

The economic potential of low carbon and environmental goods and services (LCEGS) sector in Cheshire and Warrington

This research was commissioned by the Environmental Sustainability Technical Assistance Project.

Appendix B

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Cheshire East LCEGS Report

Jan 2013

from kMatrix Ltd



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1. Introduction to LCEGS

The data in this report is based upon our work for UK Government, UK regions, City Regions, companies and UK Investors. This data has been used extensively since 2007/ 08 as part of the UK Low Carbon and Green Job agendas and has been reported annually by BIS since 2008/ 09 as the Low Carbon Environmental Goods and Services (LCEGS) sector. The data in this report is for fiscal years 2010/ 11 and 2011/ 12.

The definition of the LCEGS sector and its market segments is the result of six year's work with UK National and regional government and UK industry organisations. The definition was designed to address the gap in current Standard Industry Classification (SIC) codes that has resulted in market activities in this area of the economy being consistently over- looked and under- valued.

This is a broad definition of activities that may appear under the overlapping headings of Enviro, Eco, Renewable Energy, Sustainable Technologies, Clean Tech, Green Tech, Low Carbon or Green Economy (and any other we might have missed). It has drawn on definitions from the US, Europe and further afield. It is constantly evolving and updating as new activities are identified, reach the market or are assigned one of the above labels. In the strictest sense it is not a "sector" but a flexible construct or "umbrella" term for capturing disparate Low Carbon, Environmental and Renewable Energy activities spread across many existing sectors like transport, construction, energy etc.

The current definition includes 2800 product and service activities that derive from sector supply chain activities (componentry & assemblies) and value chain activities (R&D, Supply & Training). A glossary of economic activities included for each sub sector of LCEGS is included as an Appendix.

The sector has been defined using 24 sub sectors (Level 2 markets). These are sub- divided into three broad categories- Environmental, Renewable Energy and Low Carbon- the addition of each broadly mapping the evolution of the current LCEGS sector definition from its Environmental roots:

Environmental	Renewable Energy	Low Carbon
<ul style="list-style-type: none">• Air Pollution• Contaminated Land• Energy Management• Environmental Consultancy• Environmental Monitoring• Marine Pollution Control• Noise & Vibration Control• Recovery and Recycling• Waste Management• Water Supply and Waste Water Treatment	<ul style="list-style-type: none">• Biomass• Geothermal• Hydro• Photovoltaic• Wave & Tidal• Wind• Renewable Consulting	<ul style="list-style-type: none">• Additional Energy Sources• Alternative Fuel/ Vehicle• Alternative Fuels• Building Technologies• Carbon Capture & Storage• Carbon Finance• Nuclear Power



2. Methodology

2.1 Introduction

This sector is not well documented by government statistics, so our methodology works beyond standard industrial and market classifications and looks for multiple sources of industrial- based evidence to quantify market values. We are unique in how we identify, assemble, evaluate, monitor and develop rules for the use of those sources- to quantify difficult-to-measure markets.

Market activities are only included when there are multiple data sources. These sources are screened to remove duplicate references to any single source and then shortlisted by removing outliers and unreliable sources. This shortlist is then screened again until some consistency in value is achieved.

Market values created in this way are then “reality tested” by comparing these values within and across sectors, against known national/ regional industrial specialism, across nations, against known trade flows and recognised industry benchmarks.

This methodology is quantitative and data intensive. It’s uniqueness resides in the ability to manage and select reliable sources that are specific to each market activity. The data sources are global in nature and derive from government, private sector, institutional, industrial, trade, advertising, HR, financial, investor, academic and other (unpublished) sources. Up to 900 sources are used to compile the national LCEGS data set.

Sources are carefully managed. We measure and rate their accuracy and reliability over time and we exclude sources that are outdated or without a measureable track record. We use no less than seven qualified sources showing some consistency in results for deriving any values that we print. We create a mean value from these selected values and then assign a confidence level (generally of about 85%) based upon the spread of selected values around the mean

In contrast to most research or consulting reports we do not identify, copy and then acknowledge single data sources for specific tables or analytical comments. This is impossible for us to do because we multi- source every aspect of our data and then “transform” it into a new value. This makes single source attribution meaningless.

2.2 Measures

Throughout this file we focus on a small number of key measures. To summarise, these are:

- Sales is our estimate (in £m) of economic activity by identified companies in a defined region with the supply/ value chain for market products and services. Our estimate is based upon where sales activity takes place *rather than where it is reported*.
- Companies is a measure of the total number of companies in a defined region that match (or fit within) the market activity headings.



- Employment is a measure of the estimated employment numbers across all aspects of the supply/ value chain. National, regional and other economic data sources have been used to estimate current employment levels for each market activity.
- Growth is a multi- year measure that includes historical AND forecast growth. The growth measure is derived from live, rapidly changing and multi- sourced data links and is specifically based upon growth in Sales. Growth is generally a measure of increased market opportunity and can be used for trend analysis, comparison across different markets or as an moving indicator of market confidence (growth time series).
- Exports is a measure of products and services sold overseas and is calculated using in- country/ out- of- country data and additional data from the logistics and freight forwarding industry.

2.3 Methodology

Our methodology for sector analysis is definition and source- driven. The definition determines WHAT gets measured and our source model determines HOW it gets measured.

All of our data measures are multi- sourced and our process starts by defining the financial value of the sector (based upon our inclusive definition) from a wide variety of sources.

When we create a sector definition we always check that multiple sources of economic data exist for each included activity. This financial value is checked against existing sector values and also against the value of other economic sectors.

This is an iterative process that continues until we arrive at robust values and comparisons for all activities within the sector (comparative values of Wind v. Photovoltaic v. Biomass) that can then be meaningfully compared across global economies (UK v. US v. China etc) and across different sectors (environmental consultancy v. Other specialist consulting activities). It is important that we triangulate economic values in this way so that a) we can exclude the research bias that often occurs from focusing on a single sector in a single sector and b) ensure that we are effectively monitoring a sector that is still evolving by absorbing activities often included in other sectors.

Sales

The key measure that we use for financial value is Sales i.e. the value of sector products and services sold either to other businesses or directly to consumers from the geographically located company base, whether it be national, regional, sub regional or Local Authority. This means that our analysis only includes activities where there is a measurable economic footprint. It does not include publicly- funded research or pre- commercial consumption of funds, except where those activities result in the purchase of product and services from third parties

As we derive the financial value for the sector we also assemble and assess the UK company base that is contributing to this value. In the first case we identify all “significant” companies (where LCEGS accounts for @80% of company sales) and then the supply/ value chain companies, where LCEGS sales is an important and measurable component of overall sales (@20%). These percentages are indicative and vary for different LCEGS activities.



Companies

The company count acts as a further reality check on the financial value of the sector (by comparing company turnover values in this and other sectors) and also assists in the geographical analysis of where LCEGS value is created. For company counts and company listings we use standard data sources (FAME, Companies House etc), international sources, industry/ trade sources, the advertising industry (YELL etc) and company- published information (with caution).

One important fact about our methodology is that in a typical SIC approach to sector analysis, a company is counted once and the value of its activities are very often assigned to a single category (which may or may not reflect what a company actually sells now), within a single sector and from a single geographical location.

Our approach is to identify and assign value to different activities within a company that may fall within the same sector and to exclude values associated with different sectors. Where possible, we also break the reported activity down within larger multi- site companies so that only the value created within a region/ LA is reported for that region/ LA.

By analysing a sector in this way we are able to capture the economic value generated by all “prime” and supply/ value chain companies (and without any double counting of value). However, our methodology does mean that a single company may contribute value to multiple activities and we have to be careful not to double- count companies. To avoid this we assign a company (for counting purposes) to the activity that accounts for most of its sector sales. This does mean that on some occasions some of the smaller activities in our analysis may have a £value but a zero in the company column.

