



The Potential of the  
Low Carbon Sector  
in Greater Manchester

A report by GC Business Growth Hub,  
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[businessgrowthhub.com](http://businessgrowthhub.com)



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# Executive Summary

An update to the Business Growth Hub's understanding of Greater Manchester's (GM) potential to develop and grow the low carbon sector was prepared using two stages of research:

- I. Quantitative sector analysis led by kMatrix Ltd, which used five different definitions of the low carbon sector for comparison and data for the year 2015/16. The methodology and tables of data are provided in Appendix 1 of the main report;
- II. Qualitative research led by Gyron LLP, which focused on the future threats and trends impacting the growth of the sector. The research methodology and findings are summarised in Appendix 2 of the main report.

The main report provides headlines and main findings from both stages of research. Gyron LLP consolidated these findings to provide an up to date description of the characteristics of the GM low carbon sector, as shown below.

- Sales in the GM low carbon sector grew by 24% over the four-year period between 2011/12 and 2015/16, equivalent to a compound growth rate of 5.6% per year.
- The GM low carbon sector outperformed the UK sales growth rate between 2014/15 and 2015/16.
- Internationally, GM outperforms Barcelona, Milan and Copenhagen when comparing low carbon sector sales value in proportion to GDP.
- GM is ranked second behind London and the South East with 5% (£6.8bn) of low carbon sector sales in England.
- GM forecast sales growth rates exceed global forecast sales growth rates for the low carbon sector, to 2020/21.
- There are 2,400 low carbon sector companies in GM employing 45,100 people.
- The low carbon sector represents 13.6% of the GM business base (based on GVA) and 3.2% of GM employment.
- GM's low carbon sector is larger than Advanced Manufacturing, Digital, Life Sciences and Textiles sectors combined.
- The strongest diversification opportunity with a market value of £28,660m is for General Engineering companies going into Biomass, Wind and Heat Pump markets.
- GM contributed 43% of the North West's low carbon sector exports (£764m) in 2015/16, with the top exporting sub-sector being Wind (£152m).

- Sub-sectors in a good position based on sales, forecast growth and national/local developments indicating support for these sub-sectors, are:
  - Wind (Renewable and Low Carbon Energy);
  - Heat Pumps (Renewable and Low Carbon Energy);
  - Building Technologies and Sustainable Construction (Energy Efficiency); and
  - Low Emission Vehicles and Infrastructure.

# 1. Introduction

Welcome to the Business Growth Hub's report on The Potential of the Low Carbon Sector in Greater Manchester. Our aim is to explore the potential of one of Greater Manchester's key priority growth areas to develop and grow.

Preparation of this report has involved two stages of research: quantitative sector analysis and qualitative research on the future threats and trends impacting the growth of the sector.

The methodology and tables of data from the sector analysis are provided in Appendix 1 and the qualitative research methodology and findings is summarised in Appendix 2. Headlines and main findings from both stages of research are presented in Section 2 and 3 of this report, respectively.

## 2. Status Update on the GM Low Carbon Sector

This section provides a status update on the low carbon sector in GM. The headlines presented are based on analysis of the Low Carbon and Environmental Goods and Services (LCEGS) sector data set for 2015/16, unless otherwise stated. This data set is organised into three Level 1 sub-sectors (Environmental, Low Carbon and Renewable Energy) and a further 24 Level 2 sub-sectors. Further information is provided in Appendix 1 and below.

### 2.1 Sector size and growth rates

#### Summary

Globally, LCEGS sales were £4,203,424m in 2015/16, up 7% on the previous year.

The GM LCEGS sector achieved a higher growth rate in sales (6.3%) than the UK (6.1%) between 2014/15 and 2015/16. The headlines for 2015/16 are:

- Sales were £6,759m
- There were 2,398 companies
- These companies employed 45, 115 people

**Low Carbon** is the largest Level 1 sub-sector and grew 6.9% (sales) from the previous year. It is made up of eight Level 2 sub-sectors including: Alternative Fuels, Alternative Fuel Vehicles, Building Technologies and Nuclear Power. The headlines for 2015/16 are:

- Sales were £3,572m
- There were 1,172 companies
- These companies employed 22,888 people

**Renewable Energy** is the second largest Level 1 sub-sector behind Low Carbon and grew 6.9% (sales) from the previous year. It is made up of seven Level 2 sub-sectors including: Wind, Geothermal, Biomass and Solar Photovoltaic. Growth in sales from the previous year was 6.9%:

- Sales were £1,956m
- There were 846 companies
- These companies employed 14,645 people.

**Environmental** is the smallest Level 1 sub-sector and grew just 3.5% (Sales) from the previous year. The sub-sector is made up of nine Level 2 sub-sectors including: Water and Waste Water Treatment, Waste Management, Recovery & Recycling, and many environmental management disciplines. The headlines for 2015/16 are:

- Sales were £1,231m
- There were 380 companies
- These companies employed 7,583 people

## Sector size

The following high-level analysis of the current size of the sector includes some comparison between different definitions of the low carbon sector, for which further information is provided in Appendix 1. In particular, two different versions of the LCEGS data have been compared, as follows:

1. **LCEGS** - The whole sector
2. **Filtered LCEGS**—Data for the Level 1 Low Carbon sub-sector is distorted by a large presence in activities that are generally low value-adding fuel supply and distribution dominated (at Level 2 in Alternative Fuels and Alternative Fuel Vehicles sub-sectors). These have been removed from this version of the data set to allow for comparisons.

