the whole subsector. Likewise, manufacturing activities represent 46.9% of the value of the sector. This sub-sector has the highest proportion of manufacturing activity and reflects the current status of proving the methodology and technology through pilot projects[1].

19.14 Significant opportunities exist for UK suppliers of capital goods to the power generation industry. The UK has a strong manufacturing and R&D base in the sector. A range of transnational companies have significant production facilities and research operations in the UK. UK industry has the capability to supply a number of the major systems, subsystems and components of an advanced coal-fired plant. Areas of particular strength include: supercritical boiler systems, steam turbine generators, gas compressors, air separation units, heat exchanger systems, fans, pumps/valves and pipework[1].

19.15 AEA in a recent report which looked to estimate a value of Carbon Abatement Technologies in the UK identified the following business/activity areas:

[164] Towards a Low carbon Economy – economic analysis and evidence for a low carbon industrial strategy. BIS July 2009

- Project Management
- Engineering (e.g. design)
- Manufacturing/Procurement
- Construction
- Commissioning
- Financial & Legal Services
- Consultancy
- Management of Storage Sites

19.16 Likewise, the CCS Association lists businesses according to the following:

- Manufacturing and Contracting
- Oil and Gas
- Power Generation
- Air Separation
- Coal
- Law
- Banking and Finance
- Consultancy
- Carbon Storage
- Transport

Investment Trends

19.17 The Cleantech investment trends research showed that between 2003 and 2006, very little venture capital funding went into Carbon Capture and Storage companies[165].

East Midlands Supply

19.18 The East Midlands does not have a comparative advantage in this subsector[1], with 7.25% of the UK GVA for the sector. Key East Midlands suppliers include: Alstrom, British Geological Survey, The Coal Authority and EON.

[165] Investment Trends in European Clean Energy 2003-2006. Watt bubble or carbonated fizz? A study commissioned by Carbon Trust Investments and carried out by Cleantech Advisers LSSC. June 2007.

19.19 The ekosgen business survey found 8 businesses operating in this sector, of which 3 identified it as their main sector. 5 business supply to the sector.

East Midlands Demand

19.20 The East Midlands and Yorkshire and Humberside includes almost 35% of the UK's fossil fuel generating capacity, of which over 20% is coal, and is adjacent to the main area of the North Sea gas fields[166]. The Humber is one of five potential locations for CCS projects and cluster development[167].

19.21 There are three coal fired power stations in the East Midlands with a combined installed capacity of 6020MW[168], 30% of UK coal output. All three of which were built at the end of the 1960s and will require retrofitting or replacement under emissions regulations referred to above.

19.22 E.ON has proposed using pre-combustion capture in a feasibility study (announced in 2006) for a possible 450 MW IGCC plant to be built on a site next to the existing Killinghome Power Station (Lincolnshire)[169].

Higher Education

19.23 The Centre for Innovation in Carbon Capture and Storage (CICCS) at the University of Nottingham is an interdisciplinary and international leading centre for research at the interface between science and engineering and international cooperation to accelerate the technological innovation needed for the wider deployment of carbon capture and storage[170]. The university has recently received funding from E.ON and the Engineering and Physical Sciences Research Council to investigate combustion and CO2 capture and transport technologies.

The Energy Technology Institute

19.24 The Carbon Capture Storage Programme aims to create a focused portfolio of CCS research, development and demonstration projects, which will leverage the unique capabilities of its Industry Members to support large-scale rollout of CCS in the UK.

Skills and Capabilities

19.25 The deployment of Carbon Abatement Technologies and CO_2 capture technologies will require a high level and breadth of technical expertise. These competencies are needed to support deployment and also underpin the training of a new generation of engineers and scientists that will be needed in a growing CCS industry. The table below illustrates the main competencies required in each technology area[171].

[166] Carbon Capture and its Storage. Simon Shackley and Clair Gough. 2006

[167] The UK Low Carbon Industrial Strategy. HM Government 2009

[168] Department of Energy and Climate Change/ Energy Statistics

[169] Carbon Capture and Storage Association

[170] http://www.nottingham.ac.uk/carbonmanagement/

[171] Cleaner Fossil Power Generation in the 21st Centuary – A technology Strategy for Carbon Capture and Storage. UK Advanced Power Generation Technology Forum April 2009

	Combustio	Materials	Fabrication Techniques	Catalysts	Membranes	Control and instrument	Fuel	Manufacturi	Math.	Component life integrity	Remote Sensing	Geology	Civil Engineerin	Reliability
Power Plant Efficiency Pulverised fuel		x	x			x	x	x		x				
Power Plan Efficiency (GTs)	x	x	x				x	x	x	x				
Biomass co-use	x	x				x	x		x	x				
Biomass plants	x	x				x	x		x	x				
Post combustion capture		x			x	x		x	x	x				
Oxy fuel	x	x			x	x	x		x	x				x
Novel cycles	x	x	x	x	x	x	x		x					x
Pre-combustion capture	x	x			x	x	x	x	x	x				
CO2 transport		x	x						x					
CO2 stage – mapping									x		x	x	x	x
CO2 storage - monitoring											x	x		x

Business Classifications

19.26 SIC, Yell and Thompson codes identified for each sector have been indentified below. As previously discussed, business classification codes are not always a perfect match to the industrial sector we are trying to identify. Therefore to give some sense of the level of fitness of each code, they have been assigned one of the following colour codes green – good/near exact fit, orange – moderate fit, red – poor/low fit.

SIC codes[7]		Thompson codes		Yell codes	
4521 : General Construction of Buildings And Civil Engineering Works		18632 : Civil Engineers		00295 : Project Management Services	
2852 : General Mechanical Engineering		17080 : Chemical Engineers		05000 : Civil Engineers	
7420 : Architectural and Engineering Activities and Related Technical Consultancy		31590 : Engineers - Consulting		02485 : Chemical Engineers	
2830 : Manufacture of Steam Generators, Except Central Heating Hot Water Boilers		25000 : Design Engineers		03318 : Mechanical Engineers	
3120 : Manufacture of Electricity Distribution And Control Apparatus		30590 : Electricity Generating & Distributing Equipment		02488 : Constructional Engineers	
2921 : Manufacture of Furnaces And Furnace Burners		38450 : Furnaces		03311 : Engineers-Industrial	
2875 : Manufacture of Other Fabricated Metal Products Not Elsewhere Classified Power, Except Aircraft, Vehicle and Cycle Engines		30586 : Electricity Companies		03327 : Plant Maintenance Engineers	
4010 : Production and Distribution of Electricity		54125 : Oil & Gas Exploration Supplies & Services		03344 : Engineers-Project	
4020: Manufacture of Gas; Distribution of Gaseous Fuels Through Mains		54150 : Oil & Gas Extraction		02490 : Engineers-Design & Development	
6030 : Transport Via Pipelines				03307 : Power Processing Eqpt	
6523 : Other Financial Intermediation Not Elsewhere Classified				03112 : Furnaces-Industrial	
				03313 : Engineers-Inspecting & Testing	
				03312 : Instrumentation Engineers	
				06775 : Pipe Line Consultants	
				06777 : Pipe Work Contractors	
				03334 : Pipe Work Engineers	
				06737 : Oil & Gas Exploration Eqpt	

Business Directories/Trade Associations

- Association of Electricity Producers - www.aepuk.com
- UK Carbon Capture and Storage Association - www.ccsassociation.org.uk

20 Emerging Low Carbon: Carbon Finance

Carbon Finance
Rating: Low
Carbon finance is an emerging sector supporting the trade in carbon emissions. The London-based emissions trading exchange leads the world and is more than twice as active as its nearest competitor. Innovas estimate that the international market value of this sub-sector stands at £31bn and is forecast to grow rapidly. Within the UK however, London dominates the market, accounting for 96.6% of sectoral GVA. This research found 10 companies operating in this sector, but only 1 describing it as their main sector. This sector has been rated of medium- low importance for the region.

20.1 Carbon Finance the emerging sector supporting this trade in Carbon emissions. This includes accountancy, carbon management consultancy, financial services, product development, insurance, legal services, monitoring and verification, brokerage services, registry services and market analysis.

Global Market Situation

20.2 The Kyoto Protocol is an international treaty introduced in 2005 to reduce greenhouse gas (GHG) emissions. The Protocol provides the means to monetise the environmental benefits of reducing GHGs. The Protocol and new European Union emissions rules have created a market in which companies and governments that reduce GHG gas levels can sell the ensuing emissions 'credits'. To implement the Kyoto Protocol, the EU and other countries have set up 'cap and trade' systems, under which companies are obliged to match their greenhouse gas emissions with equal volumes of emission allowances. The Government allocates a number of allowances to each company. Any company that exceeds its emissions beyond its allocated allowances will either have to either buy allowances or pay penalties. A company that emits less than expected can sell its surplus allowances to those with shortfalls[1].

20.3 The London-based emissions trading exchange, leads the world and is more than twice as active as its nearest competitor. The EU Emissions Trading Scheme accounts for four-fifths of global carbon trading. The investment flows to developing countries generated by scaling up the Kyoto Protocol Clean Development Mechanism (CDM) could also grow rapidly. Activities in the CDM are estimated to have generated investments of approximately £13 billion in 2006 alone[172].

20.4 Innovas estimate that the international market value of this subsector stands at £31.62bn, which represents 1.04% of the total global LCEGS market[173].

National Market Situation

[172] Commission on Environmental Markets and Economic Performance. BERR November 2007

[173] Low Carbon Goods ands Services: an industry analysis, Innovas Solutions 2009

Size of sub-sector	Proportion of UK market	UK share of global market	No. of Businesses	No. of employees
£5.19bn	4.86%	16.4%	2577	21,766

20.5 Innovas estimate that market value for the Carbon Finance subsector will grow by a compound growth rate of 62.21% or £3.23 billion between 2008/2015[1]. Carbon Finance accounts for nearly 5% of the total UK LCEGS sector.

20.6 The UK is home to Europe's largest low carbon venture capital market, and growth in this area is high[1]. London plays a major international role in Carbon Finance and the UK dominates the global market with 16.40% of the global market value[1]. Within the UK, again London dominates the market in the UK, accounting for 96.6% of sectoral GVA, followed by the South East with 0.63%[1].

20.7 Overall this sub-sector is considered to be a strong sector with strong UK relative advantage[174]. This is partly due to the UK's strength in financial services and open economy.

Political Drivers in the Subsector

20.8 On 23 January 2008, The European Commission published its draft proposals for the review of the EU ETS required under Article 30 of the EU Directive on the EU ETS. The role of the review was to develop the EU ETS in a positive way post-2012 and learn from experiences so far.

20.9 The package contains proposals to implement the decisions agreed by EU heads of State and Government at the 2007 Spring European Council, including a 20 per cent reduction in EU greenhouse gas emissions by 2020, increasing to 30 per cent when there is an international climate agreement; 20 per cent of total EU energy consumption to come from renewables by 2020; and measures to support the development of carbon capture and storage (CCS) including up to twelve CCS demonstration projects.

20.10 The proposals put the EU Emissions Trading Scheme (ETS) at the heart of EU climate policy, including establishing an EU-wide central cap on emissions covered by the EU ETS to 2020 and beyond, ensuring both scarcity and certainty, changed from the current system of Member States setting emissions caps for their own economies.

20.11 For the UK, the Commission's proposals include:

- A reduction of 16 per cent in UK greenhouse gas emissions from sectors not covered by the EU ETS by 2020 from 2005 levels;
- For 15 per cent of the energy consumed in the UK to come from renewable sources by 2020;

[174] Market Opportunities in Environmental Goods and Services, renewable energy, Carbon Finance and CAT. Overview Report. October 2008.UKTI

- For 10 per cent of road transport fuels to come from renewable sources, subject to them being produced in a sustainable way.

20.12 Carbon Trading is increasing affecting all businesses in the UK, with 3 main government initiatives encouraging the trading of carbon between companies of various sizes.

- Climate Change Agreements
- The Carbon Reduction Commitment
- EU Emissions Trading System

Supply Chain/Niches

20.13 The Innovas report does not include a statistics on the supply chain or proportion manufacturing for this sector. Presumably because the sector is made up of companies selling services, consultancy and advice.