Employment

When financial values and company numbers have been calculated we then look at the employment base for the sector. Our analysis of employment includes HR/ Recruitment industry data, trade/ industry data, government statistics, company reported employment levels and a variety of industry benchmarks that show employee input ratios into different products and processes. We do not survey companies directly for this information.

From these different sources we calculate employment numbers for LCEGS sector activities, taking into account how staff can operate processes that produce products for different markets. We, therefore, measure our employment numbers in Whole Time Equivalents (WTE).

Growth

Sales Growth is both an historical and a forecast measure and we apply the same multi-source rigour to assessing growth that has already occurred as to growth that may occur. Growth forecasting shows the importance of both multi sourcing AND tracking the historical reliability/ accuracy of sources used. It is based upon continuous monitoring of forecast “opinions” that are constantly being updated and re-evaluated, as a result “in-year” measurements of predicted growth can vary (when the sample is taken) and change (as sources respond to events like recession).

For this reason we measure annual growth as a) a value frozen at a point in time and b) a time series (monthly or quarterly) measured throughout the year. In this file we include only the single (frozen) forecast. Separate files with detailed time series forecasts and trend analysis for the LCEGS sector are available.



Annual growth figures are useful in calculating and comparing the future contribution of sector activities beyond the current baseline. The percentage growth shows the RATE of change, the application of growth rates to the current sales baseline shows the IMPACT of change. Measuring the impact of change in financial terms shows how the ranking and importance of existing activities to the region/ local authority may change over time and suggests when and where action may need to be taken to accommodate changes in the employment and company base.

A note of caution. The quoted growth rates in this file apply specifically to sales value. A growth in sales is indicative of changes in company numbers/ employment but 5% sales growth does not necessarily equate to 5% employment growth. Companies can achieve growth in different ways and the recession has shown that companies will consume any “slack” before creating new jobs.

Geography

Our methodology is designed to locate and measure economic activity at various geographical levels. The smallest unit of measurement is the Local Authority, but we can analyse data at County, sub regional, LEP, regional and UK level.

When we calculate and measure economic activity at the local authority level we take into account existing local government boundaries, local GDP calculations and demographics, the postcode location of companies in the sector and any other local data that is available and relevant to the sector. When we measure sales and employment, therefore, our numbers are based upon where the business is located, rather than where people live.

There are some limits to what economic measures can be meaningfully or accurately applied at the local level. This is due to the range and specificity of data sources. Most of the economic development measures within this file are fine. Growth is an exception because rates cannot meaningfully be differentiated at local level, therefore, we apply regional growth rates throughout.

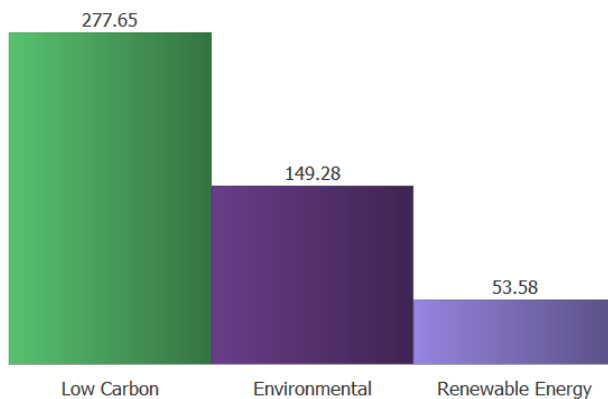


3. Analysis for Cheshire East

3.1 Cheshire East Summary

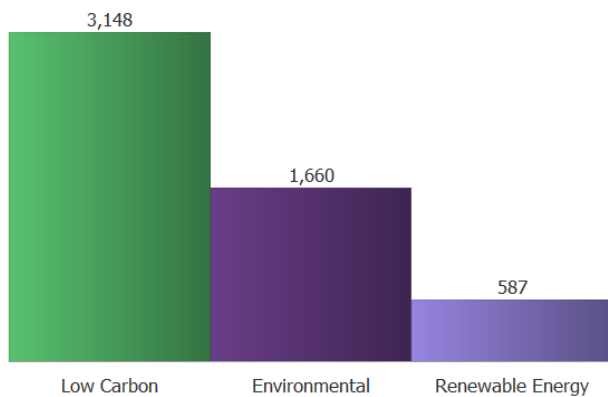
The analysis in this section of the report focuses on the 24 sub sectors of LCEGS and is supported by detailed data tables. These data tables include data to Level 4 for further in-house analysis.

Figure 1: Sales 2011/ 12 in £m



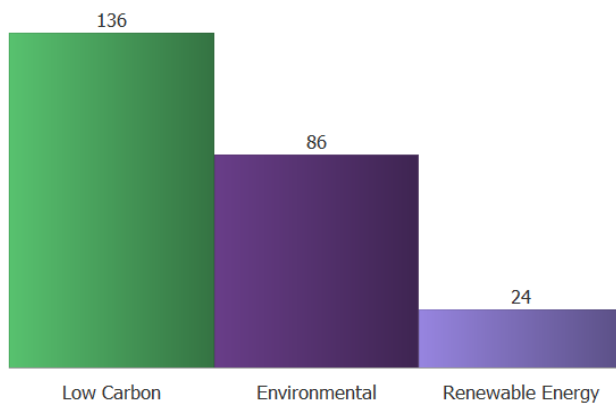
Sales for the LCEGS sector in 2011/ 12 was £480.5m. This is split 58% Low Carbon, 11% Renewable Energy and 31% Environmental.

Figure 2: Employment 2011/ 12



The employment count for the LCEGS sector in 2011/ 12 was 5,394. This is split 58% Low Carbon, 11% Renewable Energy and 31% Environmental.

Figure 3: Companies 2011/ 12

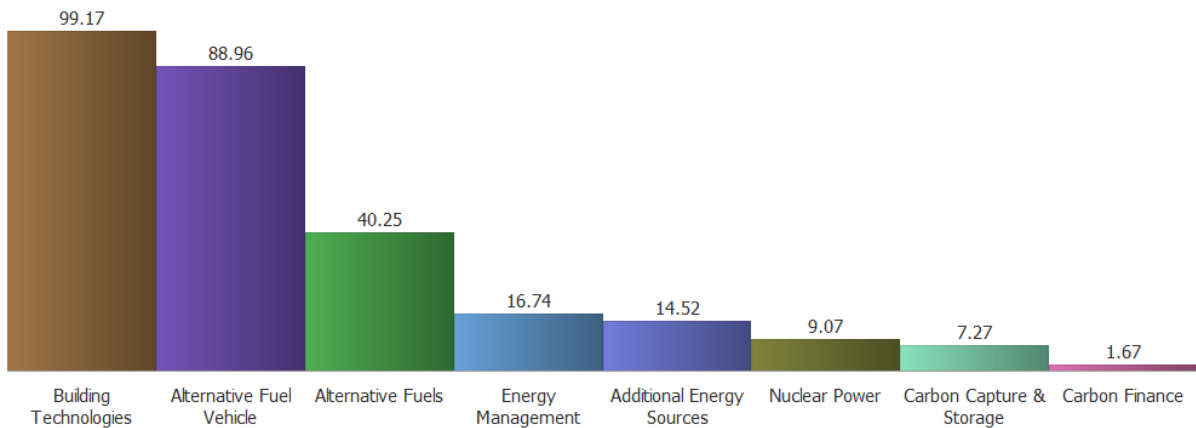


The company count for the LCEGS sector in 2011/ 12 was 245. This is split 55% Low Carbon, 10% Renewable Energy and 35% Environmental.