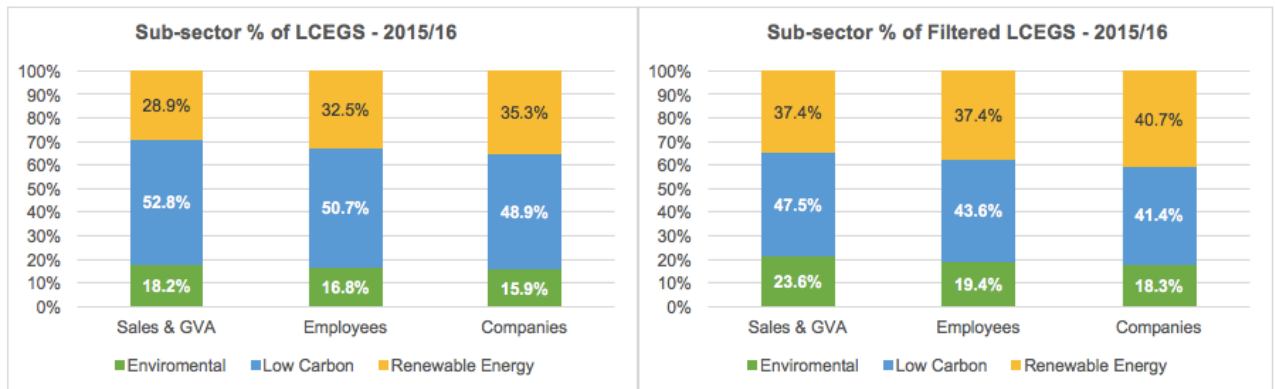
Table 1 compares the performance of the GM LCEGS sector in 2015/16 with its performance in 2011/12, as reported previously in the 2013 report. Overall, sales in the GM LCEGS sector have grown by 24% over this four-year period, equivalent to a compound growth rate of 5.6% per year. The largest growth in sales, employees and companies has been in the Renewable Energy sub-sector.

**TABLE 1 – GM LCEGS SECTOR IN 2011/12 AND 2015/16**

LCEGS Sector in GM		Sales	Employees	Companies
By sector & Level 1 sub-sector		(£m)	#	#
2015/16	<b>GM LCEGS Sector</b>	<b>£6,759</b>	<b>45,115</b>	<b>2,398</b>
	Environmental	£1,231	7,583	380
	Low Carbon	£3,572	22,888	1,172
	Renewable Energy	£1,956	14,645	846
2011/12	<b>GM LCEGS Sector</b>	<b>£5,446</b>	<b>37,054</b>	<b>1,941</b>
	Environmental	£981	6,720	398
	Low Carbon	£2,944	20,354	1,019
	Renewable Energy	£1,521	9,980	524

Figure 1 below shows how Level 1 sub-sectors contributed to the GM LCEGS sector overall (comparing LCEGS to filtered LCEGS data) in 2015/16, measured in sales and Gross Value Added (GVA), employees and companies. Filtering out the low value-adding activities reduces the size of the Low Carbon sub-sector and gives more relative importance to the Renewable Energy and Environmental sub-sectors, however, it still remains the largest sub-sector overall.

**FIGURE 1 – SUB-SECTOR % CONTRIBUTION USING LCEGS AND FILTERED LCEGS DATA- 2015/16**



Sales by Level 2 sub-sector are presented in Figure 2 below. Within Environmental, the Level 2 sub-sector Water and Waste Water Treatment is the largest with sales of £409.6m by 131 companies employing 2,594 people in 2015/16. This is closely followed by the Level 2 sub-sectors Recovery and Recycling and Waste Management, with sales of £384.1m and £274.7m in 2015/16, respectively.

Within Low Carbon, the Level 2 sub-sector Building Technologies is the second largest behind Alternative Fuels, with sales of £829.7m by 314 companies employing 6,191 people in 2015/16. This is followed by Alternative Fuel Vehicles and Carbon Finance with sales of £747.12m and £441.49m in 2015/16, respectively.

Within Renewable Energy, the Level 2 sub-sector Wind dominates with sales of £713.6m by 360 companies employing 6,005 people in 2015/16. This suggests that the Wind sub-sector is in a relatively ideal position with a high number of sales, companies and employees. This is followed by Geothermal and Biomass sub-sectors, both of which are relevant to renewable heat, which had sales of £590.4m and £301.4m in 2015/16, respectively.