20.14 The UK trade and investment report examining UK strengths and capabilities shows that the UK had strengths in financial and professional services, engineering design and consultancy, project development and management, policy development and regulation giving it an overall strong ranking for the sector as a whole[175].

20.15 The Carbon Markets and Investors Association lists the following sub-sectors:

- accountancy,
- carbon management consultancy,
- financial services,
- product development,
- insurance,
- legal services,
- monitoring and verification,
- brokerage services,
- registry services and market analysis.

20.16 The most significant area of work appears to be around carbon management consultancy and financial services.

East Midlands Supply

[175] Market Opportunities in Environmental goods and services, renewable energy, carbon finance and CATS. October 2008.

20.17 The East Midlands has below average performance in this subsector with only 0.27% of UK GVA for this sector. In terms of financial services more generally, the East Midlands has a low location quotient for other financial and business services, suggesting that this sector is not one of the region's strengths[176] and likewise, the Financial Services Sector Skills Council states that the East Midlands does not possess a financial services sector cluster[177].

20.18 The ekosgen business survey found 10 companies operating in the sector, but only stating that it was their main business sector.

East Midlands Demand

20.19 Demand for Carbon Finance services arises from companies desire or requirement to trade in Carbon. As legislation and public opinion forces more companies to participate in CO_2 reduction schemes there will in an increase in demand for the services of the carbon finance sector. GVA within the East Midlands is comparable with most other UK regions except London and the South East, suggesting that the East Midlands demand is likely to be similar to other UK regions.

Higher Education

20.20 No identified centres in this sub-sector.

Skills and Capabilities

20.21 No reports have been identified covering the skills needs of the carbon finance sub-sector.

Business Classifications

20.22 SIC, Yell and Thompson codes identified for each sector have been indentified below. As previously discussed, business classification codes are not always a perfect match to the industrial sector we are trying to identify. Therefore to give some sense of the level of fitness of each code, they have been assigned on of the following colour codes green – good/near exact fit, orange – moderate fit, red – poor/low fit.

[176] Regional Economic Strategy, Evidence Base.

[177] Financial Services Clusters. Financial Services Sector Skills Council, April 2008

SIC codes[7]		Thompson codes		Yell codes	
Accountancy					
7412 : Accounting, Book-Keeping And Auditing Activities; Tax Consultancy		01340 : Accountants		00259 : Accounting & Book Keeping Services	
7414 : Business And Management Consultancy Activities		01420 : Accounting & Book-Keeping Services		08710 : Accountants	
6523 : Other Financial Intermediation Not Elsewhere Classified		32415 : Environmental Consultants		00354 : Environmental Consultants	
6711 : Administration Of Financial Markets		35240 : Financial Services		03381 : Financial Trade Services	
6713 : Activities Auxiliary To Financial Intermediation Not Elsewhere Classified		47830 : Legal Services		01763 : Venture Capital	
6720 : Activities Auxiliary To Insurance And Pension Funding		05480 : Auditors		05529 : Legal Services	
7411 : Legal Activities		20460 : Commodity Brokers		01762 : Auditors	
7430 : Technical Testing And Analysis		35210 : Finance Brokers		01366 : Commodity Brokers	
				03455 : Finance Brokers	

Business Directories/Trade Associations

- The Carbon Markets and Investors Association - www.cmia.net
- The International Emissions Trading Association - www.ieta.org

21 Emerging Low Carbon: Energy Management

Energy Management
Rating: High
This sector includes energy saving, lighting, heating, ventilation and electrical equipment. It is therefore a relatively mature sector and encompasses the likes of the household appliance industry. Demand for improvements in these technologies has been increasing and is largely driven by regulation such as building regulations, the Carbon Emission Reduction Target and Energy labelling. This research found 304 businesses operating in this sub-sector, making it an important sub-sector for the region.

21.1 This sector is a grouping of industries which manufacture energy saving equipment. This includes:

- Energy Saving Lighting Equipment;
- Energy Saving Heating and Ventilation Equipment;
- Energy Saving Electrical Equipment;
- Gas Supply;
- Consulting, Education and Training; and
- Technologies, Research and Development

Global Market Situation

21.2 The international market value of this subsector stands at £73.13bn, which represents 2.40% of the total global LCEGS market[178].

21.3 The household appliance industry is pan-European and is one of Europe's leading industrial sectors. The industry provides direct and indirect jobs for half a million people across Europe[179].

National Market Situation

Size of sub-sector	Proportion of UK market	UK share of global market	No. of Businesses	No. of employees

[178] Low Carbon Goods ands Services: an industry analysis, Innovas Solutions 2009

[179] The Association for the Manufacture of Domestic Appliances

Size of sub-sector	Proportion of UK market	UK share of global market	No. of Businesses	No. of employees
£2.54bn	4.76%	3.3%	1,304	21,897

21.4 Innovas estimate that market value for the Energy Management subsector will grow by a compound growth rate of 36.59% or £0.92 billion between 2008/2015[1]. This is mid range forecast compared with other UK LCEGS sectors.

21.5 Heating accounts for approximately 80% of residential energy demand. Approximately 18m homes have central heating systems and nine out of ten are gas fired. Domestic heating in the UK is therefore a significant source of emissions and boilers account for approximately 60% of those emissions. The UK is the largest gas boiler market in Europe accounting for almost a quarter of annual sales across the continent[180]. The UK is also a major designer and manufacturer of boilers. A number of household names, some British and some foreign owned, have substantial production facilities in the UK. These include Baxi, Worcester, Bosch Valliant and Keston.

21.6 Changes in building regulations requiring that all new boilers installed must be high efficiency condensing boilers resulted in sales of condensing boilers rising from 11% to 95% of total gas boiler sales. Early replacement of existing inefficient boiler stock represents an important opportunity for UK manufacturers[2].

21.7 Micro CHP is the application of cogeneration (i.e. the simultaneous generation of electricity and useful heat) on a small scale e.g. in the home or SME. Following recent Carbon Trust Field trials, there is thought to be considerable potential for micro CHP to expand in the UK.[2] It is believed that the substantial manufacturing base currently producing condensing boilers could be adapted to produce micro CHP units as some manufacturers already are e.g. Baxi and Worcester Bosch. SBGI carried out an assessment of the potential UK market for micro CHP in 2006. The central finding was that with appropriate policy support, micro CHP systems could capture approximately 1/3 of the boiler replacement market by 2015[2].

21.8 However, with both micro CHP and condensing boilers, the lack of government supported financial incentives to reftrofit/replace older boilers may present a barrier to uptake.

21.9 The UK market is considered to have sectoral strengths in engineering design and consultancy, manufacturing and supply, research and development but only moderate strengths in project development and management. This leads to an overall assessment of strong UK comparative advantage for this sub-sector[181].

Political Drivers in the Subsector

21.10 For all of the equipment sub-sectors, improvements in performance are being driven by the changes in the legislative environment including:

[180] Delivering the Low Carbon Economy – Business Opportunities for UK manufacturers. EEF January 2008.

[181] Market Opportunities in environmental goods and services, renewable energy, carbon finance and CATS. October 2008.

21.11 *The Carbon Emission Reduction Target* introduced in 2008 and replacing the Energy Efficiency Commitment provides incentives for utility companies to improve the energy efficiency of the householders they supply. Under CERT, energy suppliers must, by 2011, deliver measures that will provide overall lifetime carbon dioxide savings of 154 MtCO2 – equivalent to the emissions from 700,000 homes each year. It is expected to lead to energy supplier investment of some £2.8bn. This includes measures to promote the use of energy efficient lighting, heating and more recently promotion of real time display devices. The 2006 Energy Review and the 2007 Energy White Paper reaffirmed the Government's commitment to maintain some form of obligation on household energy suppliers until at least 2020, with an ambition level at least equal to that under the Carbon Emissions Reductions Target.

21.12 Changes to Part L of the building regulations putting into force minimum standards in terms of low energy lighting, heating and hot water and control equipment.

21.13 The European commission has recently adopted new regulations which will mean that inefficient lightbulbs will be phased out across the European Union over the next few years. The UK is already one year ahead, thanks to the voluntary phase out initiative[182].

21.14 Energy labelling has made an important contribution to improved efficiencies in the appliances sector which is set to continue as more electrical appliances are brought into the scheme.

Supply Chain/Niches

21.15 The supply-chain for this sub-sector is valued at 45% of the whole subsector. Manufacturing is a significant part of the energy management sub-sector representing 21.4%[1].

21.16 Opportunities exist in production of Energy saving industrial lighting bulbs, production of energy saving industrial lighting systems, industrial lighting control systems, production of energy saving domestic lighting bulbs, production of domestic energy saving heating equipment, building control systems, industrial power factor control equipment, leak detection and maintenance services, consumer equipment maintenance, gas meterage equipment, energy management publications of books and periodicals[1].

Investment Trends

21.17 Between 2003 and 2006, significant amounts of venture capital funding went into this sector with €240m invested in building technology companies such as energy efficient lighting, office equipment and appliance and €359m pumped into Industrial and manufacturing technologies (such as materials, process intensification and sensors and controls) with novel materials showing the greatest share of this investment[183].

East Midlands Supply

[182] Energy Saving Trust

[183] Investment Trends in European Clean Energy 2003-2006 - What Bubble or Carbonated Fizz? A study commissioned by Carbon Trust Investments and carried out by Cleantech Advisors LLC

21.18 The East Midlands has a regional comparative advantage in this subsector[1], with 9.53% of the UK GVA for the sector. Performance of this sub-sector in the East Midlands is considered to be above average.

21.19 The ekosgen business survey found 304 businesses operating in the sector, of which 149 identified it as their main sector. 251 businesses supplied to the sector.

East Midlands Demand

21.20 Whilst there are regional variations in energy consumption across both the domestic and non-domestic sectors, the demand for energy efficient equipment is linked to replacement of appliances, replacements of boilers and new build. On this basis, demand for energy efficient lighting, heating equipment and electrical equipment is likely to be broadly similar to other regions in the UK.

Higher Education

21.21 Institute of Building Technology, University of Nottingham - The Institute, carries out high quality, strategic and applied research into environmental performance of building services, including areas such as energy conservation, renewable energy systems, ventilation and air movement in buildings, indoor air quality and air pollution.

Skills and Capabilities

21.22 Companies in the sector will need to engage in lean manufacturing techniques and improve productivity and competitiveness as customers at the top of the supply chain demand better quality, lower costs and on time delivery. In response, companies are looking to increase productivity by:

- Focusing on added value
- Batch rather than mass production
- Separating the design and marketing of products from production
- Automating production

21.23 These will all give rise to skills changes in the next two or three years.

21.24 High volume, low value work will keep moving overseas and demand for higher-level skills will increase. Although overall employment is declining, there is still a need for the sector to recruit – particularly managers, skilled craftspeople and operatives. A lack of technical and practical engineering skills is the major cause of skill-related problems. Strategic management, entrepreneurship and technical skills such as advanced design skills are crucial to improving productivity. There is also a need for the current workforce to have skills that make them more flexible and adaptable[184].

Business Classifications

[184] www.semta.org.uk

21.25 SIC, Yell and Thompson codes identified for each sector have been indentified below. As previously discussed, business classification codes are not always a perfect match to the industrial sector we are trying to identify. Therefore to give some sense of the level of fitness of each code, they have been assigned one of the following colour codes green – good/near exact fit, orange – moderate fit, red – poor/low fit.