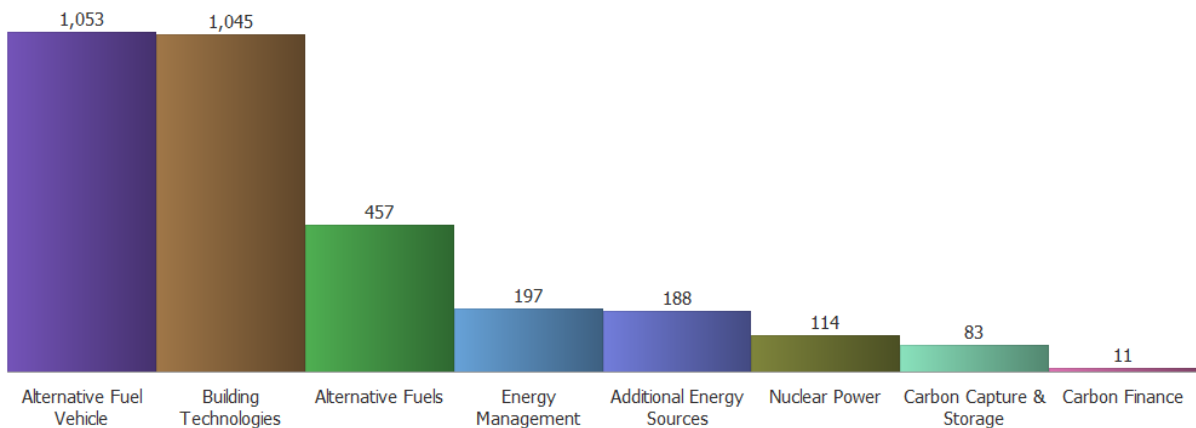
3.2 Low Carbon Summary

Figure 4: Sales 2011/ 12 in £m



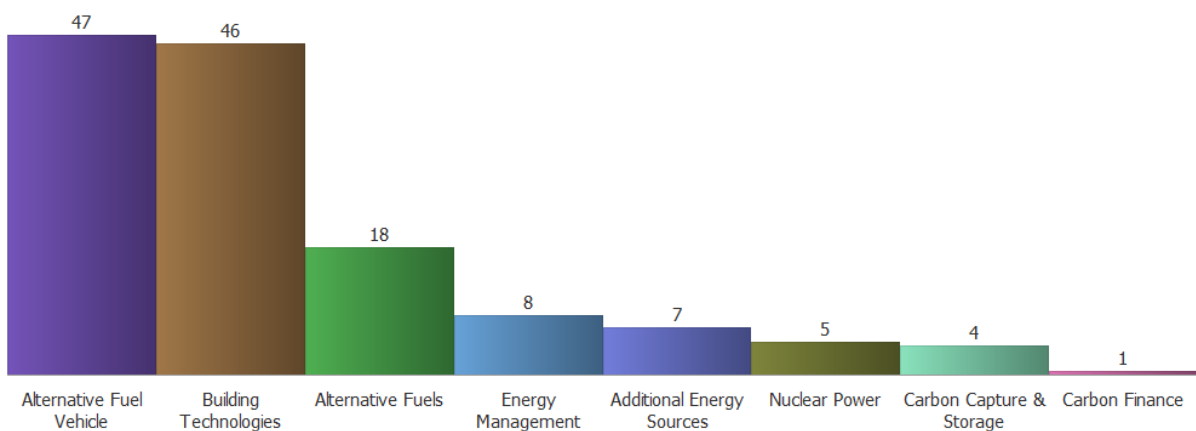
Low Carbon is split into eight sub sectors, of which three account for 82% of Sales- Building Technologies 36%, Alternatives Fuels 14% and Alternative Fuelled Vehicles 32%.

Figure 5: Employment 2011/ 12



Three sub sectors account for 81% of Employment- Building Technologies 33%, Alternatives Fuels 15% and Alternative Fuelled Vehicles 33%.

Figure 6: Companies 2011/ 12

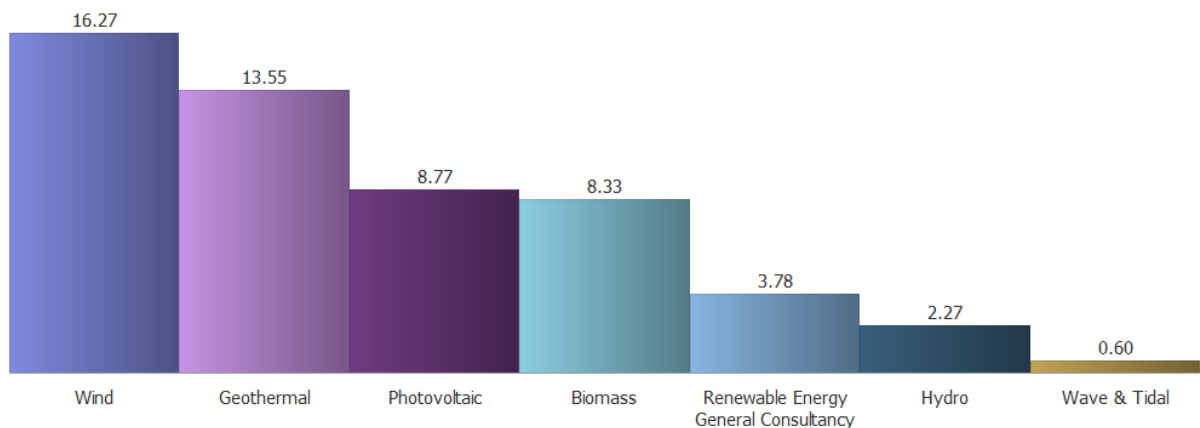


Three sub sectors account for 82% of Companies- Building Technologies 34%, Alternatives Fuels 13% and Alternative Fuelled Vehicles 33%.