**FIGURE 2 – GM LCEGS SALES (£M) BY LEVEL 2 SUB-SECTOR 2015/16**

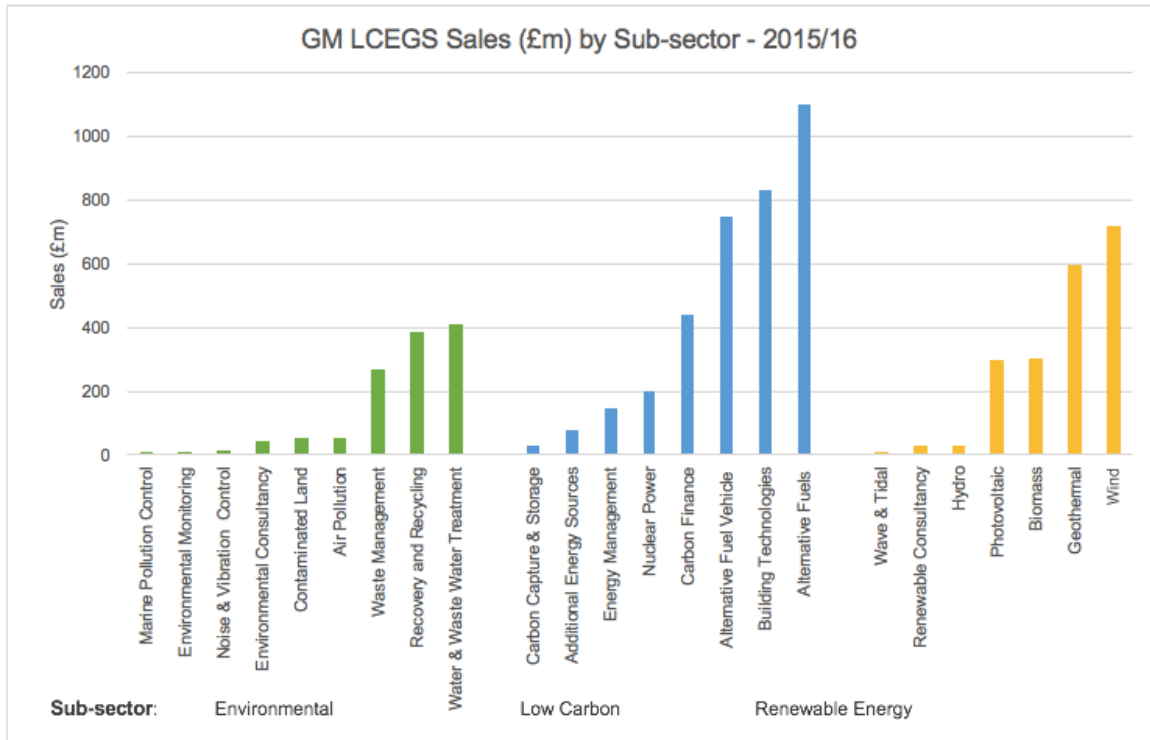


Figure 3 below compares Low Carbon Level 2 sub-sector sales using the LCEGS and filtered LCEGS data to demonstrate the impact on sales performance of removing low value-adding activities from Alternative Fuels and Alternative Fuel Vehicles sub-sectors.

**FIGURE 3 – COMPARISON OF LOW CARBON LEVEL 2 SUB-SECTOR SALES (£M) USING LCEGS AND FILTERED LCEGS DATA - 2015/16**

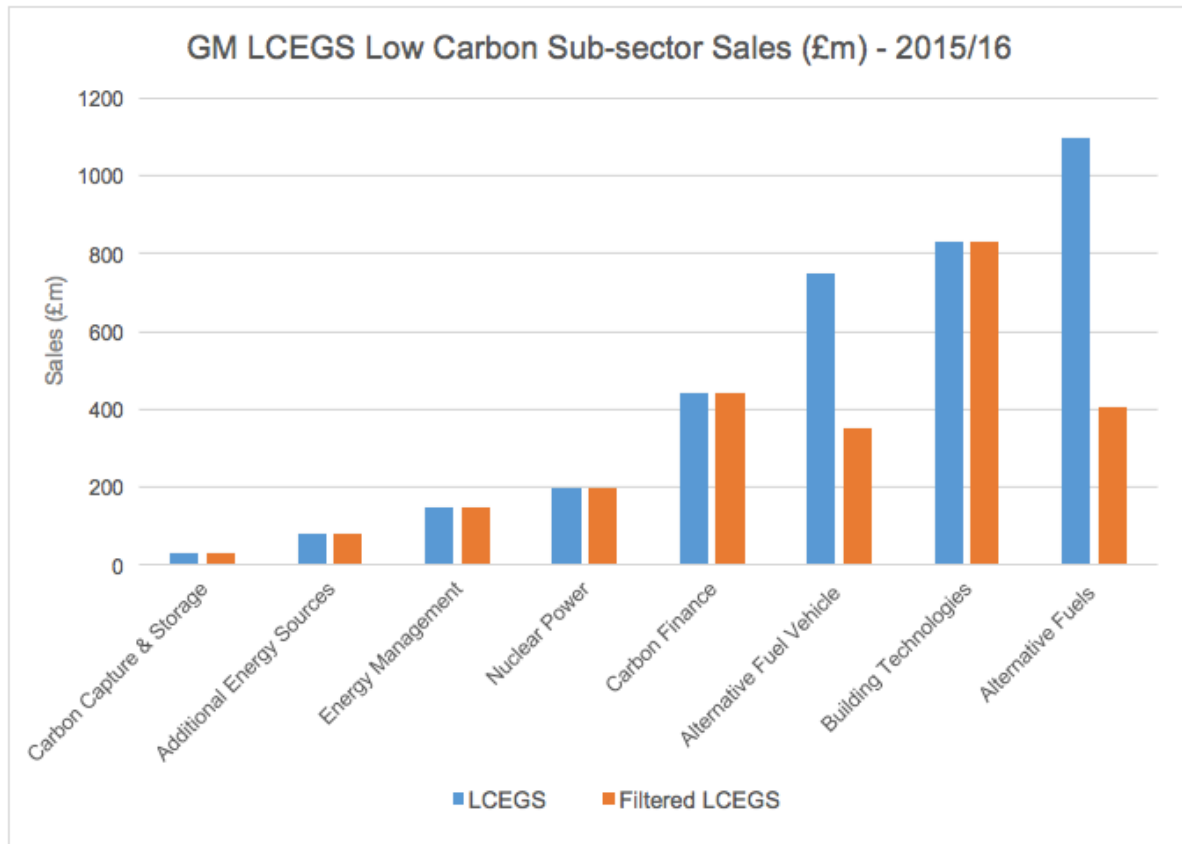


Table 2 compares the size of the sector using six different sector definitions: LCEGS, filtered LCEGS, Business Growth Hub’s bespoke definition (BGH), an updated and expanded version of LCEGS (LCEGSS), Low Carbon and Renewable Energy (LCRE) and Environmental Goods and Services Sector (EGSS). Both the BGH and LCEGSS definitions include more sub-sectors and activities than LCEGS, hence the larger sector size reported in the data. All definitions used are described in more detail in Appendix 1.