SIC codes[7]		Thompson codes		Yell codes	
Energy Saving Lighting					
3150 : Manufacture Of Lighting Equipment And Electric Lamps		48100 : Lighting Consultants		05567 : Lighting Consultants	
2830 : Manufacture Of Steam Generators, Except Central Heating Hot Water Boilers		48130 : Lighting Contractors		05568 : Lighting Goods Wholesalers	
2923 : Manufacture Of Non-Domestic Cooling And Ventilation Equipment		48390 : Lighting Manufacturers		05570 : Lighting Goods Mfrs	
3162 : Manufacture of other electrical equipment not elsewhere classified		48490 : Lighting Wholesalers		05571 : Lighting Fixtures & Supplies	
2822 : Manufacture Of Central Heating Radiators And Boilers		30250 : Electrical Heating Equipment & Systems		05572 : Lighting Installers & Erectors	
2971 : Manufacture Of Electric Domestic Appliances		16715 : Central Heating Supplies & Equipment		00334 : Heating Eqpt-Electrical	
2972 : Manufacture Of Non-Electric Domestic Appliances		42680 : Heating Appliance Spare Parts		01234 : Central Heating Eqpt	
3001 : Manufacture Of Office Machinery		42700 : Heating Consultants		01622 : Underfloor Heating	
3002 : Manufacture Of Computers And Other Information Processing Equipment		42920 : Heating Equipment - Sales & Service		04528 : Heat Exchangers	
3162 : Manufacture of other electrical equipment not elsewhere classified		42500 : Heat Exchangers		04531 : Heating Appliance Control Eqpt	
		77820 : Thermometers & Thermostats		04533 : Heating Consultants	
		53390 : Office Equipment Manufacturers & Distributors		00332 : Heating Eqpt-Solid Fuel	
				00333 : Heating Eqpt-Gas	
				04534 : Heating Services-Industrial	

				00331 : Heating Eqpt-Oil Fired	
				02439 : Electrical Appliance Mfrs	
				06627 : Office Eqpt Mfrs	
				08771 : Energy Conservation Consultants	

Trade Associations

- Lighting Industry Federation
- Lighting Association
- TACMA – The Association of Control Manufacturers
- TEHVA - The Electric Heating and Ventilation Association
- TMVA - Thermostatic Mixing Valves Association

22 Emerging Low Carbon: Building Technologies

Building Technologies
Rating: Important
22.1 This is a large and important sector, accounting for 1/5 of the total global LCEGS market. The Carbon Trust estimates that buildings alone account for around 40% of the UK's carbon emissions. The Government has indicated that change is needed and will be driven by climate change regulations. The region is home to the Institute of Sustainable Energy Technology at Nottingham University which undertakes research into renewable and sustainable technologies in buildings. This research has found 293 businesses operating in this sector, with 203 stating that this was their main sector. The RDA is already working with this sub-sector through the iNET for Sustainable Construction which facilitates delivery of training in low carbon construction skills and innovation to industry. This sector has been rated highly important to the region.

22.2 The construction industry plays a significant part in Britain's economy. With annual output of around £115 billion, it accounts for around 9% of Gross Domestic Product (GDP) and provides employment for around 3 million workers in the UK[185]. The Innovas definition of Building Technologies includes windows, doors, insulation and heat retention materials and monitoring and control systems[2]. We believe that this misses important elements such as sustainable construction and facilities management. These have been included within the qualitative elements of this report, but it is not possible to reconcile their inclusion within the Innovas estimates of the size of the subsector.

Global Market Situation

22.3 The international market value of this subsector stands at £563.92bn. This is nearly one fifth (18.51%) of the total global LCEGS market[186].

National Market Situation

22.4 The Carbon Trust estimates that buildings alone account for around 40% of the UK's carbon emissions, with non-domestic buildings responsible for approximately half of this. The Government has indicated that change is needed and will be driven by climate change regulations. These changes will provide opportunities for UK companies in a domestic and global market[1].

[185] The UK Low Carbon Industrial Strategy. HM Government 2009

[186] Low Carbon Goods ands Services: an industry analysis, Innovas Solutions 2009

Size of sub-sector	Proportion of UK market	UK share of global market	No. of Businesses	No. of employees
£12.9bn	24.19%	3.3%	6,601	106,986

22.5 Innovas estimate that market value for the Building Technologies subsector will grow by a compound growth rate of 44.68% or £5.77 billion between 2008/2015[1]. This is a relatively high ranking LCEGS sub-sector, however, whilst report indicates that forecasts were revised in December 2008 to take account of the credit crunch, the full impact of the recession on this sector in particular was not known at this point. On this basis, these figures are highly optimistic.

22.6 Since 1996 the energy efficiency of homes has steadily improved with the average energy efficiency (SAP) rating increasing by 8 points from 42 in 1996 to 50 in 2007. On average social sector homes are substantially more energy efficient than private sector homes and the rate of energy efficient improvement since 1996 has been greater in the social sector. In 1996 the social sector was on average six SAP points greater than the private sector. In 2007 there was a 10 point difference between the two sectors; the social sector had an average SAP rating of 58 compared to 48 in the private sector[187].

22.7 In 2007, 8% (1.7 million) of homes achieved the highest Energy Efficiency Rating (EER) Bands A to C, the majority of which were in Band C, with only 35,000 dwellings achieving a Band A/B rating7. Nineteen percent (4.3 million) of homes were in the least energy efficient EER Bands F and G, whilst the majority of homes (73%, 16.2 million) fell within the middle EER bands D and E[188].

22.8 The UK requires an industry equipped with skills for retrofitting existing buildings, using more innovative low carbon construction methods and materials. The UK Low Carbon Industrial Strategy outlines that as well as technical ability of trades, the UK needs a greater understanding and prioritisation of low carbon imperatives from designers, senior facilities and building managers.

22.9 The sector has underinvested in research and innovation compared to other sectors[5]. This may be partly attributed to the nature of construction where innovations that are proven to be cost effective are quickly diffused throughout the industry. This limits the incentive for individual companies to innovate or undertake research.

22.10 Given that the majority of the building stock that will exist in Britain in 2050 is already constructed, performance of existing buildings needs to be raised to meet higher environmental standards. Building standards and regulations have been introduced to drive up performance but the appetite to raise standards in existing buildings is less than clear. For example, occupiers are likely to prioritise other characteristics before green credentials and the cost of retrofitting older city centre buildings can often be prohibitively high.

[187] English House Condition Survey 2007

[188] English House Condition Survey 2007

22.11 In 2008, the Government published a joint Strategy for Sustainable Construction with industry. This Strategy is intended to promote leadership and behavioural change. It includes specific commitments by industry and government to take the sustainable construction agenda forward.

22.12 In 2008 the Government introduced the Code for Sustainable Homes, the national standard for the sustainable design and construction of new homes. The Code aims to reduce carbon emissions and create homes that are more sustainable by measuring the sustainability of a new home against categories of sustainable design using a 1 to 6 star rating, rating the property as a complete package. It is now mandatory for all new homes to be rated against the Code and include a Code or nil-rated certificate within the Home Information Pack.

22.13 The Buildings Energy Performance Directive was brought into force in 2003. The principal objective of the Directive is to promote the improvement of the energy performance of buildings within the EU through cost-effective measures. There are four main aspects to the EPBD; calculation of the energy performance of buildings, minimum energy performance requirements, energy performance certificates and inspections of boilers and air-conditioning[189].

22.14 Amendments to Part L of the Building Regulations (conservation of fuel and power) came into force in 2006. The revisions to Part L introduce new energy efficiency requirements and have been revised as part of the government's drive to reduce greenhouse gas emissions. One important way of achieving this is by improving the energy efficiency of buildings. Part L covers all buildings, new and existing[190].

Supply Chain/Niches

22.15 The supply chain is an important part of this sub-sector, representing approximately 60% of the sector's value[2].

22.16 Opportunities exist in the manufacture of electro-chromatic window glass, double gazed units, triple glazed units, advanced plastic thermally insulated frames (windows), honeycomb systems (windows), insulated alloy frames (windows), insulated plastic doors, insulations materials (walls), controlled venting and ducting, heat retention ceramics, heat retention surfaces, fibre insulation materials (roofing), granular insulation materials, electronic control systems, motorized valves and actuators, sensing devices, inter building electronic control systems, balanced inter building heating systems, energy monitoring systems[2].

Investment Trends

22.17 The clean tech report did not identify significant levels of venture capital entering this market[191].

East Midlands Supply

[189] www.bre.co.uk

[190] www.mech-elec.org.uk

[191] Investment Trends in European Clean Energy 2003-2006. Watt bubble or carbonated fizz. A study commissioned by Carbon Trust Investments and carried out by Cleantech Advisors LLC. June 2007

22.18 The East Midlands does not show either comparative advantage or disadvantage for this sector based on GVA performance indicated in the Innovas report.

22.19 This research has found 293 businesses operating in this sector, with 203 stating that this was their main sector. 200 business are supplying to the sector.

East Midlands Demand

22.20 The Government is also helping to stimulate demand in the retrofit market. There are various grants and offers of home insulation available to the domestic market provided by utility providers, independent providers and the Energy Saving Trust.

Higher Education

22.21 The School of the Built Environment's Institute of Sustainable Energy Technology at Nottingham University undertakes quality research into renewable and sustainable technologies and part of its work research is conducted in the new £2 million state-of-the-art Sustainable Research Building and the David Wilson Millennium Eco-Energy House. The Sustainable Research Building provides a test facility for technologies at an earlier stage than those in the eco-house, and houses lecture theatres and laboratories.

22.22 The building is unique, incorporating removable walls, windows and roofs so that new systems can be tested and added as part of research programs. An example of this is the new design of a photovoltaic roof on the building which makes the most of the sun's energy and is tested for strength, durability and energy efficiency[192].

The Energy Technology Institute

22.23 The ETI is working on a strategic overview of the buildings sector and is currently developing a programme of activities for the next three years. This work will be in conjunction with key public sector bodies which include EPSRC, TSB and the Carbon Trust, ensuring that the ETI contribution to the built environment will be complimentary and effective. The ETI is proposing to fund a new project focused on the refurbishment of the domestic housing stock to improve their energy efficiency. They are looking to assemble a team of innovative companies and researchers to investigate ways the refurbishment process can be accelerated at a national level[193].

Skills and Capabilities

22.24 To promote specialist and professional skills within the industry, the Government is working with ConstructionSkills to develop their strategies. Publicly funded centres of excellence are being developed for the provision of training and support for business. The iNET for Sustainable Construction in the East Midlands facilitates the delivery of training in low carbon construction skills and innovation to industry through partnerships with training providers, universities and local industry[194].

[192] www.nottingham.ac.uk

[193] www.energytechnologies.co.uk

[194] The UK Low Carbon Industrial Strategy. HM Government 2009

Business Classifications

22.25 SIC, Yell and Thompson codes identified for each sector have been indentified below. As previously discussed, business classification codes are not always a perfect match to the industrial sector we are trying to identify. Therefore to give some sense of the level of fitness of each code, they have been assigned one of the following colour codes green – good/near exact fit, orange – moderate fit, red – poor/low fit.