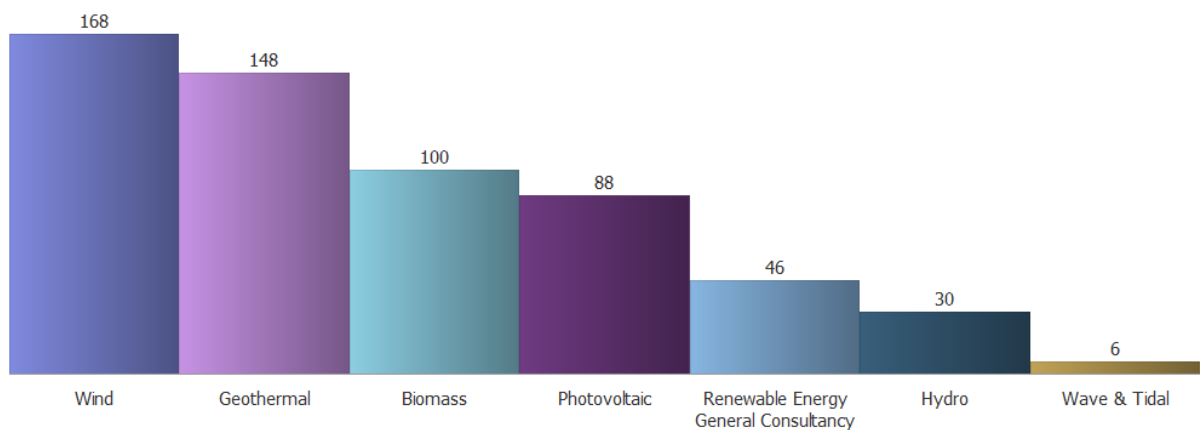
3.3 Renewable Energy Summary

Figure 7: Sales 2011/ 12 in £m



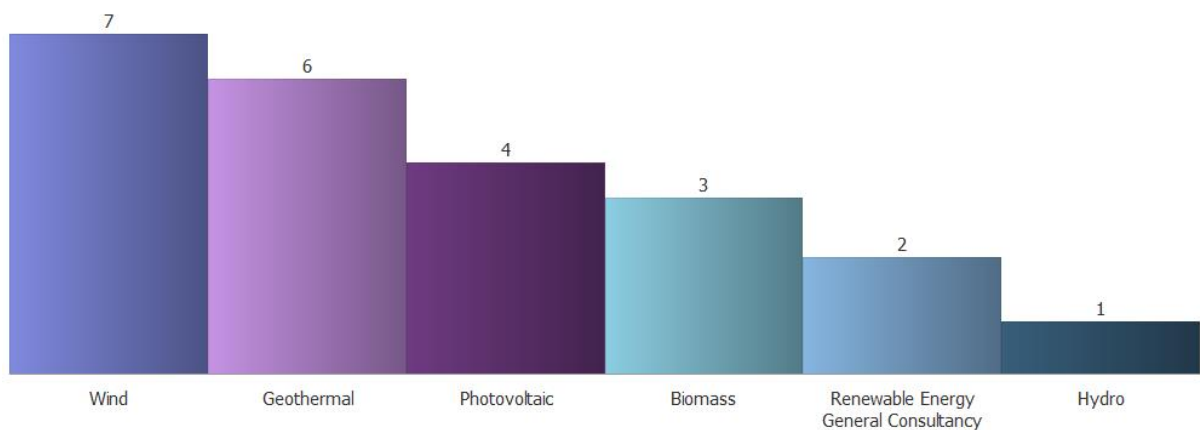
Renewable Energy is split into seven sub sectors, of which four account for 87% of Sales. These are Wind (30%), Geothermal (25%), Photovoltaic (16%) and Biomass(16%).

Figure 8: Employment 2011/ 12



Renewable Energy is split into seven sub sectors, of which four account for 86% of Employment. These are Wind (29%), Geothermal (25%), Photovoltaic (17%) and Biomass(15%).

Figure 9: Companies 2011/ 12

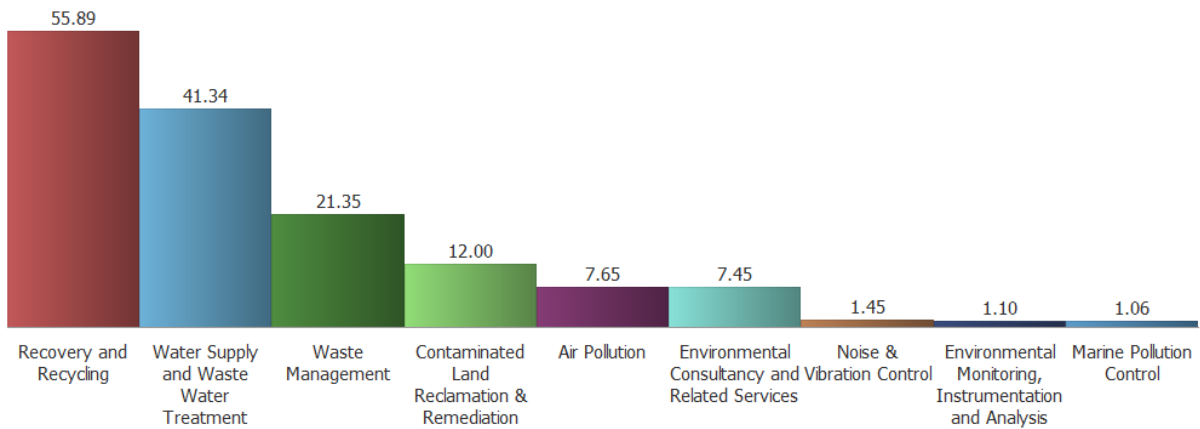


Renewable Energy is split into seven sub sectors, of which four account for 86% of Companies. These are Wind (28%), Geothermal (25%), Photovoltaic (18%) and Biomass(15%).



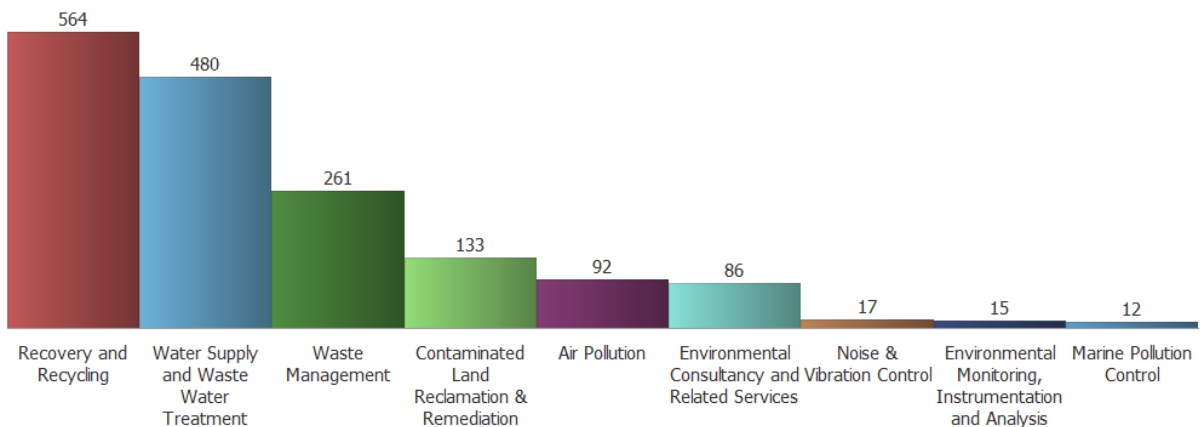
3.4 Environmental Summary

Figure 10: Sales 2011/ 12 in £m



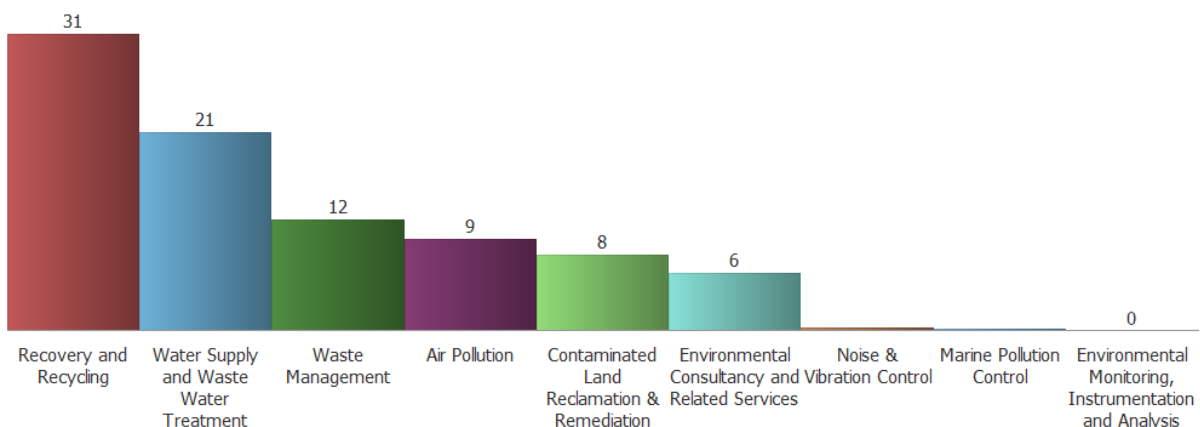
Environmental is split into nine sub sectors, of which three account for 79% of Sales- 28% Water Supply & Waste Water, 37% Recovery & Recycling and 14% Waste Management.