**TABLE 2 – SIZE OF THE GM LOW CARBON SECTOR BY DEFINITION – 2015/16**

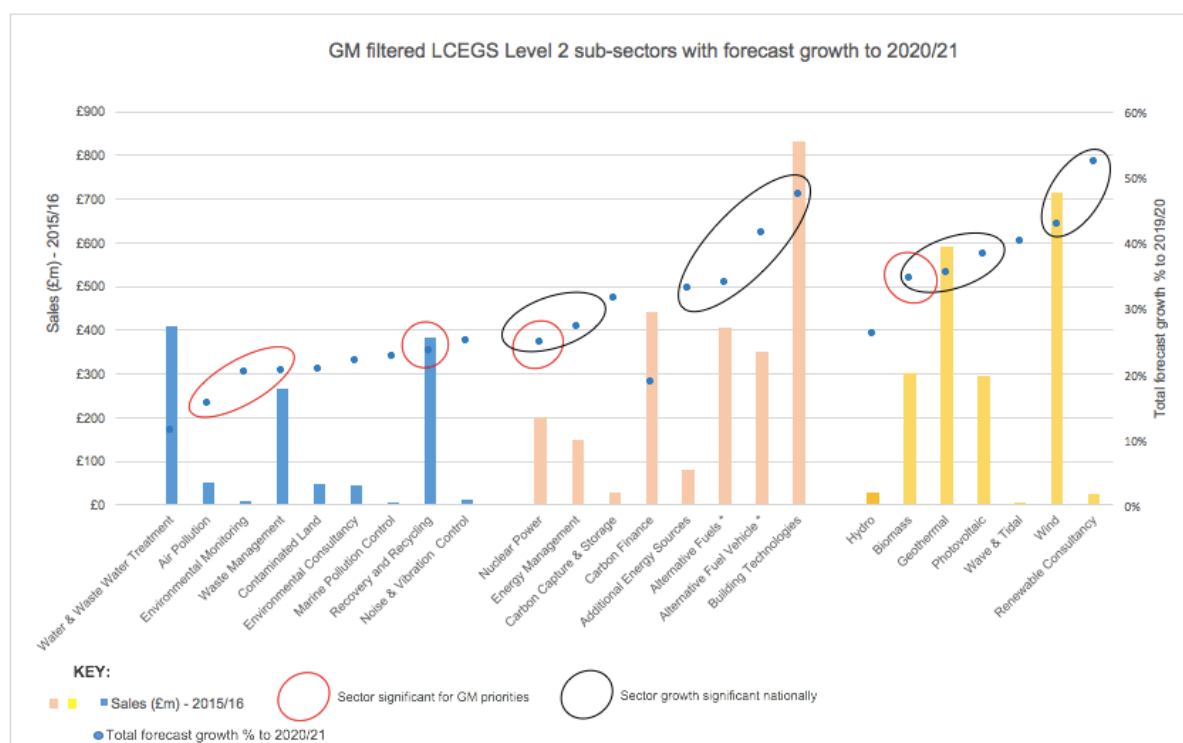
Size of the GM low carbon sector by definition - 2015/16						
GM Total & Low Carbon sector definitions → Metric ↓	LCEGS	Filtered LCEGS	BGH	LCEGSS	LCRE	EGSS
Sales (£m)	£6,759	£5,666	£6,924	£8,460	£6,176	£2,284
# Employees	45,115	39,272	46,562	53,627	40,974	12,653
# Companies	2,398	2,086	2,511	3,095	2,318	776

## Forecast growth

The UK sales growth rate for LCEGS has generally exceeded the global sales growth rate historically and this trend is forecast to continue. For GM, the forecast sales growth rates for LCEGS to 2020/21 exceed global forecast sales growth rates (see Appendix 1).

Figure 4 below presents forecast sales growth in GM for filtered LCEGS Level 2 sub-sectors. Sub-sectors circled in black are in a good position with national potential, based on sales over £500m in 2015/16 and/or a forecast sales growth of more than 25% over five years to 2020/21. National/local strategy or policy indicating support for these sub-sectors was also taken into consideration. Building Technologies (Low Carbon sub-sector) and Wind (Renewable Energy sub-sector) stand out in this analysis. Those circled in red are of importance based on forecast growth rates and stated local strategy and policy commitments in GM. Section 3 of this report summarises the findings of research about future threats and trends impacting the sector from local and national policy and other developments.

**FIGURE 4 – GM FORECAST GROWTH ANALYSIS USING FILTERED LCEGS BY LEVEL 2 SUB-SECTOR – TO 2020/21**



## Exports & imports

Globally, about 9% of LCEGS sales were exported to or imported by another country in 2015/16.

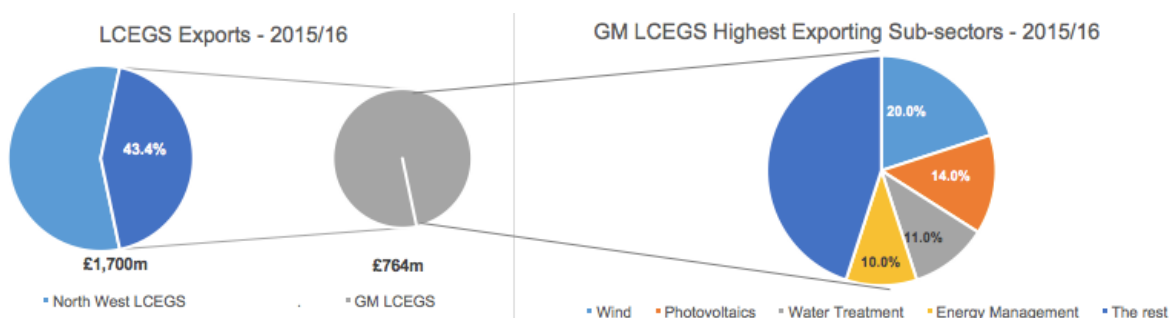
The EU, including the UK, is responsible for around 32% of all global LCEGS exports (23% of which stays within the EU) but only around 23% of global LCEGS imports. In absolute terms, the EU is a net exporter of LCEGS, globally.

The UK accounts for 5% of all global LCEGS exports (29% of which goes to the EU) and around 15% of EU total global LCEGS exports. It is responsible for about 3% of global LCEGS imports and in absolute terms is a net exporter of LCEGS, globally and marginally also to the EU.