SIC codes[7]		Thompson codes		Yell codes	
Window and Doors					
4532 : Insulation Work Activities		27590 : Double Glazing Suppliers		04632 : Double Glazing Materials	
2614 : Manufacture Of Glass Fibres		27250 : Door Manufacturers - Domestic		00056 : Air Conditioning Consultants	
2923 : Manufacture Of Non-Domestic Cooling And Ventilation Equipment		27253 : Door Manufacturers - Industrial		04630 : Insulation Installers	
3330 : Manufacture Of Industrial Process Control Equipment		45302 : Insulation Installers		05002 : Cladding	
3120 : Manufacture Of Electricity Distribution And Control Apparatus		45370 : Insulation Materials		04633 : Insulation Materials	
4521 : General Construction Of Buildings And Civil Engineering Works		42500 : Heat Exchangers		00335 : Solar Energy	
7420 : Architectural And Engineering Activities And Related Technical Consultancy		77300 : Temperature Monitoring Systems Manufacturers		00152 : Automatic Control Eqpt	
4534 : Other Building Installation		21800 : Control system products		02209 : Control Panel Mfrs	
		21555 : Construction Contractors - General		03612 : Electrical Control Gear Mfrs	
		04420 : Architects		04531 : Heating Appliance Control Eqpt	
		04422 : Architectural Services		02488 : Constructional Engineers	
		04424 : Architectural Technologists		00322 : Building Consultants	
		31600 : Engineers - General		08765 : Architects	
		11280 :Building Consultants		02480 : Architectural Services	
		11400 : Building Services		00097 : Architectural Technologists & Technicians	
		33630 : Facilities Management		02488 : Constructional Engineers	
				03345 : Structural Engineers	

				00875 : Building Services Engineering	
				00963 : Facilities Management	

Business Directories/Trade Associations

- Chartered Institute of Architectural Technologists - www.biat.org.uk
- Chartered Society of Designers - www.ceca.co.uk
- Combined Heat & Power Association - www.chpa.co.uk
- Construction Confederation - www.thecc.org.uk
- Construction Equipment Association - www.coneq.org.uk
- Construction Industry Council - www.cic.org.uk
- Construction Industry Research & Information Association - www.ciria.org.uk/
- Construction Products Association - www.constprod.org.uk
- National Specialist Contractors Council - www.nscc.org.uk/
- The Construction Centre - www.theconstructioncentre.co.uk
- Boiler & Radiator Manufacturers Association Ltd - www.metcom.org.uk
- Builders Merchants Federation - www.bmf.org.uk
- National Federation of Builders - www.builders.org.uk
- The Association of Building Engineers - www.abe.org.uk
- The Chartered Institute of Building - www.ciob.org.uk

23 Emerging Low Carbon: Electricity Generation

Electricity Generation
Rating: Important
This is an established sector which is forecast to grow significantly in the next 20 years as demand for electricity generating capacity increases. At the national level, the industry faces substantial challenges in ensuring delivery of new generating capacity that will be needed if Britain is to maintain security of supply at current levels. There will be substantial demand for both replacement plant and renewables, as well as appropriate back-up facilities to deal with intermittency and an upgraded transmission network. The region has a number of centres of expertise in this area such as the University of Leicester and the University of Loughborough. This research found 102 businesses currently operating in the sector and as such it has been rated highly important to the region.

23.1 This sector is not part of the Innovas definition, but has been included at the client request. Given it is not part of the Innovas definition, it is not possible to compare any figures with those reported for the other sectors.

23.2 The electricity industry has four key parts; generation, supply, transmission and distribution. Generation is the production of electricity in generating stations. Supply is the sale of electricity to the final consumer. Transmission is the bulk transportation of the electricity, from power stations, along a high voltage system ('the grid') and the distribution network is a lower voltage system for the local delivery of electricity to the point of demand.

23.3 Some companies operate in more than one sector of the industry, for example generation and supply. A few generate electricity, own and operate local distribution networks and supply final consumers. Generation and supply takes place in a competitive market. Transmission and distribution are regulated monopolies.

Global Market Situation

23.4 World electricity generation is expected to reach almost 34000 TWh by 2030, with the addition of just over 5000 GW in generating capacity between now and then and with global investment in coal and gas fired generating capacity between now and 2030 expected to be in the vicinity of $3 trillion it is obvious that this sector offers a huge long term opportunity for innovative businesses with low carbon solutions[195].

National Market Situation

23.5 Estimate of the size of the sector vary from 30,000 people (UK Energy Excellence) to 77,500 (EU Skills).

[195] UK Energy Excellence - http://www.ukenergyexcellence.com/why-uk-energy/sectors/power

23.6 Likewise, UK Energy Excellence estimate that there are thousands of companies active in the sector – valuing the sector at approximately £6billion. Whereas Energy and Utilities skills estimates that there are 950 power business units functioning across the UK. The majority are based in England (700 businesses). The vast majority of these businesses are Small and Medium Enterprises (SMEs), but it is important to note that most of the employees in the industry are employed by the 50 large organisations.

Political Drivers

23.7 Over the next few years, Britain Power sector faces considerable challenges. As plants start to close, the electricity generating industry faces a substantial challenge in ensuring delivery of the new generating capacity that will be needed if Britain is to maintain security of supply at similar levels to those so far enjoyed. In particular, as coal-fired plant closes by 2016 under the Large Combustion Plants Directive, there will be a requirement for replacement capacity. In the longer term, the move to a low-carbon economy will require substantial investment in renewables, and appropriate back-up capacity to deal with intermittency. The Government has also signalled the need for new nuclear plant in the mix, and the role for Carbon Capture and Storage in the context of fossil fuel generation. The delivery of new generation plant, and potential upside to electricity demand, will also lead to a need for expansion and strengthening of the transmission network.

23.8 The Energy Act 2008 was given Royal Assent on 26 November 2008. It implements the legislative aspects of the Energy white paper 2007: 'Meeting the energy challenge'. With respect to the power sector it includes:

- Legislation to enable private sector investment in Carbon Capture an Storage;
- Strengthening of the Renewables Obligation;
- Support for small scale rewewable regeneration through feed in tarrifs;
- Ensuring that new build nuclear operators build funds to meet costs of future decommissioning;
- Ensuring that Ofgem is able to run offshire transmission licencing more effectively;
- Encouragement for smart metering;
- Establishing a support programme for renewable heat.

Supply Chain/Niches

23.9 The UK Energy Excellence website identifies the following subsectors within the power sector:

- Thermal Generation;
- Distribution;
- Pollution Control;

- Asset Management;
- Pollution Control;
- Combined Heat and Power (CHP)

23.10 The table below identified the UK strengths in these subsectors.

	Overview	UK Specialisms	Leading UK suppliers
Thermal Generation	UK-based companies have strong design and manufacturing abilities for power generation, including gas turbines (up to 60MW), steam turbines (up to 500MW) and reciprocating diesel and gas engines (up to 2.6MW). The UK has considerable experience in designing, manufacturing and installing steam turbines for power generation, combined cycle, cogeneration and waste-to-energy projects. UK-produced steam turbines are supplied worldwide and operate primarily in the 1 MW to 40MW range, although there is manufacturing capability up to 500MW.	• Fired boilers (up to the largest supercritical boilers) and Heat Recovery Steam Generators (HRSG). • Development of integrated gasification combined cycle (IGCC) technologies. • Packaged power generation, cogeneration (combined heat and power) or 'trigen' (power, heat and cooling). • Further along the supply chain, the UK has a number of manufacturers of power generation components. The UK has strong capability in generators, transformers, switchgear and turbogenerators. There are also diverse suppliers of heat exchangers, pumps and process fluid controls, gears and clutches and pressure seals.	Rolls Royce, Siemens, ABB, Alstom, AMEC, Costain and Doosan Babcock. Mitsubishi Power Systems Ltd Howden Compressors, Thompson Valves and SM Seals.

	Overview	UK Specialisms	Leading UK suppliers
Distribution	UK manufacturers can supply a range of equipment from large transformers, HVDC and protection relay equipment to low voltage transformers, switchgear and smart meters. Other key transmission system components manufactured in the UK include FACTS (Flexible AC Transmission System) equipment which control voltage directly. Quadrature boosters, which enable variable line compensation, are another leading-edge HV network control device designed and manufactured in this country. UK companies are able to design and manufacture a range of transformers, switchgear and protection equipment. This includes a wide variety of distribution, power, dry type, cast resin and traction transformers, along with flameproof transformers and switchgear.	In addition to these equipment manufacturers, the UK has a number of major companies providing engineering, procurement and construction (EPC) services in the development of substation and transmission equipment and power lines (overhead, underground and sub-sea). Most of these companies also provide bespoke refurbishment, maintenance and spares for existing assets. In terms of asset management, the UK is a leader in condition monitoring and service quality monitoring.	National Grid Balfour Beatty Areva T&D EA Technology Brush Transformers Lucy Switchgear

	Overview	UK Specialisms	Leading UK suppliers
Pollution Control	Environmental performance is increasingly critical to business success in the power sector. To obtain permits, it is essential to understand the demands of stakeholders and legislation and the possible physical impact of power projects. In addition, environmental risks can have a broad impact on the business.	Specialists in areas such as air quality, greenhouse gas emissions, ecology and landscape, marine environment, contaminated land and noise can provide world class analytical capability as well as practical proposals to mitigate pollution. They can also provide guidance on management and monitoring. A number of UK environmental consultants have experience advising governments on environmental regulations.	EcoSecurities IT Power Climate Change Capital
Asset Management	The UK has exceptional skills in asset management services that aim to either improve operating performance or extend the economic life of power generation assets. This is done by means of technical improvements, major retrofitting / refurbishment of main plant and networks, new operations practices, sophisticated monitoring and complex decision analysis.	For an operator to run an efficient maintenance and capital budgeting programme it must know the conditions of its assets and their current performance. UK providers have responded to this challenge by producing some of the world's most sophisticated condition and performance monitoring equipment. This includes equipment to monitor oil-filled cables, switchgear, steel and concrete structures. It also includes IT systems and software for modelling complex systems. The UK's engineering and management consultants have also developed decision tools and other analytical techniques for appraising asset management options.	Alstrom RWE Power International TWI

	Overview	UK Specialisms	Leading UK suppliers
Professional Services	The three main areas are financial (advice on issues such as project feasibility and returns, capital structures, sources of funds, taxation and insurance), technical (advice on engineering, management, IT, resources, environment, planning and markets) and legal (advice on drafting and revising laws, licences and industry codes, which define the foundation of a jurisdiction's regulatory framework, as well as commercial advice on restructurings and acquisitions).		Mott MacDonald CMS Cameron-McKenna Halcrow
CHP	The UK has a well established supply chain capability in the delivery of CHP projects worldwide and there is significant R&D on new fuels going on at UK universities and research institutions.	The UK supply chain has CHP-related capabilities in; professional services, including financial, commercial and technical consultancy; project management; design engineering; equipment design; asset management and production support, including maintenance, upgrades and modifications.	Centrax Rolls Royce EnerG Combined Power Ceres Power

East Midlands Supply

23.11 The electricity industry currently employs 3,500 people in the East Midlands[196]. Major Regional Employers include: AMEC Utilities, Babcock Networks, Balfour Beatty, Balfour Beatty Power Networks, Cottom Power Station, Fulcrum Connections, Infinis, Morrison Utilities, Murphy Pipeline, Siemens Power Systems, Waste to Energy, West Burton Power Station.

23.12 The ekosgen survey of businesses found 102 businesses operating in the sector, of which 40 stated that this was their main sector. 83 businesses supply to the sector.

East Midlands Demand

23.13 The Regional Energy Strategy (Part 2, Framework for Action identified the following demand issues:

- There are already parts of the region (areas of Lincolnshire, East Nottinghamshire and northern Derbyshire) where insufficient energy infrastructure (gas and electricity) is restricting regeneration. Refurbishment, replacement and restructuring of the energy distribution systems will be a significant part of regional investment over the next ten years and must be designed to accommodate the aspirations of the low carbon economy, including embedded generation, smaller scale local generation including Combined Heat and Power (CHP), heat distribution systems including examples of industrial symbiosis, and accommodation of the expansion of offshore wind development.

- Coal-fired power station closures due to EU Sulphur Emissions Restrictions may lead to a real threat of power shortages and cuts in the near future.

- Opportunities exist in terms of Energy from Waste, co-firing of biomass (currently occurring in some of the regions coal fired stations) and coal mine methane.

Higher Education

23.14 The region's universities have a number of centres of expertise in this area including:

23.15 The University of Leicester has two centres of expertise in this area - Power Electronics, Electrical Machines & Power Systems and Renewable Power Generation and Energy Storage

23.16 The University of Loughborough – CREST centre is a specialist centre looking at Renewable Energy.

Skills and Capabilities

23.17 Energy and Utilitiy Skills report that the power sector if facing a significant skills gap. This is arising from a significant aging workforce, but also the need for new trainees to address the following areas of growth:

[196] Energy and Utility Skills. Sector Skills Agreement, East Midlands Stage 5 Report.

- Renewal of the transmission and distribution network;
- New Technologies such as smart metering;
- Embedded generation and local distribution;
- Other new technologies with respect to the low carbon agenda.