Figure 11: Employment 2011/ 12



Three sub sectors account for 78% of Employment- 29% Water Supply & Waste Water, 34% Recovery & Recycling and 16% Waste Management.

Figure 12: Companies 2011/ 12



Three sub sectors account for 73% of companies- 24% Water Supply & Waste Water, 36% Recovery & Recycling, and Waste Management 13%.



3.5 LCEGS Summary

Figure 13: LCEGS Summary

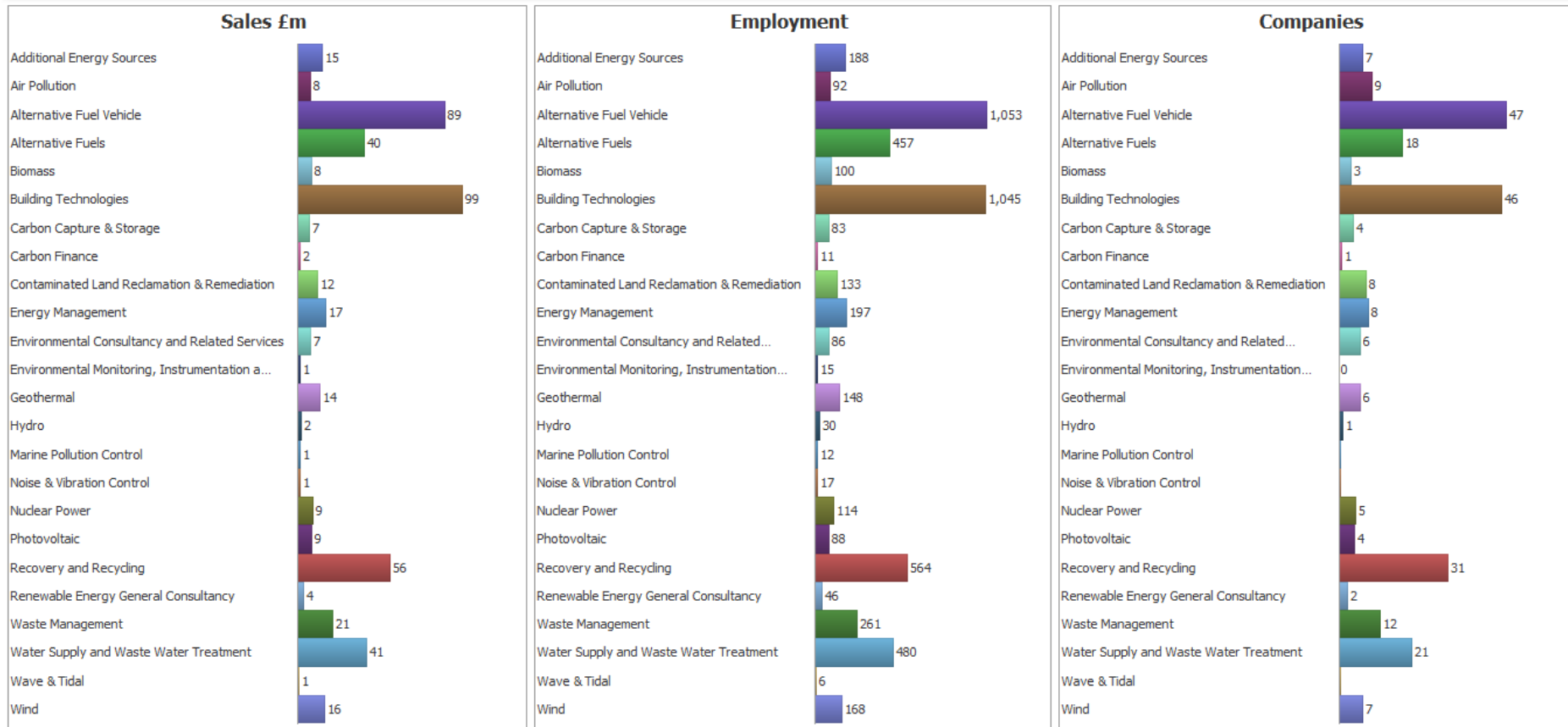


Figure 13 compares all 24 sub sectors of LCEGS and shows that Building Technologies (21%) dominates in terms of Sales, Employment and Companies, followed by Alternative Fuelled Vehicles (19%) and Recovery & Recycling (12%).



3.6 Growth

Table 1: LCEGS Growth Tables

Local Authority	Sales £m	Employment	Companies	Growth % 2008/ 09	Growth % 2009/ 10	Growth % 2010/ 11	Growth % 2011/ 12	Growth % 2012/ 13	Growth % 2013/ 14	Growth % 2014/ 15
Cheshire East	480.51	5,394	245	3.6	3.7	3.8	4.0	4.1	4.3	4.4

Level 1	Sales £m	Employment	Companies	Growth % 2008/ 09	Growth % 2009/ 10	Growth % 2010/ 11	Growth % 2011/ 12	Growth % 2012/ 13	Growth % 2013/ 14	Growth % 2014/ 15
Environmental	149.28	1,660	86	2.8	2.8	2.9	3.0	3.1	3.2	3.3
Low Carbon	277.65	3,148	136	4.0	4.1	4.2	4.5	4.6	4.7	4.9
Renewable Energy	53.58	587	24	5.1	5.3	5.4	5.6	5.7	6.0	6.0

Level 2	Sales £m	Employment	Companies	Growth % 2008/ 09	Growth % 2009/ 10	Growth % 2010/ 11	Growth % 2011/ 12	Growth % 2012/ 13	Growth % 2013/ 14	Growth % 2014/ 15
Additional Energy Sources	14.52	188	7	3.5	3.3	3.3	4.4	3.8	3.6	4.1
Air Pollution	7.65	92	9	2.0	2.0	2.0	2.0	2.2	2.2	2.4
Alternative Fuel Vehicle	88.96	1,053	47	3.6	3.6	4.0	3.9	3.9	3.9	4.4
Alternative Fuels	40.25	457	18	5.7	6.4	5.4	6.0	6.9	6.3	6.9
Biomass	8.33	100	3	4.9	5.3	5.8	5.4	5.4	5.7	5.8
Building Technologies	99.17	1,045	46	4.8	5.1	4.8	5.5	5.4	5.5	5.7
Carbon Capture & Storage	7.27	83	4	3.3	3.3	3.5	3.3	3.2	3.6	3.9
Carbon Finance	1.67	11	1	6.6	7.3	6.1	7.1	9.0	7.5	7.6
Contaminated Land Reclamation & Remediation	12.00	133	8	2.5	2.5	2.6	2.8	2.8	2.9	3.1
Energy Management	16.74	197	8	3.2	3.3	3.3	3.4	3.7	3.9	3.6
Environmental Consultancy and Related Services	7.45	86	6	3.4	3.4	3.5	4.1	3.8	3.7	4.0
Environmental Monitoring, Instrumentation and Analysis	1.10	15	0	3.0	3.0	3.1	3.3	3.3	3.5	3.6
Geothermal	13.55	148	6	5.5	5.6	5.8	6.1	6.5	6.8	7.0
Hydro	2.27	30	1	2.9	3.6	3.2	3.2	3.5	3.5	3.5
Marine Pollution Control	1.06	12	0	3.4	3.4	3.7	3.7	3.5	3.7	4.2
Noise & Vibration Control	1.45	17	0	3.7	3.6	3.9	4.2	4.4	4.3	4.1
Nuclear Power	9.07	114	5	1.4	1.5	1.7	1.8	2.0	2.3	2.4
Photovoltaic	8.77	88	4	6.5	6.5	6.8	7.2	7.1	7.3	7.5
Recovery and Recycling	55.89	564	31	3.3	3.6	3.5	3.7	3.9	4.4	4.4
Renewable Energy General Consultancy	3.78	46	2	2.6	2.7	3.0	2.9	2.7	3.1	2.9
Waste Management	21.35	261	12	2.7	2.9	2.9	3.2	2.9	3.3	3.4
Water Supply and Waste Water Treatment	41.34	480	21	1.6	1.7	1.8	1.9	1.9	2.0	2.2
Wave & Tidal	0.60	6	0	5.4	5.8	5.5	5.9	6.5	6.1	6.2
Wind	16.27	168	7	7.1	7.8	7.6	7.9	6.9	8.7	8.0

Table 1 shows all LCEGS measures and specifically forecast growth rates (which relate to Sales).