Figure 4, below, shows that GM contributed 43% of the North West region's LCEGS exports (£764m) in 2015/16. Of this, 34% of GM exports were from the Renewable Energy sub-sector (Wind, Photovoltaic) and a further 21% from the Environmental (Water Treatment) and Low Carbon (Energy Management) sub-sectors.

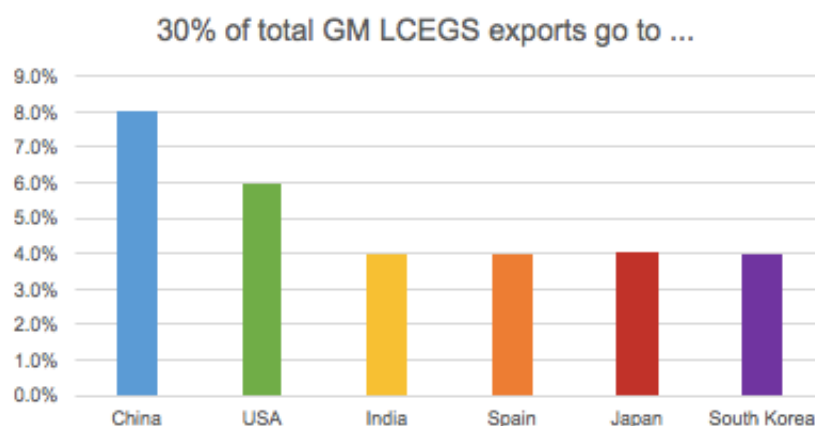
The top exporting sub-sector was Wind, exporting around £152m of sales in 2015/16.

**FIGURE 4 – GM LCEGS EXPORTS ANALYSIS**



The leading destinations making up 30% of GM LCEGS exports during 2015/16 are shown in Figure 5 below. The leading continent is Asia, with China, India, Japan and South Korea all figuring. The leading destination is China, with 8% of GM LCEGS exports going to this country.

**FIGURE 5 – LEADING DESTINATIONS FOR 30% OF GM LCEGS EXPORTS IN 2015/16**

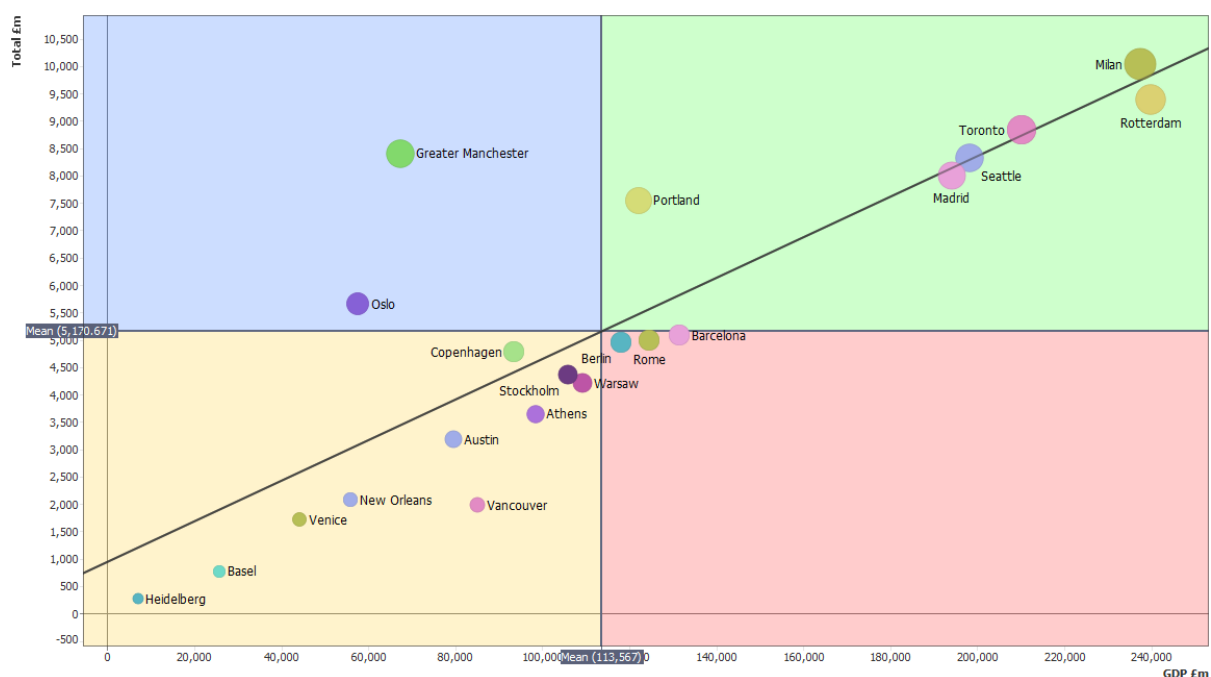


## 2.2 How the GM Low Carbon Sector Compares

### Globally

GM has been compared to 21 European and North American cities using an upgraded version of the LCEGS data set: LCEGSS<sup>1</sup> (see Appendix 1 for a full description). GM's LCEGSS sales value is proportionally large for its Gross Domestic Product (GDP) and is therefore above average compared to similar global cities. Only two other cities, Portland and Oslo, share this position with GM as illustrated in Figure 6.

**FIGURE 6 – COMPARISON OF GM(LC)EGSS SECTOR WITH LEADING INTERNATIONAL CITIES**



GM is well above average for the Low Carbon sub-sector and, in particular, well above average for the Level 2 sub-sectors of Alternative Energy Sources, Alternative Fuel Vehicles, Alternative Fuels, Carbon Capture & Storage and Nuclear Power.

GM is also above average for the Environmental sub-sector and, in particular, well above average for the Level 2 sub-sectors of Contaminated Land, Energy from Waste and Marine Pollution Control.

For the Renewable Energy sub-sector, GM is average overall but above average for Renewable Consulting, Wave & Tidal and Wind Level 2 sub-sectors.