Business Classifications

SIC codes[7]		Thompson codes		Yell codes	
Generation					
4010 : Production And Distribution Of Electricity		**30586 :** Electricity Companies		**02415 :** Electricity Generating Eqpt	
2911 : Manufacture Of Engines And Turbines, Except Aircraft, Vehicle And Cycle Engines		**30590 :** Electricity Generating & Distributing Equipment		**06020 :** Electricity Supply Companies	
2830 : Manufacture Of Steam Generators, Except Central Heating Hot Water Boilers		**60700 :** Power Transmission Equipment		**03307 :** Power Processing Eqpt	
2852 : General Mechanical Engineering		**60760 :** Power Transmission Services		**01474 :** Uninterruptable Power Supplies	
2875 : Manufacture Of Other Fabricated Metal Products Not Elsewhere Classified Power, Except Aircraft, Vehicle And Cycle Engines		**42500 :** Heat Exchangers		**03332 :** Power Transmission Engineers	
2912 : Manufacture Of Pumps And Compressors		**31590 :** Engineers - Consulting		**06850 :** Power Transmission Eqpt	
2914 : Manufacture Of Bearings, Gears, Gearing And Driving Elements		**50275 :** Mechanical Engineers		**03312 :** Instrumentation Engineers	
3110 : Manufacture Of Electric Motors, Generators And Transformers		**80920 :** Turbine Manufacturers		**03327 :** Plant Maintenance Engineers	
3120 : Manufacture Of Electricity Distribution And Control Apparatus		**45000 :** Industrial Engineers		**03318 :** Mechanical Engineers	
		25000 : Design Engineers		**03311 :** Engineers-Industrial	
		80010 : Transformer Manufacturers		**08764 :** Engineers-Consulting	

				03343 : Steam Engineers	
				02490 : Engineers-Design & Development	
				04528 : Heat Exchangers	

Business Directories/Trade Associations

23.18 Association of Electricity Producers, Association for Instrumentation and Control, Association of Manufactures of Power Generating Systems, British Electrotechnical & Allied Manufacturer's Association , Combined Heat.

24 Emerging Low Carbon: Civil Nuclear Power

Civil Nuclear Power
Rating: Important
This is a globally and nationally important sector, with important opportunities in the next 20 years. The white paper on Nuclear power set out a clear role for nuclear power to play a key role in the country's future energy mix. The presence of Rolls Royce in the region with its supply chain, makes this an important sector for the region, although the choice of the NW and Yorkshire as the nuclear low carbon economic area may have an impact on the future opportunities available to the sector in the region.

24.1 The Innovas report includes nuclear power within the wider sector of alternative fuels which also includes biofuels, biomass, hydrogen, LPG, E85, biodiesel and methane as well as batteries. The qualitative element of this report focuses on nuclear only. In terms of the size of the sector, it is not possible to separate the nuclear element from the wider alternative fuels sector, therefore it should be noted that the figure will be an over-estimate.

Global Market Situation

24.2 Innovas estimate that the international market value for alternative fuels stands at £563.92bn, which represents 18.51% of the total global LCEGS market[197].

24.3 The civil nuclear sector is a global industry with a global supply chain. The World Nuclear Association estimates that nuclear energy currently provides approximately 15% of the world's electricity[1].

24.4 Rolls-Royce recently estimated that the global civil nuclear market is currently worth approximately £30 billion a year. By 2023 this figure could increase to £50 billion a year. Of this, approximately £20 billion is estimated to be from new build, £13 billion in support to existing nuclear plants, and £17 billion for new reactors[198]. This is substantially lower than we would expect given the Innovas estimate above.

24.5 There are currently around 440 nuclear plants, across 30 countries, with a total capacity of over 370 GW. The US leads with 104 operating units. France is second with 59 and Japan follows with 55, plus one more under construction. Russia has 31 operating, and five more under construction[199]. The Nuclear Energy Agency has estimated that as many as 12 nuclear reactors will be constructed per year between 2007-2030 and that between 2030-2050 this will rise to 23-54 reactors a year[200].

[197] Low Carbon Goods ands Services: an industry analysis, Innovas Solutions 2009

[198] The Supply Chain for a UK Nuclear New Build Programme. NAMTEC 2009

[199] Nuclear Energy Report. 2009

[200] The UK Low carbon Industrial Strategy. HM Government 2009

National Market Situation

Size of sub-sector	Proportion of UK market	UK share of global market	No. of Businesses	No. of employees
£18.45bn	34.58%	3.27%	9,550	162,175

24.6 The White Paper on Nuclear Power set out the UK's policy on nuclear power[201]. It states that new nuclear power stations should have a role to play in this country's future energy mix alongside other low carbon sources of electricity. The White paper also states that it would be in the public interest to allow energy companies the option of investing in new nuclear power stations; and that the Government should take active steps to facilitate this.

24.7 On 9th November 2009, the Government published its draft nuclear National Policy Statement. This confirmed that by 2025, there is expected to be a need for 25GW of non-renewable capacity and that a significant proportion of this will be filled with nuclear capacity.

24.8 The statement also included a list of sites that the Government has judged to be potentially suitable for the deployment of new nuclear power stations by the end of 2025:

- Bradwell;
- Braystones;
- Hartlepool;
- Heysham;
- Hinkley Point;
- Kirkstanton;
- Oldbury;
- Sellafield;
- Sizewell; and
- Wylfa

24.9 On Thursday 3 December 2010, Lord Mandelson announced a package of measures to support the UK's civil nuclear industry:

- Appointment of North West and Yorkshire as a Nuclear Low carbon Economic Area (LCEA), led by the North West Development Agency (NWDA) in collaboration with Yorkshire Forward.

- A new Nuclear Advanced Manufacturing Research Centre (NAMRC) is to be based in South Yorkshire. The lead University is Sheffield in partnership with Manchester, with Rolls-Royce as the lead industrial partner. Rolls-Royce plan a civil nuclear factory in South Yorkshire. This is part of an investment programme

[201] Meeting the Energy Challenge: A white paper on Nuclear Power, January 2008.

announced on 28 July 2009, which included £45m of investment from the Government.

- The Government has committed £15m from the Strategic Investment Fund to NAMRC. This is a commitment under the Low Carbon Industrial Strategy. An additional £8m will be allocated to upgrade the nuclear laboratories at Manchester University's Dalton Nuclear Institute to support the NAMRC. It will bring together university research and industrial expertise to develop manufacturing techniques and components that will meet the demand for new nuclear power stations. It will also benefit supply chain companies with support in securing accreditation to compete in the civil nuclear sector

- As part of the Nuclear LCEA the North West will support the Manufacturing Advisory Service's (MAS), offering advice and support to access the nuclear energy market by supporting the MAS national network.

Supply Chain/Niches

24.10 The civil nuclear manufacturing supply chain in Britain has a turnover of approximately £3.6 billion and employs over 33,000 people[202].

24.11 The supply chain required to support a construction programme offers considerable opportunities for the UK in supply into, and provide services to, a UK nuclear new build and global new build programmes, and the supply chain has capability in most of the areas required to support such programmes. UK companies are equipped to provide all aspects of pre-build phase of nuclear programme, project management, all elements of civil construction including nuclear and turbine islands, balance of plant and supporting infrastructure, on-site fabrication, manufacture of components for plant and equipment, operation and decommissioning[203].

24.12 There are supply chain issues related to global capacity, as in the case of ultra-large forgings for the manufacture of Nuclear Steam Supply System equipment and turbine generator rotors. There are significant issues associated with the availability of skilled workers, across the whole supply chain, and there will be strong competition from overseas new build programmes for nuclear skills[4].

24.13 With a history of development (and decommissioning) of civil nuclear power the UK is well positioned to operate successfully within this sub-sector, particularly in areas of manufacturing, advanced design, research and development, construction plant operation and maintenance, decommissioning and nuclear waste management[3].

24.14 As outlined in the NAMEC report opportunities in UK and overseas markets for the UK's nuclear supply chain could include the following (some of which would require investment):

- Consultancy: technical and commercial feasibility studies and evaluation;
- Detailed understanding and development of the Nuclear Safety case.
- Project management of new plant construction (which can account for up to 15% of overall project value);

[202] Low Carbon Goods ands Services: an industry analysis, Innovas Solutions 2009

[203] The Supply Chain for a UK Nuclear New Build Programme. NAMTEC 2009

- Supply of raw materials (eg, steel, cement, etc.);
- Civil engineering and construction ('civils') (accounting for up to 25% of project value);
- On-site erection / installation ('mechanicals'):
- Reactor plant sub-system module and product definition;
- Supply chain management;
- Specialist equipment supply (instrumentation & control, and electrical);
- Electrical, on-site installation;
- Supply of large forgings for Nuclear Steam Supply Systems;
- Supply of other forgings and castings for the nuclear island:
- Specialist component supply (valves, pumps, cables, etc.);
- Manufacture of nuclear island equipment, including steam generators, pressurisers and primary circuit pipework, and its engineering support (with some investment);
- Manufacture of reactor pressure vessel (RPV) internals (with some investment);
- Operational and asset management and plant life extensions;
- Integrated decommissioning project management and site management;
- Decommissioning specialist equipment; and
- Integrated fuel and waste management / services and disposal.

East Midlands Supply

24.15 Existing East Midlands based Rolls-Royce capabilities include about 1,000 nuclear engineering and safety staff and three UK manufacturing sites dedicated to producing nuclear components. Rolls-Royce also manages all aspects of the nuclear supply chain for submarine propulsion involving 260 suppliers, which are primarily UK-based. The skills which exist with these organisations are relevant to a civil nuclear new build programme which Rolls-Royce are addressing[204]. In July 2008, Rolls Royce announced that it would be setting up a new unit to address civil nuclear power in Derby.

24.16 With the exception of Rolls Royce, the East Midlands, does not employ significant numbers of people within the existing nuclear industry due to the absence of any existing nuclear power plant.

24.17 Findings from the ekosgen business survey found 116 businesses operating in the sector, of which 52 stated that this was their main sector. 114 businesses supplied to the sector.

East Midlands Demand

24.18 Budget 2009 announced £405 million to help establish Britain as a market leader in low carbon industries and advanced green manufacturing. Central government is set to provide capital investment of up to £15 million in order to establish a Nuclear Advanced Manufacturing Research Centre consisting of a consortium of manufacturers from the UK nuclear supply chain and universities. The facility will enable around 30 companies to work together on the development and production of high quality nuclear components, and to achieve the necessary accreditation to

[204] The Supply Chain for a UK Nuclear New Build Programme. NAMTEC 2009

supply this industry. Rolls-Royce will take a leading role – bringing technical ability, commercial discipline and access to markets[205].

24.19 The Government's ambition is for British based businesses to be an integral part of the domestic civil nuclear supply chain for both existing and any new nuclear power stations in Britain and to be in a position to compete in the rapidly expanding global market for civil nuclear power[3].

24.20 The Government have also proposed a £4 million expansion of the Manufacturing Advisory Service, to provide more specialist advice to manufacturers on competing for low carbon opportunities, including support for suppliers for the civil nuclear industry[3].

Higher Education

24.21 Nottingham University's School of Biosciences has expertise in the areas of nuclear waste disposal and nuclear risk assessments. They are currently looking researching nuclear waste repositories.

Investment Trends

24.22 According to the Nuclear Industry Association website[206] there have been the following strategic investments in nuclear energy:

- **£12.5 billion:** EDF takeover of British Energy in Jan 2009 at a cost of £12.5 billion. EDF now operate the existing fleet of nuclear power stations and they have publicly made their clear their intention to use this investment as part of their new build strategy.

- **£387 million:** Proceeds to the NDA from the recent sale of land at Oldbury, Bradwell and Wylfa came to £387 million.

- **£70 million:** A consortium of GDF SUEZ SA, Iberdrola SA and Scottish and Southern Energy Plc has secured an option to purchase land for the development of a new nuclear power station at Sellafield. They have plans to build up to 3.6 GW of new nuclear capacity in the UK, with work beginning in 2015.

24.23 The 16GW of new nuclear capacity announced by these energy companies could be expected to result in an investment of approximately **£40 billion:**

- **Up to £17.6 billion:** EDF have said they plan to build 6.4 GW of new nuclear. This is 4 EPRs, which EDF expect to cost of up to £4.4 billion each

- Horizon announced their intention to build at least 6GW of new nuclear capacity on the land, subject to necessary approvals (including regulatory approvals and planning permission) - this could be 4 EPRs or 6 AP1000s. They have stated that this could result in more than **£15 billion** of investment.