The Local Authority table shows annual growth rates for the LCEGS sector as a whole.

The Level 1 table shows annual growth rates for Environmental, Low Carbon and Renewables and demonstrates that Renewable Energy shows by far the highest growth rates.

The Level 2 table shows annual growth rates by sub sector and displays a much greater range of results and also more variability on an annual basis. The key to this table is to relate high growth to existing high values of Sales.

Note: Forecast growth rates are set at the same rate for all Local Authorities. This means that ACTUAL growth (Section 3.9) may be above or below the above value for 2010/11.



3.7 Exports

We are currently unable to calculate Export values "bottom up" from Local Authority level, although this may be possible in the future. Our current method for estimating LCEGS Exports is to take a percentage of North West regional Exports (which have been calculated consistently since 2007/ 08) and apply this to the Local Authority area.

In the data tables provided, we have compared Local Authority Sales with North West Region Sales for all sub sectors for 2010/ 11 and 2011/ 12. Sales are then expressed as a percentage of regional Sales and this percentage is then applied to North West Exports. The results for 2011/ 12 are shown at Table 2.

Table 2: Exports 2011/ 12 £m

Level 2	Region Exports £m	Estimated LA Exports £m
Additional Energy Sources	27.56	1.9
Air Pollution	17.41	0.9
Alternative Fuel Vehicle	64.89	3.6
Alternative Fuels	126.14	2.4
Biomass	74.98	1.3
Building Technologies	147.79	9.1
Carbon Capture & Storage	13.44	1.0
Carbon Finance	0.86	0.1
Contaminated Land Reclamation & Remediation	9.45	0.7
Energy Management	35.78	1.9
Environmental Consultancy and Related Services	4.28	0.3
Environmental Monitoring, Instrumentation and Analysis	2.07	0.1
Geothermal	104.89	1.7
Hydro	7.01	0.4
Marine Pollution Control	0.28	0.0
Noise & Vibration Control	3.46	0.2
Nuclear Power	32.24	0.5
Photovoltaic	139.2	2.5
Recovery and Recycling	60.13	4.0
Renewable Energy General Consultancy	7.18	0.5
Waste Management	53.81	3.6
Water Supply and Waste Water Treatment	124.52	8.2
Wave & Tidal	0.86	0.1
Wind	170.78	1.6
Total	1229.0	46.7

Cheshire East LCEGS Exports were £46.7m in 211/ 12 and £45.1m in 2010/ 11. This represents annual growth of 3.4%.

The main exporting sub sectors are Building Technologies and Water Supply and Waste Water Treatment.



3.8 Annual Comparisons

In summary:

- Sales in 2011/ 12 was £480.5m and in 2010/ 11 was £460.5m. This equals 4.3% annual growth.
- There is minimal change in the levels of Companies and Employment between 2010/ 11 and 2011/ 12. Low/ no growth in LCEGS Companies and Employment has been a feature of the LCEGS sector since 2008/ 09 and is not restricted to this Authority.

3.9 Regional Comparisons

In 2011/ 12 Cheshire East represented 3.85% of the total Sales value of the North West, region compared with 3.9% in 2010/ 11. This suggests that Cheshire East is growing at slightly less than the average for the region. This is confirmed by annual Sales growth of 5.7% for the region, compared with 4.3% for Cheshire East.

In a similar analysis for the Cheshire and Warrington LEP, Cheshire East represented 25.45% of the total Sales value in 2011/ 12 and 25.5% in 2010/ 11. This suggests that Cheshire East is growing slightly less than the average for the LEP. This is confirmed by annual Sales growth of 4.55% for the LEP, compared with 4.3% for Cheshire East.



LCEGS Sector Definition

The **Low Carbon and Environmental Goods and Services** (LCEGS) sector is divided into three main activity blocks- Environmental, Renewable Energy and Low Carbon (Level 1). These are in turn divided into 24 subsectors (Level 2):

- The Environmental activity block includes Air Pollution Control, Contaminated Land Reclamation & Remediation, Environmental Consultancy, Environmental Monitoring, Marine Pollution Control, Noise & Vibration Control, Recovery & Recycling, Waste Management and Water Supply/ Waste Water Treatment.
- The Renewable Energy activity block includes Biomass, Geothermal, Hydro, Photovoltaic, Renewable Energy Consultancy, Wave & Tidal and Wind.
- The Low Carbon activity block includes Additional Energy Sources, Alternative Fuels & Vehicles, Alternative Fuels, Building Technologies, Carbon Capture & Storage, Carbon Finance, Energy Management and Nuclear Power.

Environmental activities include 9 sub sectors (Level 2), divided into 47 Level 3 activity groupings:

- Air Pollution includes indoor and industrial air quality and emissions control.
- Contaminated Land Reclamation/ Remediation includes Decommissioning of Nuclear Sites.
- Environmental Consulting includes consulting, training & other services.
- Environmental Monitoring includes analysis, monitoring and instrumentation.
- Marine Pollution and Noise & Vibration Control both include abatement, consulting and R&D.
- Recovery & Recycling includes Waste Collection and various recycling processes
- Waste Management includes Waste Treatment Facilities & Equipment, consulting and R&D
- Water Supply and Waste Water Treatment includes treatment, distribution, consulting and R&D.

Low Carbon includes 8 sub sectors (Level 2), divided into 49 Level 3 activity groupings:

- Carbon Finance includes Credits Finance, Fund Management, Trading and Research
- Carbon Capture & Storage includes Capture, Pipeline, Storage and Engineering.
- Energy Management includes Lighting, Heating & Ventilation and Engineering.
- Nuclear Power includes Construction, Commissioning, Operations, Engineering and Testing Services.
- Additional Energy Sources include Energy Storage Research, Fuel Cells & Hydrogen.
- Alternative Fuels & Vehicles includes main stream and other vehicle fuels.
- Alternative Fuels includes Main Stream and other Bio Fuels, Batteries and Other Fuels.
- Building Technologies includes Doors, Windows, Monitoring & Control Systems and Insulation/ Heat Retention Materials.



Renewable Energy includes 7 sub sectors (Level 2), sub divided into 30 Level 3 activity groupings:

- Wind includes Large Turbines, Small Turbines and Wind Farm Systems.
- Wave & Tidal includes Ebb & Flood, Pumps & Equipment, Turbine & Generation etc.
- Photovoltaic includes Systems & Equipment, Cells and Chemicals.
- Hydro includes Turbines, Pumps, Electricity Supply and Dams.
- Geothermal includes Whole Systems, Specialist Equipment, Consulting and R&D.
- Biomass includes Energy, Furnace, Boilers and Related Systems.
- Renewable Energy consulting includes specialist consulting and legal advice.

The **Additional Energy Sources** sub sector groups together R&D, Design and Prototyping activities relating to a range of new Low Carbon energy sources.

These energy sources include: Fuel Cells, Hydraulic Accumulators, Hydrogen, Molten Salt, Thermal Mass, Compressed Air, Superconducting Magnets and more general energy storage research.