### Nationally

<sup>1</sup> 86 global cities from the C40 Cities Climate Leadership Group have piloted a new LCEGSS definition, which is more closely compliant with the Eurostat Environmental Goods and Services Sector (EGSS) definition due to the addition of new sub sectors (Biodiversity and Energy from Waste) and the addition of new activities to existing sub sectors. GM has been measured against 21 cities from the C40 group using the LCEGSS data set. Further information is provided in Appendix 1.

GM's ranking amongst English LEPs has not significantly changed since the previous analysis was carried out in 2013.

#### **Sector sales:**

GM is ranked 3rd of all English LEPs (behind London and South East) with 5% of total LCEGS sales (£6,759m). This overall ranking has not changed since the last analysis was undertaken in 2013. Exceptions to this ranking can be found within the Level 2 sub-sectors:

- Within Environmental, the Contaminated Land sub-sector ranks 4<sup>th</sup>(behind London, South East and Leeds).
- Within Low carbon, the Carbon Finance sub-sector ranks 2<sup>nd</sup>(behind London and ahead of South East (3<sup>rd</sup>) and Leeds (4<sup>th</sup>)).
- Within Renewable Energy, the Biomass, Photovoltaic, Hydro and Renewable Consultancy sub-sectors rank 4<sup>th</sup>(behind London, South East and Leeds).

#### **Sector employment:**

GM is ranked 4th of all English LEPs (behind London, South East and Leeds) with 4% of total LCEGS employment (45,100). Exceptions to this ranking can be found within the Level 2 sub-sectors:

- Within Environmental, the Air Pollution sub-sector ranks 3<sup>rd</sup>(behind London and South East).
- Within Low carbon, the Alternative Fuels, Carbon Finance, Nuclear Power and Additional Energy Storage sub-sectors are ranked 3<sup>rd</sup>(behind London and South East).
- Within Renewable Energy, the Wind sub-sector ranks 3<sup>rd</sup>(behind London and South East).

#### **Sector companies:**

GM is ranked 4th of all English LEPs (behind London, South East and Leeds) with 4% of total LCEGS companies (2,400). There is no significant variation to this in the Level 2 sub-sectors.

### **GM business base**

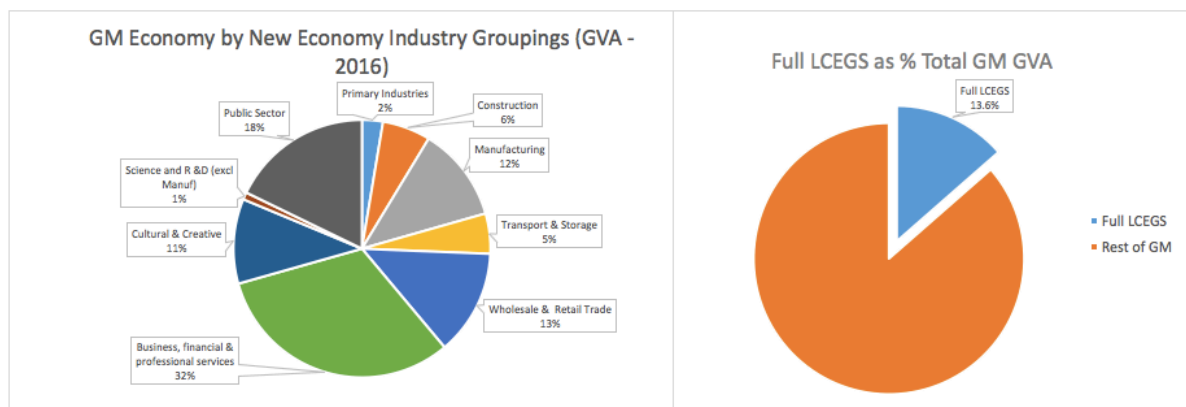
It is important to note that this part of the analysis used two different sources of data – the LCEGS data set (from which Gross Value Added (GVA) figures were calculated) and the Greater Manchester Forecasting Model (GMFM) compiled by New Economy, which provides a regular analysis of GM's overall economy (including GVA) but does not include the low carbon sector. Further information is provided in Appendix 1.

The use of two different data sets in this analysis makes it difficult to draw conclusions from any trends shown in the data presented below, since the methodologies behind the data sets are not comparable.

GMFM groupings and sub-sector definitions were compared to LCEGS and its sub-sectors at comparable levels, using “% of GM total” for the metrics GVA, employees and companies (where known).

Based on this analysis, Figure 7 shows that GM LCEGS broadly equates to 13.6% of total GM GVA.

**FIGURE 7—GM LCEGS AS A % OF TOTAL GM ECONOMY (GVA) - 2015/16\***



**\*The Full LCEGS definition of the sector cuts across and includes parts of the New Economy Sector Groupings shown in the chart on the left, therefore cannot be included in that pie chart.**

Manufacturing is a New Economy Industry Grouping containing the sub-sectors Advanced Manufacturing, Food & Drink Manufacturing, Textile Manufacturing and Other Manufacturing. This grouping represented 11.6% of the whole GM economy as measured by GVA in 2015, according to the New Economy GMFM tool.