[205] The UK Low carbon Industrial Strategy. HM Government 2009

[206] January 2010 http://www.nuclearsupplychain.com/

- Iberdola, GDF Suez and SSE have plans to build 3.6 GWs – this could be 2 EPRs or 3 AP100s. The value of this investment is unknown, but it would be reasonable to expect the costs might be comparable, resulting in an investment in the region of **£8 billion**.

Skills and Capabilities

24.24 Cogent, the Sector Skills Council for Nuclear has identified the following skills required for the nuclear industry:

- Commissioning
- Waste & Repository Operations
- Construction
- Business
- Scientific & Technical Support
- Engineering Design
- Project Management
- Radiation Protection
- Safety & Security
- Maintenance Operations
- Process Operations
- Decommissioning Operations
- Energy Production Operations

Business Classifications

24.25 The table below details the relevant business classification codes for the civil nuclear sector. Business classification codes are not always a perfect match to the industrial sector we are trying to identify. Therefore to give some sense of the level of fitness of each code, they have been assigned one of the following codes green – good/near exact fit, orange – moderate fit, red – poor/low fit.

SIC codes[7]		Thompson codes		Yell codes	
3162 : Manufacture of other electrical equipment not elsewhere classified		30710 : Electronic Component Manufacturers & Distributors		02456 : Electronic Components	
29.11 : Manufacture of engines and turbines, except aircraft, vehicle and cycle engines		30590 : Electricity Generating & Distributing Equipment		02415 : Electricity Generating Eqpt	
2912 : Manufacture Of Pumps And Compressors		31520 : Engine Manufacturers & Distributors		02474 : Engine Mfrs & Suppliers	
28.30 : Manufacture of steam generators		50275 : Mechanical Engineers		00092 : Manufacture of pipes and fittings - metal	
7310 : Research And Experimental Development On Natural Sciences And Engineering		45258 : Instrumentation Engineers		03318 : Mechanical Engineers	
2710 : Manufacture Of Basic Iron And Steel And Of Ferro-Alloys (ECSC)		21800 : Control System Equipment		03311 : Engineers-Industrial	
2722 : Manufacture Of Steel Tubes		62580 : Pump Manufacturers		03312 : Instrumentation Engineers	
2852 : General Mechanical Engineering		58750 : Pipelines		03313 : Engineers-Inspecting & Testing	
3120 : Manufacture Of Electricity Distribution And Control Apparatus		58755 : Pipes & Fittings		03493 : Forgings & Stampings	
2840 : Forging, Pressing, Stamping And Roll Forming Of Metal; Powder Metallurgy		58761 : Pipework Contractors		03641 : Valves-Mechanical	
2913 : Manufacture Of Taps And Valves		04420 : Architects		03642 : Electronic Eqpt & Instruments	
74.20 : Architectural and engineering activities and related technical consultancy		04422 : Architectural Services		03331 : Pumps & Pumping Eqpt	
45.21 : General construction of buildings and civil engineering projects		04424 : Architectural Technologists		03332 : Power Transmission Engineers	

7460 : Investigation And Security Activities		31600 : Engineers - General		05163 : Generators	
40.11 : Production of electricity		21555 : Construction Contractors - General		00092 : Pipes & Fittings-Metal	
		18632 : Civil Engineers		08765 : Architects	
		64700 : Research Organisations		02480 : Architectural Services	
		69240 :Security Services		00097 : Architectural Technologists & Technicians	
		60700 : Power Transmission Equipment		02488 : Constructional Engineers	
		30586 : Electricity Companies		03345 : Structural Engineers	
				05000 : Civil Engineers	
				00046 : Science & Research Consultants	
				08972 : Security Services & Eqpt	
				06020 : Electricity Supply Companies	

Business Directories/Trade Associations

- World Nuclear Association - www.world-nuclear.org
- Nuclear Industry Association - www.niauk.org

25 Non – LCEGS sub-sectors

Context

25.1 This scoping paper maps those industries that fall outside of Low Carbon Environmental Goods and Services (LCEGS) sectors but still offer potential economic benefits to the low carbon economy through their transition into greener and more sustainable business practices. It acts as a regional parallel to recent national research[207] which examined non-LCEGS sectors that offer the greatest green business potential. It also draws upon research conducted by the Carbon Trust, CBI, BIS and the Met Office.

Non-LCEGS Overview

25.2 "For the UK to achieve an 80% reduction in carbon emissions on 1990 levels, all sectors in the economy need to reduce their carbon footprint."[208]

25.3 Non-LCEGS industries cover almost all sectors of the economy but only a proportion are best-placed to take advantage of low carbon opportunities, and can subsequently contribute to the low carbon economy. In particular, *"those businesses that have **made efforts** to introduce low-carbon, resource efficient, and/or re-manufactured products, processes, services and business models, which allow them **to operate and deliver in a significantly more sustainable way** than their closest comparators."*[209] The drive for enterprises to develop low carbon business practices also fits with the UK Government's current employment strategy which promotes the creation of more green jobs[210].

25.4 Research by the Carbon Trust[211] reports that a company which is well-positioned and pro-active could increase its value by up to 80% by making the transition to low carbon based activities and markets. Impacts on business from the transition to a low carbon economy will vary by sector and by business according to how prepared they are in terms of the skills, knowledge, finance, willingness and flexibility needed to adapt to and adopt new cleaner technologies. Linked to this, the first challenge for *emda* to support companies in their

[207] Ernst & Young/BERR (2008) Comparative advantage and green business

[208] BIS (2009) New Industry, New Jobs; and BIS (2009) Low Carbon Industrial Strategy – http://www.berr.gov.uk/aboutus/corporate/performance/buildingbritainsfuture/page51800.html

[209] Ernst & Young/BERR (2008) Comparative advantage and green business (p4)

[210] BIS (2009) New Industry, New Jobs; and BIS (2009) Low Carbon Industrial Strategy – http://www.berr.gov.uk/aboutus/corporate/performance/buildingbritainsfuture/page51800.html

[211] Carbon Trust (2008) Climate change – a business revolution – http://www.carbontrust.com/publications/CTC740_business_rev%20v5.pdf

exploitation of green opportunities is to identify and map those sectors that are best placed to do this.

Identifying Sectors

25.5 One of the main findings from the 2008 BERR report was that to maximise market opportunities in the low carbon economy, it is most effective to target industries that already have comparative advantages, rather than targeting 'low carbon' industries if they do not have a comparative strength in the market place. Utilising this finding, the second stage of the national research (a) mapped those sectors where the UK had a comparative strength and (b) estimated the potential that these sectors offer for green opportunities and CO2 savings. A similar approach is adopted for this paper and this looks firstly at East Midlands sector strengths.

Prominent sectors

25.6 Analysis of the East Midlands economy finds there are three main groups of sectors that are of high significance to the region:

- National strengths: *financial services; machinery equipment; software; electronic equipment; business services*. As referenced in the BERR report and based on UK trade data and foreign direct investment flows. Whilst business services in the East Midlands is under-represented compared to the UK average, at the EU level, the East Midlands still offers a considerable strength and is home to a high number of leading companies, including those where low carbon economic impacts can be achieved.
- Regional strategic sector strengths*: transport equipment; construction; food and drink; and healthcare*. As referenced in the emda 2006-10 RES[212] based on: potential for high quality jobs; providing good prospects for growth; and having a significant presence in the East Midlands.
- Other regional strengths: *metals; minerals; and textiles*. As referenced in the latest RES evidence base[213] which finds that these sectors (along with transport equipment and food and drink) demonstrate strong performance in outputs and growth relative to the UK average.

25.7 In summary, there are twelve broad sectors where the East Midlands offers comparative strengths or where the sector is of strategic significance to the region. These

[212] emda (2006) Regional Economic Strategy: A Flourishing Region - http://www.emda.org.uk/res/

[213] Intelligence East Midlands (2009) The East Midlands in 2009 (p194) – http://www.intelligenceeastmidlands.org.uk/content/view/1363/

sectors and their relative output and employment performance are presented in the table below.

Table 1: Industrial Structure of the East Midlands for selected (non-LCEGS) industries, 2007						
	Output (%)		FTE Employment (%)		Location Quotient	
	EM	UK	EM	UK	Output	Employment
RES priority sectors						
Transport equipment	3.7	1.6	1.9	1.2	2.3	1.5
Food and drink	4.3	2.0	2.8	1.6	2.1	1.8
Construction	6.4	6.0	8.8	8.3	1.1	1.1
Healthcare (and bioscience)	6.8	7.3	9.5	10.6	0.9	0.9
Other significant regional industries						
Minerals	1.4	0.5	0.8	0.4	2.6	1.9
Metals	2.2	1.4	1.9	1.6	1.5	1.2
Textiles and clothing	0.8	0.4	1.3	0.5	2.0	2.6
Significant national industries						
Banking and insurance	5.1	9.8	2.1	3.8	0.5	0.6
Machinery and equipment	1.6	1.3	1.4	1.1	1.2	1.3
Electrical and optical equipment	1.2	1.4	1.4	1.2	0.9	1.1
Business services - software consultancy	13.2	15.2	13.4	15.5	0.9	0.9
Other financial and business services	3.4	4.4	2.5	2.9	0.8	0.9
Source: East Midlands in 2009 – RES Evidence Base						

Green Credentials

25.8 In gauging sectors' green potential, the BERR report employed a series of criteria that was mapped against individual businesses. This assessed business performance in five categories: inputs; processes; outputs; marketing; and environmental externalities[214]. Each criterion was weighted and given a relative score based upon the report's interpretation of 'green business', as presented in the box below.

What makes businesses 'green'?

"To be successfully green, businesses need to not only implement **cleaner business practices**, for example, reduce their carbon footprint, but also have **better communications** with their customers."

"The strategy of a firm is therefore based not only on the concept of productivity but also on the assessment of the **life-cycle of products and services**. Such fundamental change helps both improve the process by which a product is developed, therefore enhancing a firm's productivity, and change the way a business presents itself to customers."

[214] Source: Ernst & Young/BERR (2008) Comparative advantage and green business (p5)

Ernst & Young/BERR (2008) Comparative advantage and green business (p5)

25.9 Individual company mapping, utilised by the national 2008 report and based around 5 metrics, is relatively technical and difficult to achieve within the limits of this regional paper. Instead, this paper assesses sectors' green credentials based upon research conducted by agencies including the Carbon Trust, CBI, Met Office and individual Sector Skills Councils (SSCs). This includes research that assesses:

- Opportunities for sectors to create value;
- Sector responsiveness to sustainability; and
- Sector responsiveness to carbon abatement.