This is a small sub sector (in value and impact) because only energy sources that have a current economic footprint (i.e. trading) are included. This excludes a number of promising energy sources that are still in development and for which economic evidence is not yet available.

The **Air Pollution Control** sub sector includes a wide range of manufacturing, operations, consulting and engineering functions that relate to improving and maintaining air quality. This includes:

- Emission Control sensing and monitoring systems and technologies.
- Indoor Air Quality Control (domestic and industrial) through ventilation, cooling and purification systems.
- Dust & Particulate control through installed technologies like filters, towers, scrubbers, cyclones and eliminators.
- Process Engineering for odour control and other cleaner technologies.
- Industrial Emission Control technologies and equipment (manufacture, installation, operations and maintenance).
- Emission Control through manufacture, installation and operation of sampling, control and evaluation systems.

The **Alternative Fuel and Vehicles** sub sector includes Low Carbon Fuel and technology activities that relate to (predominantly) automotive transport. It is divided into Alternative Fuels (main stream) and Other Fuels and Vehicles. This sub sector does not include bio diesel (see Alternative Fuels). It does include:

- Alternative Fuels includes the production, supply and distribution of Natural Gas (Compressed or Liquefied), Synthetic Fuel and Auto Gas (LPG, LP Gas or Propane).
- Other Fuels and Vehicles includes vehicle technologies and fuel sources that are still at an early stage.



- Research, Design, Development and Prototyping activities are included for: Hydrogen fuel cells and hydrogen internal combustion, Electric, Hybrid Electric, Steam powered, Organic waste fuel, Wood gas, Solar powered and Air, Spring and Wind powered vehicles.

The **Alternative Fuels** sub sector includes a wide range of Low(er) carbon fuel sources that are not included under Renewable Energy. It includes the manufacture, production, supply and distribution of:

- Batteries- chemicals, chargers, controllers, cables, connectors, containers, suppliers and testing equipment.
- Bio fuels for Vehicles- bio diesel, butanol, ethanol and vegetable oils.
- Mainstream Bio fuel applications (non transport)- bio diesel, butanol and ethanol.
- Other Bio fuels- biomass, methane, peanut oil, vegetable oil, wood and woodgas.
- Other fuels- Hydrogen.

The **Biomass Energy** sub sector includes all activities that convert biomass into energy but excludes biomass materials (see Alternative Fuels). It includes:

- Biomass furnace systems- manufacture, supply, consulting, design, installation, engineering and other services for domestic, industrial and community applications.
- Biomass energy systems- manufacture, supply, consulting, design, installation, engineering and other services for domestic, industrial and community applications.
- Manufacture of biomass boilers and systems including boilers, cogeneration, heat exchange and packaged power systems for domestic, industrial and community applications.
- Biomass boilers and related systems including supply, consulting, design, engineering, installation and other services for boilers, cogeneration, heat exchange and packaged power systems for domestic, industrial and community applications.
- Technical and operational consulting.

The **Building Technologies** sub sector includes main stream building materials and systems that contribute to reduced energy use and to lowering the carbon footprint of buildings. It includes:

- Windows- the manufacture, supply, distribution, installation and development of double glazed, electro chromatic, insulated alloy, honeycomb and triple glazed units.
- Doors- the manufacture, supply, distribution, installation and development of insulated alloy and plastic doors.
- Insulation and heat retention materials- the manufacture, supply, distribution, installation and development of insulation materials, heat retention surfaces & ceramics, electronic control systems and controlled venting and ducting systems.
- Monitoring and control systems- the manufacture, supply, distribution, installation and development of energy and distributed energy control, monitoring, management and analysis systems.

The **Carbon Capture & Storage** sub sector includes activities that store carbon emissions- from locations like power plants and prevent them entering the atmosphere. It includes manufacturing, supply, distribution, installation, maintenance, development and design of:



- Pre combustion capture systems
- Post combustion capture systems
- OxyFuel combustion systems
- Pipeline systems and services
- Ship storage and discharge systems
- Ocean storage equipment and services
- Mineral storage equipment and services
- Geological storage equipment and services
- Engineering, project management and consulting services.

The **Carbon Finance** sub sector includes investment activities and financial instruments for emission reduction projects and carbon trading. This includes:

- Carbon credits finance and fund management - land, project or general trading services from finance houses and investment funds.
- Carbon credits trading- development and supply of trading systems, land/ project/ general trading houses and transactions.
- Carbon market intelligence- carbon markets analysis & reporting and carbon trading by forecasting and reporting from journals, online, data providers or other publishing sources.
- Projects and verification- data collection, verification, legal, project development, capacity development and carbon declaration services.
- Press and journalism- financial press and periodicals, other journals, data providers and online services.

The **Contaminated Land Reclamation and Remediation** sub sector includes all activities that bring land back into agricultural, industrial, community or commercial use. This includes longer term activities like the decommissioning of nuclear sites.

Remediation and land reclamation includes land forming, bunds, geotextiles, storage & containment, oil interceptors, drainage systems, monitoring systems, proprietary treatment processes, sampling & analysis, site investigation, specialist cleaning services, cleaner technology R&D, surface & ground water services, organic waste composting and other services.

Decommissioning includes equipment, consulting, project management, safety critical assessment, pollution control, enviro risk analysis & impact assessment, recycling & compaction, waste collection & containment, waste water treatment, site assessment, excavation, sampling & analysis and monitoring.

The **Energy Management** sub sector includes energy saving and power management activities for industrial and domestic use. It includes:

- R&D into high efficiency lighting, heating & ventilation, power, lighting, equipment & pumps and advance management systems.
- Gas Supply- monitoring, meterage, leak detection & maintenance, gas supply control and manufacture of high efficiency consumer equipment and devices.
- Lighting- manufacture, supply, distribution and installation of energy saving light bulbs & tubes, lighting and control systems.
- Heating & Ventilation- manufacture, supply, distribution and installation of energy saving equipment and systems.
- Electrical- manufacture, supply and installation of energy saving power control, building control, power consumption control & monitoring systems.



- Consulting and other services - advice & consultancy, publication, training and design of management systems.

The **Environmental Consulting and Services** sub sector includes consulting, training and management services that are specific to the environmental sector. This includes:

- Specialist consulting- habitat assessment, regulations, compliance and management systems, audits and impact assessment, eco design, eco- investment, climate change modelling, insurance and bio- diversity advice & assessment.
- Manpower and executive recruitment, temporary and permanent recruitment, contracted and interim management services.
- Management services- general consulting, financial, IT, software and marketing services.
- Training and education- publications, online publications, teaching aids, newsletters and courses for waste management, waste water treatment etc.

The **Environmental Monitoring, Instrumentation and Analysis** sub sector includes activities that measure water, soil and air quality and that support wider pollution control activities in other land, water, marine or air- based environmental sub sectors. It includes:

- Environmental monitoring- development of cleaner monitoring processes and technologies, vehicle testing, oil spill detection, food testing, nitrate levels, meteorological, water/soil/air quality testing and monitoring.
- Instrumentation equipment & control manufacture, supply, maintenance and development of instrumentation, laboratory equipment and software for environmental/ air/ water/ land/ marine analysis.
- Environmental analysis- laboratory testing, data logging & recording, quality reporting, collection & collation of samples, auto sampling systems, in-field measurement and reporting and R&D in water, soil and emissions analysis.

The **Geothermal Energy** sub sector includes all activities relating to the extraction and use of heat generated from the earth. It includes:

- Manufacture and supply of specialist thermally enhanced equipment- grout, heat pumps, pipes, flow control valves, drilling equipment, installation rigs and ancillary equipment.
- Whole systems manufacture and supply for industrial, residential and community geothermal energy applications.
- Component design and research- design services, component research and component recycling.
- Consulting & related services- architectural, construction, systems design, consulting, engineering, installation and project development services.