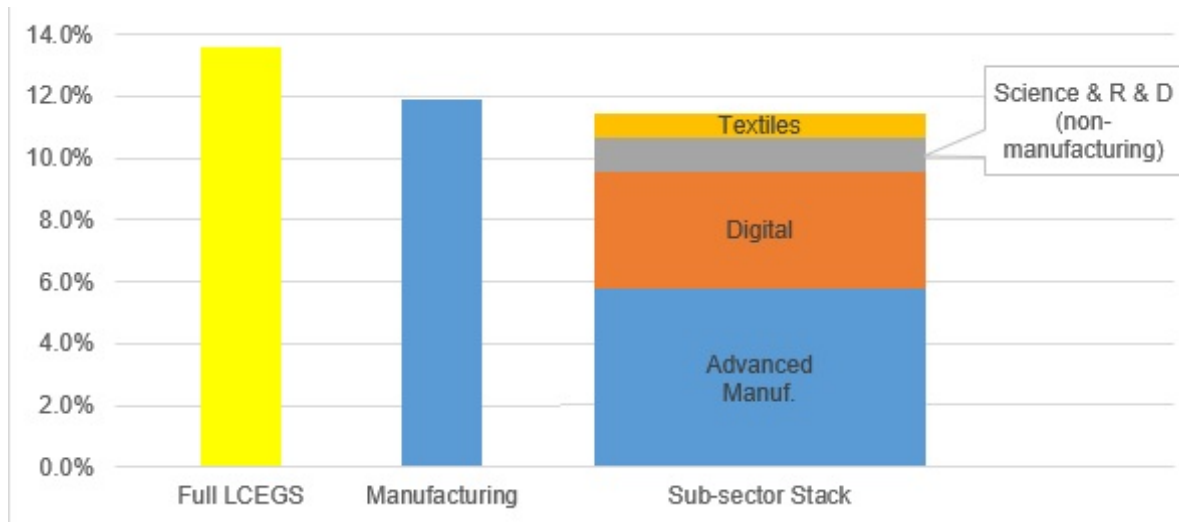
The Business Growth Hub has identified Advanced Manufacturing, Textiles and the Digital sub-sectors as current priorities. Two of these are in the Manufacturing industry grouping previously discussed. Digital is the largest sub-sector in the New Economy ‘Cultural and Creative’ industry grouping. Science & R & D (non-manufacturing) (or Life Sciences) is the smallest of the New Economy industry groupings, representing just over 1% of the GM Economy by GVA in 2015.

LCEGS is the 3<sup>rd</sup> largest sector grouping compared to the New Economy Industry Groupings, after the ‘Business, financial and professional services’ industry group and the ‘Public sector’ industry group.

LCEGS is the 2<sup>nd</sup> largest sector grouping compared to the Broad Industry Groupings, after the Real Estate Activities sub-sector. Full ranking of the major industry groupings and sub-sectors is provided in Appendix 1.

GM LCEGS is larger than the GM Manufacturing industry grouping and larger than the GM priority sectors of Advanced Manufacturing, Digital, Life Sciences and Textiles COMBINED, as shown below in Figure 8.

**FIGURE 8 - COMPARING GM LCEGS WITH NEW ECONOMY SUB-SECTORS IN AGGREGATE - % OF TOTAL GM ECONOMY (GVA) 2015/16**



## 2.3 Diversification opportunities

The LCEGS sector is very diverse, incorporating a wide range of technologies and skills. As a growing sector, it offers opportunities for companies with the right core technologies or skills to diversify into new markets. The analysis undertaken shortlisted Professional Services, Process Industries, Engineering and Manufacturing as having the closest fit with the technology and skill requirements of the LCEGS sector and a significant presence in GM.

Analysis shows that the diversification opportunity in GM is valued at £82,460m. This overall value and the sub-sector values presented below, are based on available market value which equates to realisable additional sales opportunity outside of GM based upon what has already happened in the past year. The opportunity represents 28 LCEGS markets for 17 different industrial and business processes to diversify into. The strongest diversification opportunities are primarily for General Engineering companies. These are summarised below by Level 2 LCEGS sub-sector.

### Renewable energy

**Biomass, wind and geothermal/renewable heating (i.e. heat pumps)** – market value is £28,660m for companies involved in:

- Fabrication
- Electrical
- Instrumentation
- Design
- Project Management



## Environmental

**Waste management, water treatment, and recovery & recycling** - market value is £15,989m for companies involved in:

- Fabrication
- Machining
- Electrical
- Instrumentation
- Design
- Civil Engineering
- Project Management

## Low carbon

**Carbon finance and energy management** - market value is £684m for companies involved in:

- Professional Services

## Other opportunities

A number of other markets are of interest to the Business Growth Hub for diversification opportunities. These are:

**Energy efficiency/Housing retrofit** – for:

- Plumbers
- Heating engineers

This appeared in the analysis but was not of significant value, demonstrating that this is still not an established market for businesses to accept the risks of diversification into it.

**Heat networks** – for:

- Civil engineers

Although there is a pipeline of heat network projects in GM (see Section 3), this is still an emerging market that would be considered high risk and therefore did not survive the filtering process in the analysis that was undertaken. Qualitative discussions with stakeholders suggests that there is an opportunity for companies that have ground work / digging expertise to come forward to diversify into the heat networks market.

**Smart grids** – for:

- Electrical engineers

This is a very specialist market and therefore is not considered a diversification opportunity within this analysis i.e. volume of companies versus market value is not significant.

This narrower view of the market was not reflected in the qualitative stakeholder consultations. For example, several Smart Grid examples were raised where electrical engineering skills may be relevant, which are outside the direct power networks

maintenance arena. These include setting up direct current (DC) power networks for households and small businesses and development of smart energy management systems using sensors and a “Rule base”, to optimise income from and use or storage of renewable energy.

**Markets for:**

- Digital technologies

Digital was not included in the shortlist of technologies and skills that a) closely fit with the operational requirements of the low carbon sector and b) have a significant presence in GM. The Digital sector is one of the priority sectors for the Business Growth Hub and is growing in size. It is recognised as a sector that has technology and tools that cross many other sectors including low carbon, for example:

- The CityVerve programme aims to demonstrate how such technologies can support a Smart City in the future, which includes low carbon applications such as sensors for monitoring and managing energy use in buildings.
- IT investments to support Smart Grids, such as energy data modelling and actuals analysis in real time, and sophisticated accounting and billing systems used between the Transmission System Operators and Distribution System Operators (DSOs), DSOs and Energy Suppliers, Energy Suppliers and consumers.