Sector opportunities to create value

25.10 The Carbon Trust[215] identifies four categories of sector/business adaptation to the sustainability agenda and assesses whether economic value would be created or destroyed for each sector by the move towards greener business. Based upon this categorisation, the **power, transport, building and industrial sectors** were all identified as having significant scope to cut emissions and to exploit opportunities from low carbon activity and demand (creation of economic value).[216]

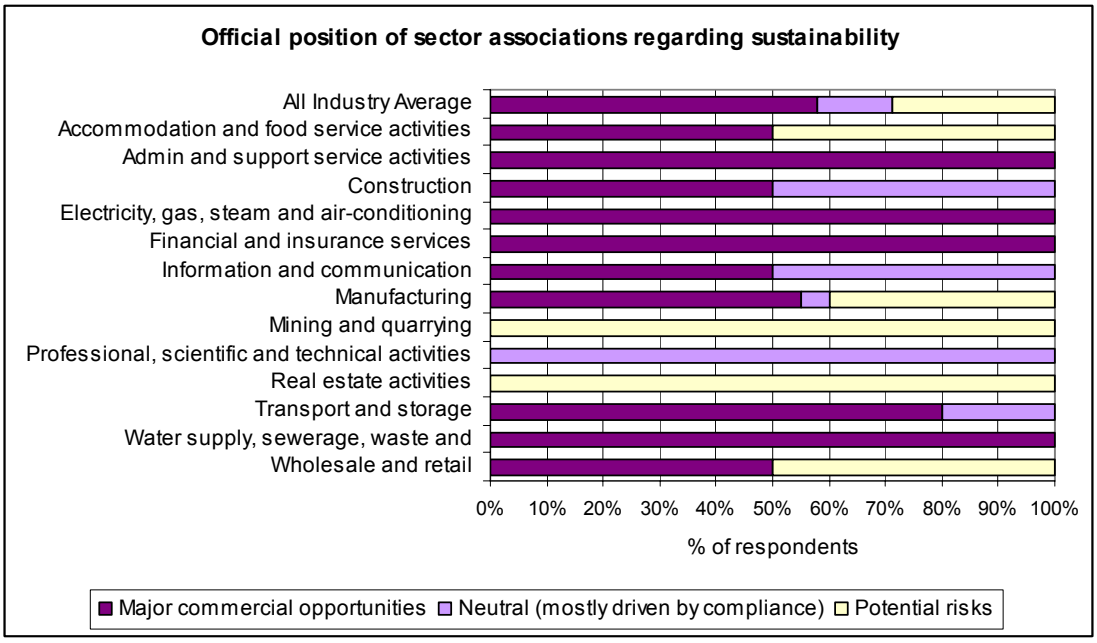
Sector responsiveness to sustainability

25.11 The best data concerning sector attitudes towards sustainability comes from a survey of 51 sector associations conducted by PWC for BIS in 2009.[217] Responses are presented in the figure below and were typically mixed, although most sector associations identified opportunities from sustainability rather than risks. Manufacturing sector associations were divided over the issue with only a slightly higher proportion of respondents recognising opportunities rather than risks; the main risk being that economic value is destroyed rather than created.

[215] Carbon Trust (2008) Climate change – a business revolution – http://www.carbontrust.com/publications/CTC740_business_rev%20v5.pdf

[216] BIS (2009) Towards a Low Carbon Economy - economic analysis and evidence for a low carbon industrial strategy (p vi) - http://www.berr.gov.uk/files/file52165.pdf

[217] PWC / BIS (2009) Sectoral Progress on Sustainability - http://www.berr.gov.uk/files/file52075.pdf



25.12 In summary, this finds that the risks of economic value being destroyed are felt most significantly by the sectors of: **mining; real estate; accommodation and retail; and manufacturing.**

Sector responsiveness to carbon abatement

25.13 The 2007 CBI Climate Change Task Force[218] reported four areas that offered the greatest scope for carbon abatement in the period to 2030: emissions reduction in buildings (improvements in residential buildings); power sector; transport technologies (engine efficiency and bio-fuels); and industry (improving manufacturing processes and low carbon sources source of energy). This has an implication for volatility (both creation and destruction of value) in the **construction; transport; power generation; and manufacturing** sectors.

25.14 Of note, the potential for businesses to adapt to the low carbon economy is also affected by their size. Compared to larger companies, SMEs were found to have less knowledge about their energy/carbon usage, presenting opportunities for carbon savings. This has an implication for **business service** sectors which typically employ fewer people per business. From 2010, the Carbon Reduction Commitment will require mid-sized UK firms to implement carbon reporting, and it is expected that UK suppliers will be increasingly asked to provide evidence of their contribution to their customer's carbon emissions.[219]

[218] CBI (2007) Climate Change: Everyone's Business

[219] Experto Crede / BIS (2009) UK Business Carbon Top3Map (p2).

Summarising Green Credentials

25.15 Referencing the three sets of research around green value creation, sustainability and carbon abatement, ekosgen have developed and applied green scores which can be applied sectorally. This green score is based upon the concept of value creation/destruction developed in the 2008 Carbon Trust Report. The green scores of 1 to 4 are as follows:

- 4) Significant opportunities to create value from implementing low carbon practices or adapting to the low carbon agenda;
- 3) Opportunities to create value from implementing low carbon practices or adapting to low carbon agenda;
- 2) Risk of value destruction if unable to adapt to the low carbon agenda
- 1) Significant risk of value destruction if unable to adapt to the low carbon agenda.

25.16 Applying the green scores to the 12 East Midlands strategic sectors (listed in Table 1) finds that sectors' green scores vary across the range of 1-4. This is summarised in Table 2 below:

Table 2: Green Score for East Midlands Strategic Sectors

SIC Division	Sector	Green Score
DA	Food & Drink	2) Need to Adapt / Value At Risk
DB	Textiles	2) Need to Adapt / Value At Risk
DI	Minerals	1) Significant Need to Adapt / Risk
DJ	Metals	1) Significant Need to Adapt / Risk
DK + DN	Machinery and equipment	3) Opportunities
DL	Electrical and optical	3) Opportunities
DM	Transport equipment	3) Opportunities
F	Construction	4) Significant Opportunities
J	Banking and insurance	2) Need to Adapt / Value At Risk
K (72)	Software / hardware	2) Need to Adapt / Value At Risk
K (70, 71, 73, 74)	Business Services	2) Need to Adapt / Value At Risk
N (85.1)	Healthcare	2) Need to Adapt / Value At Risk

Source: ekosgen 2009

25.17 In essence, the green score represents the extent to which the sector can exploit or adapt to anticipated opportunities in a lower carbon future. Looking at selected sectors, there are significant opportunities for the Construction sector to create value by changing its existing practices. For example, opportunities for new *value creation* through building emissions reductions legislation. In contrast, significant adaptation is needed for the metals and minerals sector to *safeguard value* in their existing activities in response to legislation rather than in response to tangible value generating opportunities in the short term.

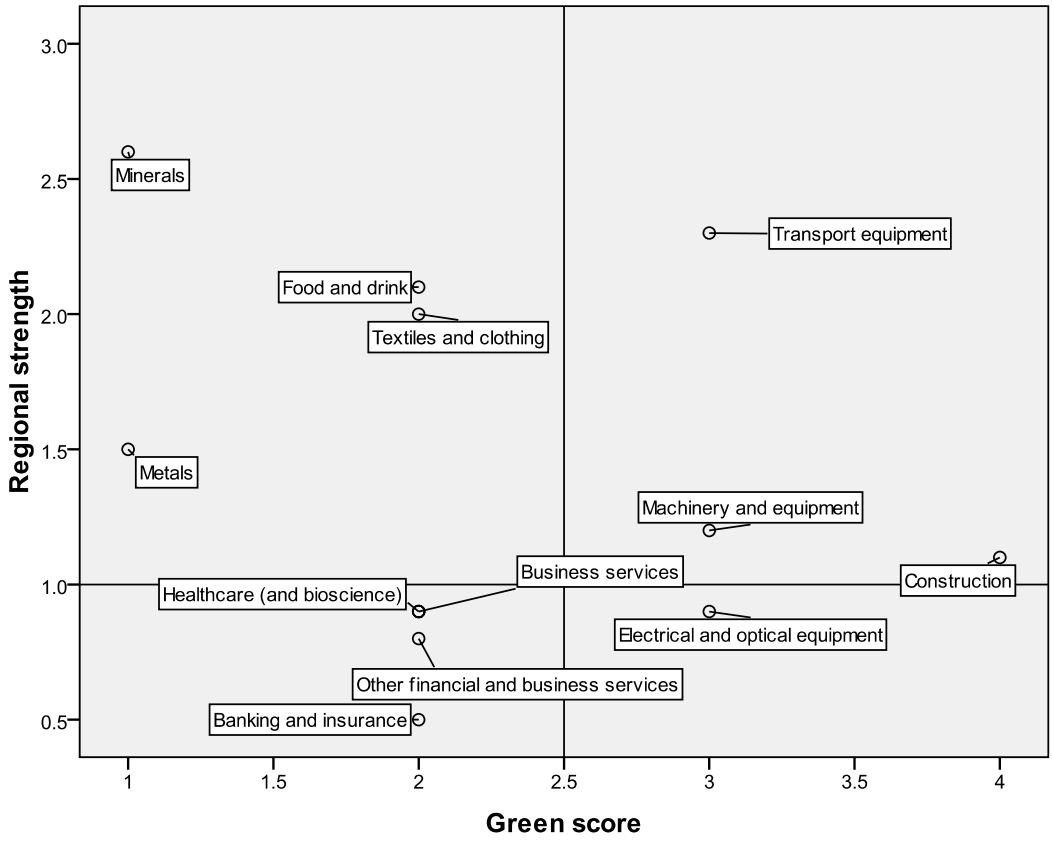
Merging Sector Strengths and Green Opportunities

25.18 The previous two sections have produced rankings on the basis of both sector strength and green opportunities. Applied to two axes, this data is presented visually in the figure below which matches regional strength (output location quotient against UK average – see Table 1) against green score. Each quadrant of the diagram represents sectors that *emda* will need to approach differently and tailor support accordingly. In summary:

- Top right quadrant: sectors with a relatively strong regional presence and good opportunities to create value through the transition to a low carbon economy.
- Bottom right quadrant: sectors with a relatively weaker220 regional presence but good opportunities to create value through the transition to a low carbon economy.
- Top left quadrant: sectors with a relatively strong regional presence but at risk if unable to adapt to the low carbon economy.
- Bottom left quadrant: sectors with a relatively weaker regional presence and at risk if unable to adapt to the low carbon economy.

25.19 A third factor (axis) to consider is anticipated growth rate based on all factors and not just those related to the low carbon economy. For example, whilst healthcare has a green score of 2 (suggesting low growth), the regional evidence base anticipates the sector to achieve significant regional growth over the next ten years due to other drivers (e.g. healthcare legislation, demographics). Similarly, the textiles sector is forecast to decline in employment and output terms, predominantly due to the continuing cost pressures from the global market. For this reason, the position of sectors in the figure is anticipated to change over time, for example, healthcare is anticipated to move from the bottom left to the top left quadrant.

[220] Note: each of the 12 sectors have been selected as offering strategic/comparative advantages. Output location quotient is just one way of measuring regional strength.



25.20 As can be seen above, significant potential exists to exploit existing strengths within the transport equipment; machinery and equipment; and construction sectors, to the greatest benefit of the low carbon economy.

Sub-sector and Business mapping

25.21 Based upon the four sectors that have a green score of 3 or 4, there are eleven sub-sectors within these that offer relative strengths in the East Midlands as well[221]. These are the prime sub-sectors for *emda* to target in order to generate the highest green value among non-LCEGS businesses[222] and are collectively referred to as Group 1. ABI data for 2008 estimates that these eleven sub-sectors account for some **8,929 business units** in the East Midlands region.

25.22 In summary, these sub-sectors predominantly cover: manufacture of engines and machinery; manufacture of transport vehicles and equipment; manufacture of domestic

[221] Based on employment Location Quotient (against the UK). Output Location Quotient unavailable for sub-sector detail.

[222] However, there is also a role for *emda* and partners to promote low carbon activity among those sectors with green scores of 1 and 2.

finished goods; and construction and building services. Although none of these sectors could explicitly be termed LCEGS, some of the 8,929 individual businesses will think of themselves as LCEGS and will therefore already be covered by the LCEGS mapping being undertaken by ekosgen.

25.23 The research also finds that there are three other groups that may be of interest to *emda* as target sub-sectors:

- Group 2: 69 sub-sectors that are well-placed to exploit opportunities in a lower-carbon economy but do not appear to have an overall relative strength in the East Midlands compared to other regions (although there may be niche strengths within these). These sub-sectors account for 14,033 business units in the East Midlands.
- Group 3: 18 sub-sectors that will need to adapt to changes in the low carbon economy, and where there is an identified strength in the East Midlands. These sub-sectors account for 5,482 business units in the East Midlands.
- Group 4: 148 sub-sectors that will need to adapt to changes in the low carbon economy, but where there are no identified significant strengths in the East Midlands. These sub-sectors account for 51,472 business units in the East Midlands.

25.24 There is potential for future mapping to calculate how these improvements in the low carbon economy would translate to carbon savings.