The **Hydroelectric Energy** sub sector includes activities that help to extract energy from river and other water sources held in dams (as opposed to wave or tidal energy) that is used to drive turbines and generators. Large scale civil engineering/construction activities associated with dam building have not been included in this analysis. Included are:

- Turbines- manufacture, supply, installation and maintenance of turbine generators, control systems, spares and structural supports and fittings.
- Dams & structures- manufacture, supply, installation and maintenance of dam operational systems, control systems, maintenance services and sluice gates and actuators.



- Pumping & lubrication- manufacture, supply, installation and maintenance of pumps, spares, storage and lubrication systems and spares.
- Electricity supply- manufacture, supply, installation and maintenance of power factor, power distribution and grid connections and supporting structures.

The **Marine Pollution Control** sub sector includes responses to pollution hazards at sea and also discharged from land- based sources. It includes the following products and services for deep sea, coastal waters and inland waterways:

- Marine pollution abatement- manufacture, supply and maintenance of booms, chemical discharge treatment equipment, solid & liquid waste/ radioactive containment and treatment equipment and monitoring services, spillage clean- up services, shoreline & shallow water remediation and maintenance services and collection & containment services.
- R&D- cleaner processes and technologies, monitoring systems, oil absorbents, boom and containment systems, water containment and treatment technologies.
- Specialist consulting and training- chemical discharge prevention, education, policy & planning, training, publications, sewerage discharge management, radioactive waste management and solid and liquid waste management.

The **Noise & Vibration Control** sub sector includes all activities that prevent or control noise and vibration pollution. It includes

- Noise abatement- manufacture, supply, installation and maintenance of barriers, acoustic management equipment, noise insulation, noise & vibration control and monitoring equipment, acoustic management equipment, noise insulation materials, monitoring services, large plant services and surface modifications.
- R&D- noise attenuation, noise sensing, vibration sensing, vibration control and noise & vibration abatement equipment and cleaner technologies and process by development.
- Consulting and training- consulting, publications, training and noise monitoring services.

The **Nuclear Power** sub sector includes all activities that relate to the generation of nuclear power, excluding decommissioning of nuclear sites. It includes:

- Nuclear safety engineering services, regulatory compliance, reactor management, fail-to-safety engineering.
- Nuclear power plant operations management, engineering and PR.
- Nuclear cooling equipment- manufacture, installation and maintenance.
- Construction of plant and equipment- site development, reactor and buildings and power plant/ equipment construction.
- Commissioning engineering services- cooling & thermal control, engineering maintenance, instrumentation, power distribution, reactor & plant commissioning.
- Sampling & testing services- thermal control testing, remote monitoring, back-up plant monitoring and effluent discharge testing.
- Nuclear scientific services- research, laboratory testing and fuel management.

The **Photovoltaic Energy** sub sector includes all activities that help to convert solar radiation into useable energy. It includes:

- Chemicals- production and supply of solar chemicals and solar pond salt.
- Systems & equipment- manufacture, supply, installation and maintenance of active and batch systems, clerestory windows, light shelves and tubes, solar box cookers, solar combi systems and solar lighting design.



- R&D- solar power and solar car research.
- Photovoltaic cells- manufacture, supply, installation and maintenance of photovoltaic modules, mounting systems, ancillary components, cells and cell materials.
- Other equipment & chemicals- manufacture, supply, installation and maintenance of glass houses, convection towers, heliostats, parabolic collectors, turbines, trough collectors, towers and solar trackers.

The **Recovery & Recycling** sub sector includes all activities relating to the collection and processing of domestic and industrial waste products. This includes:

- Waste collection- manufacture, supply, installation and operation of equipment and services for collection of household, industrial and hazardous waste, treatment of waste prior to landfill and supply of pre-treated recyclates.
- Engineering & equipment- engineering services and process control for the complete range of recycling stock Consulting & training- collection and processing consultancy and training, publishing, legal & insurance advice.
- R&D- metals recovery, pyrolysis, bio-based systems, new recyclable materials, new collection & processing technologies.
- Recycling stock- recovery, recycling, processing, sorting, supply and packaging of rubber, plastics, paper, oil, electrical, electronics, glass, composting, construction & demolition, automotive, wood and textiles stocks.

The **Renewable Energy Consulting** sub sector includes consulting and legal services specific to Renewables i.e. not included in general or specific environmental consulting. It includes:

- Legal services- wind farm location and other renewable energies.
- Consulting- turbines, solar and photovoltaic applications, public sector and corporate Renewables policies, nuclear energy, insulation technologies and alternative fuel technologies.

The **Waste Management** sub sector includes the treatment/ management of domestic and industrial waste that cannot otherwise be recycled. It includes:

- Construction & operation of waste treatment facilities for anaerobic digestion, composting, incineration, landfill, waste to energy conversion and the supporting engineering services.
- Equipment for Waste treatment, manufacture, supply, installation and maintenance of bio filters, bio reactors, collection equipment, grease traps, oil interceptors, materials processing equipment, monitoring & control equipment and nightsoil & landfill leachate treatment.
- R&D- incineration technologies, energy from waste systems, cleaner processing & treatment technologies, disposal of hazardous waste and other materials processing technologies.
- Consultancy and training- books, periodicals & publications, specialist consulting and training for asbestos, hazardous materials and other waste management systems.

The **Water Supply and Waste Water Treatment** sub sector includes activities relating to the treatment of pollutants in the water supply. It includes:



- Water treatment and distribution, manufacture, supply, installation and maintenance of systems for activated sludge, aerobic & anaerobic treatment, biological odour & corrosion control, demand management & leakage reduction, effluent treatment, filters, microbial treatment, screens, sequencing batch reactors, water disinfection and storm/ grey water treatment.
- Engineering- field engineering, pipe & valve maintenance, fitting & construction, fabrication & welding and engineering design.
- R&D - water purification, water management, black/ grey water treatment, biocides, bio reactors and aerobic/ anaerobic treatment technologies.
- Consulting and training- engineering and water management training, publishing and specialist consulting for water systems treatment, management and engineering.

The **Wave & Tidal Energy** sub sector includes all activities that help to convert the energy from waves and tides into usable power (also known as marine renewable energy). It includes:

- Turbines & generators- the manufacture, supply, installation and maintenance of tidal turbines, structural supports and fittings, spares and turbine control systems.
- Pumps & equipment- the manufacture, supply, installation and maintenance of pumps and pump spares.
- Two basin schemes- provision of structural engineering and field maintenance services.
- Ebb & flow systems- manufacture, supply, installation and maintenance of ebb and flood generation systems.
- Assessment & Measurement- waves, water levels, turbidity, tidal energy, sediment, salinity pollutants, fish stocks monitoring and local/ global environmental impact assessment.
- Other general services- financial planning, operational and maintenance services.

The **Wind Energy** sub sector includes all activities that convert wind power into usable energy. This includes wind farm systems, large and small wind turbines. The sub sector is divided by size of turbine rather than location (onshore and offshore) because it is easier to differentiate and map supply chain activities in this way. It includes:

- Wind farm systems- manufacture, supply, installation, operation and maintenance of integration, power plant, power control, grid entry equipment and systems and electrical and mechanical componentry.
- Small wind turbines- manufacture, supply, installation, operation and maintenance of small turbine systems (blades, towers, fixing structures, cowlings, enclosures, gear boxes and drive trains), componentry and research.
- Large Wind Turbines- manufacture, supply, installation, operation and maintenance of large turbine systems (blades, towers, fixing structures, cowlings, enclosures, gear boxes and drive trains), componentry and research.