Conclusions

25.25 This report targets those sectors that offer greatest economic benefits from transition to a green economy. It finds that sectors with a regional strength are typically well placed to act as vanguards for promoting the low-carbon agenda, provided that these sectors can exploit identifiable opportunities from the transition. There are 11 sub-sectors that fit this criteria in the East Midlands accounting for approximately 8,929 businesses and broadly covering manufacture of engines and machinery; manufacture of transport vehicles and equipment; manufacture of domestic finished goods; and construction and building services. There are a further three groups of sub-sectors that could also benefit in different ways from the transition to a low carbon economy, and could potentially benefit from support with this transition.

SIC Sub-Sector Tables

25.26 The full list of sub-sectors recommended for further investigation is provided below:

Group 1 Sub-Sectors

2911 : Manufacture of engines and turbines, except aircraft, vehicle and cycle engines
2952 : Manufacture of machinery for mining, quarrying and construction
3110 : Manufacture of electric motors, generators and transformers
3520 : Manufacture of railway and tramway locomotives and rolling stock
3530 : Manufacture of aircraft and spacecraft
3611 : Manufacture of chairs and seats
3614 : Manufacture of other furniture
3650 : Manufacture of games and toys
4521 : General construction of buildings and civil engineering works
4523 : Construction of highways, roads, airfields and sports facilities
4533 : Plumbing

Group 2 Sub-Sectors

2912 : Manufacture of pumps and compressors
2913 : Manufacture of taps and valves
2914 : Manufacture of bearings, gears, gearing and driving elements
2921 : Manufacture of furnaces and furnace burners
2922 : Manufacture of lifting and handling equipment
2923 : Manufacture of non-domestic cooling and ventilation equipment
2924 : Manufacture of other general purpose machinery not elsewhere classified
2931 : Manufacture of agricultural tractors
2932 : Manufacture of other agricultural and forestry machinery
2941 : Manufacture of portable hand held power tools
2942 : Manufacture of metalworking machine tools
2943 : Manufacture of other machine tools not elsewhere classified
2951 : Manufacture of machinery for metallurgy
2953 : Manufacture of machinery for food, beverage and tobacco processing
2954 : Manufacture of machinery for textile, apparel and leather production
2955 : Manufacture of machinery for paper and paperboard production
2956 : Manufacture of other special purpose machinery not elsewhere classified
2960 : Manufacture of weapons and ammunition
2971 : Manufacture of electric domestic appliances
2972 : Manufacture of non-electric domestic appliances
3001 : Manufacture of office machinery

3002 : Manufacture of computers and other information processing equipment
3120 : Manufacture of electricity distribution and control apparatus
3130 : Manufacture of insulated wire and cable
3140 : Manufacture of accumulators, primary cells and primary batteries
3150 : Manufacture of lighting equipment and electric lamps
3161 : Manufacture of electrical equipment for engines and vehicles not elsewhere classified
3162 : Manufacture of other electrical equipment not elsewhere classified
3210 : Manufacture of electronic valves and tubes and other electronic components
3220 : Manufacture of television and radio transmitters and apparatus for line telephony and line telegraphy
3230 : Manufacture of television and radio receivers, sound or video recording or reproducing apparatus and associated goods
3310 : Manufacture of medical and surgical equipment and orthopaedic appliances
3320 : Manufacture of instruments and appliances for measuring, checking, testing, navigating and other purposes, except industrial process control equipment
3330 : Manufacture of industrial process control equipment
3340 : Manufacture of optical instruments and photographic equipment
3350 : Manufacture of watches and clocks
3410 : Manufacture of motor vehicles
3420 : Manufacture of bodies (coachwork) for motor vehicles: manufacture of trailers and semi-trailers
3430 : Manufacture of parts and accessories for motor vehicles and their engines
3511 : Building and repairing of ships
3512 : Building and repairing of pleasure and sporting boats
3541 : Manufacture of motorcycles
3542 : Manufacture of bicycles
3543 : Manufacture of invalid carriages
3550 : Manufacture of other transport equipment not elsewhere classified
3612 : Manufacture of other office and shop furniture
3613 : Manufacture of other kitchen furniture
3615 : Manufacture of mattresses
3621 : Striking of coins and medals
3622 : Manufacture of jewellery and related articles not elsewhere classified
3630 : Manufacture of musical instruments
3640 : Manufacture of sports goods
3661 : Manufacture of imitation jewellery
3662 : Manufacture of brooms and brushes
3663 : Other manufacturing not elsewhere classified
4511 : Demolition and wrecking of buildings; earth moving

4512 : Test drilling and boring
4522 : Erection of roof covering and frames
4524 : Construction of water projects
4525 : Other construction work involving special trades
4531 : Installation of electrical wiring and fittings
4532 : Insulation work activities
4534 : Other building installation
4541 : Plastering
4542 : Joinery installation
4543 : Floor or wall covering
4544 : Painting and glazing
4545 : Other building completion
4550 : Renting of construction or demolition equipment with operator

Group 3 Sub-Sectors

1512 : Production and preserving of poultry meat
1513 : Production of meat and poultry meat products
1533 : Processing and preserving of fruit and vegetables not elsewhere classified
1561 : Manufacture of grain mill products
1572 : Manufacture of prepared pet foods
1584 : Manufacture of cocoa, chocolate and sugar confectionery
1589 : Manufacture of other food products not elsewhere classified
1740 : Manufacture of made-up textile articles, except apparel
1771 : Manufacture of knitted and crocheted hosiery
1772 : Manufacture of knitted and crocheted pullovers, cardigans and similar articles
2661 : Manufacture of concrete products for construction purposes
7210 : Hardware consultancy
7230 : Data processing
7415 : Management activities of holding companies
7450 : Labour recruitment and provision of personnel
7460 : Investigation and security activities
7482 : Packaging activities
8512 : Medical practice activities

Group 4 Sub-Sectors

1511 : Production and preserving of meat
1520 : Processing and preserving of fish and fish products
1531 : Processing and preserving of potatoes
1532 : Manufacture of fruit and vegetable juice

1541 : Manufacture of crude oils and fats
1542 : Manufacture of refined oils and fats
1543 : Manufacture of margarine and similar edible fats
1551 : Operation of dairies and cheese making
1552 : Manufacture of ice cream
1562 : Manufacture of starches and starch products
1571 : Manufacture of prepared feeds for farm animals
1581 : Manufacture of bread; manufacture of fresh pastry goods and cakes
1582 : Manufacture of rusks and biscuits; manufacture of preserved pastry goods and cakes
1583 : Manufacture of sugar
1585 : Manufacture of macaroni, noodles, couscous and similar farinaceous products
1586 : Processing of tea and coffee
1587 : Manufacture of condiments and seasonings
1588 : Manufacture of homogenised food preparations and dietetic food
1591 : Manufacture of distilled potable alcoholic beverages
1592 : Production of ethyl alcohol from fermented materials
1593 : Manufacture of wines
1594 : Manufacture of cider and other fruit wines
1595 : Manufacture of other non-distilled fermented beverages
1596 : Manufacture of beer
1597 : Manufacture of malt
1598 : Manufacture of mineral waters and soft drinks
1711 : Preparation and spinning of cotton-type fibres
1712 : Preparation and spinning of woollen-type fibres
1713 : Preparation and spinning of worsted-type fibres
1714 : Preparation and spinning of flax-type fibres
1715 : Throwing and preparation of silk including from noils and throwing and texturing of synthetic or artificial filament yarns
1716 : Manufacture of sewing threads
1717 : Preparation and spinning of other textile fibres
1721 : Cotton-type weaving
1722 : Woollen-type weaving
1723 : Worsted-type weaving
1724 : Silk-type weaving
1725 : Other textile weaving
1730 : Finishing of textiles
1751 : Manufacture of carpets and rugs
1752 : Manufacture of cordage, rope, twine and netting
1753 : Manufacture of non-wovens and articles made from non-wovens, except apparel

1754 : Manufacture of other textiles not elsewhere classified
1760 : Manufacture of knitted and crocheted fabrics
2611 : Manufacture of flat glass
2612 : Shaping and processing of flat glass
2613 : Manufacture of hollow glass
2614 : Manufacture of glass fibres
2615 : Manufacture and processing of other glass including technical glassware
2621 : Manufacture of ceramic household and ornamental articles
2622 : Manufacture of ceramic sanitary fixtures
2623 : Manufacture of ceramic insulators and insulating fittings
2624 : Manufacture of other technical ceramic products
2625 : Manufacture of other ceramic products
2626 : Manufacture of refractory ceramic products
2630 : Manufacture of ceramic tiles and flags
2640 : Manufacture of bricks, tiles and construction products, in baked clay
2651 : Manufacture of cement
2652 : Manufacture of lime
2653 : Manufacture of plaster
2662 : Manufacture of plaster products for construction purposes
2663 : Manufacture of ready-mixed concrete
2664 : Manufacture of mortars
2665 : Manufacture of fibre cement
2666 : Manufacture of other articles of concrete, plaster and cement
2670 : Cutting, shaping and finishing of stone
2681 : Production of abrasive products
2682 : Manufacture of other non-metallic mineral products not elsewhere classified
2710 : Manufacture of basic iron and steel and of ferro-alloys
2721 : Manufacture of cast iron tubes
2722 : Manufacture of steel tubes
2731 : Cold drawing
2732 : Cold rolling of narrow strip
2733 : Cold forming or folding
2734 : Wire drawing
2741 : Precious metals production
2742 : Aluminium production
2743 : Lead, zinc and tin production
2744 : Copper production
2745 : Other non-ferrous metal production
2751 : Casting of iron

2752 : Casting of steel
2753 : Casting of light metals
2754 : Casting of other non-ferrous metals
2811 : Manufacture of metal structures and parts of structures
2812 : Manufacture of builders' carpentry and joinery of metal
2821 : Manufacture of tanks, reservoirs and containers of metal
2822 : Manufacture of central heating radiators and boilers
2830 : Manufacture of steam generators, except central heating hot water boilers
2840 : Forging, pressing, stamping and roll forming of metal; powder metallurgy
2851 : Treatment and coating of metals
2852 : General mechanical engineering
2861 : Manufacture of cutlery
2862 : Manufacture of tools
2863 : Manufacture of locks and hinges
2871 : Manufacture of steel drums and similar containers
2872 : Manufacture of light metal packaging
2873 : Manufacture of wire products
2874 : Manufacture of fasteners, screw machine products, chains and springs
2875 : Manufacture of other fabricated metal products not elsewhere classified
6511 : Central banking
6512 : Other monetary intermediation
6521 : Financial leasing
6522 : Other credit granting
6523 : Other financial intermediation not elsewhere classified
6601 : Life insurance
6602 : Pension funding
6603 : Non-life insurance
6711 : Administration of financial markets
6712 : Security broking and fund management
6713 : Activities auxiliary to financial intermediation not elsewhere classified
6720 : Activities auxiliary to insurance and pension funding
7011 : Development and selling of real estate
7012 : Buying and selling of own real estate
7020 : Letting of own property
7031 : Real estate agencies
7032 : Management of real estate on a fee or contract basis
7110 : Renting of automobiles
7121 : Renting of other land transport equipment
7122 : Renting of water transport equipment

7123 : Renting of air transport equipment
7131 : Renting of agricultural machinery and equipment
7132 : Renting of construction and civil engineering machinery and equipment
7133 : Renting of office machinery and equipment including computers
7134 : Renting of other machinery and equipment not elsewhere classified
7140 : Renting of personal and household goods not elsewhere classified
7221 : Publishing of software
7222 : Other software consultancy and supply
7240 : Data base activities
7250 : Maintenance and repair of office, accounting and computing machinery
7260 : Other computer related activities
7310 : Research and experimental development on natural sciences and engineering
7320 : Research and experimental development on social sciences and humanities
7411 : Legal activities
7412 : Accounting, book-keeping and auditing activities; tax consultancy
7413 : Market research and public opinion polling
7414 : Business and management consultancy activities
7420 : Architectural and engineering activities and related technical consultancy
7430 : Technical testing and analysis
7440 : Advertising
7470 : Industrial cleaning
7481 : Photographic activities
7485 : Secretarial and translation services
7486 : Call centre activities
7487 : Other business activities not elsewhere classified
8511 : Hospital activities
8513 : Dental practice activities
8514 : Other human health activities