## 3. Future Threats and Trends

In this section, the main findings presented are from research and assessment of the possible future threats and trends impacting the growth of the low carbon sector from three types of development: 1. Policy and legislation 2. Technology and 3. Future GM activities. The findings presented are aligned, where possible, to the Business Growth Hub's Low Carbon Network sector definition (full definition is provided in Appendix 1). The research undertaken is summarised in Appendix 2.

### 3.1 Policy and legislation developments

Locally, there is strong political support for the low carbon sector. This includes a dedicated support programme run by the Business Growth Hub, commitments to emissions reduction targets and associated activity made in the GM Climate Change and Low Emissions Strategy and a further £18m of European Structural & Investment Funds (ESIF) committed for sustainable urban development projects involving low carbon infrastructure, whole building energy efficiency and low carbon energy generation.

The general trends in policy and legislation nationally, and locally, are towards:

- Affordable energy and driving energy efficiency in industry
- Cost effective transition of energy infrastructure to support low carbon developments
- Exploiting new technologies such as ultra low emission vehicles, energy storage, innovation in energy management and smart grids, and solutions for reducing the costs of off-shore wind
- Improving air quality

The threats presented by developments in policy and legislation include:

- The uncertainty of BREXIT for businesses in general
- The Committee on Climate Change has highlighted both heat and transport as energy demand markets in which the UK is failing to make sufficient headway to reduce reliance on fossil fuels, e.g. only 1.2% of car sales in 2016 were electric cars but by 2030 three out of every five new cars sold (60%) need to be electric. Heat and transport made up 30% and 39% of GM carbon emissions in 2016<sup>2</sup>, respectively, and although progress is beginning to be made on power and heat, the trajectory for reduction in emissions from transport is falling quite a long way short of ambitions (-17%).

The following sub-sectors are likely to be impacted the most:

1. Renewable and Low Carbon Energy
2. Energy Efficiency
3. Low Emission Vehicles and Infrastructure
4. Smart Grids
5. Environmental Monitoring and Management

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<sup>2</sup> Manchester Climate Change Agency

Other sub-sectors such as Waste Management, Recovery and Recycling, are covered by local policy and strategy statements, but there is less focus at the national level.

## 3.2 Technology developments

The general trend in public-funded technology developments is a move away from a sector focus to a technology and material innovation focus, including:

- Infrastructure – these innovations can be applied to Renewable and Low Carbon Energy and Low Emission Vehicles and Infrastructure e.g. flexibility and resilience in energy networks and smarter, greener and more efficient transport systems.
- Emerging and enabling technologies – these innovations can be applied to many low carbon sub-sectors e.g. use of sensors and internet of things in Smart Grids and use of robotics and autonomous systems in Renewable and Low Carbon Energy, such as the extreme environments associated with nuclear power and offshore wind.
- Advanced materials and manufacturing techniques - these innovations can be applied to many low carbon sub-sectors e.g. light-weighting and cost reduction in Renewable and Low Carbon Energy, such as offshore wind.

The research showed that UK funding commitments for research and innovation are likely to support the following sub-sectors:

1. Renewable and Low Carbon Energy
2. Energy Efficiency
3. Low Emission Vehicles and Infrastructure
4. Smart Grids

The main threat related to technology developments is the uncertainty that BREXIT creates for access to research and innovation funding and expertise in the future.

## 3.3 Future GM activities

The following local developments in GM could present future market opportunities for the low carbon sector:

- ESIF funding commitment within the Sustainable Urban Development Plan (£18m) for projects associated with Smart Grids, Renewable and Low Carbon Energy, Energy Efficiency and Low Emission Vehicles and Infrastructure.
- Pipeline of 21 district heat network projects in planning and delivery, presenting an opportunity for companies in the Renewable and Low Carbon Energy sub-sector.
- Innovation and demonstration programmes e.g. Hydrogen Fuel Cell Innovation Centre, CityVerve (Smart City demonstrator) – opportunities for innovative companies with solutions related to Renewable and Low Carbon Energy, Energy Efficiency, Smart Grids and Low Emission Vehicles and Infrastructure.

The threats presented by future GM activities include:

- There is little or no opportunity for local SMEs in planned heat network projects because the market tends to be dominated by large contractors with existing supply chains. The Business Growth Hub is however, planning a supply chain event in September 2017 to explore opportunities with contractors.
- Trend towards fossil fuel solutions e.g.

- Heat networks in planning and delivery are largely based on more efficient fossil fuel solutions rather than renewable energy such as biomass, e.g. seven of the nine national projects funded by BEIS' Heat Networks Investment Project (HNIP) Pilot are Gas-CHP (Combined Heat and Power) and this trend is reflected locally in GM.
- To improve electricity network flexibility, the District Network Operator's strategy includes use of diesel-fired energy generators in addition to battery storage.

# Appendix 1: Sector Analysis

## GM analysis methodology and data

Analysis of the current status and potential for growth in the low carbon sector in Greater Manchester (GM) was undertaken using five different sector definitions. The Business Growth Hub originally specified four definitions (LCEGS, LCRE, EGSS and its own bespoke definition) but also made clear that they wish to be able to compare the GM sector internationally; the inclusion of the fifth definition (LCEGSS) enables a truly international comparison since this definition has been adopted by the C40 Cities Climate Leadership Group representing 86 global cities.

The aim of this multi definition analysis is to enable the Business Growth Hub to collect intelligence about the sector in a meaningful way, taking into consideration how the sector is measured by the UK government and at the EU and international level.

In the sector analysis, the first three definitions – LCEGS, LCEGSS and BGH – are classed as ‘industry groupings’, equivalent to industry groupings used in GM economic analysis regularly undertaken by New Economy. The last two definitions – LCRE and EGSS – are classed as sub-sectors of the industry groupings and this enables some comparison to be made with GM sub-sectors from other industry groupings outside of the low carbon sector. All data sets are 2015/16 and analysis has included multi-level quantification.

### **Sector definitions:**

#### **Industry groupings**

##### **1. LCEGS: Low Carbon and Environmental Goods and Services**

This is the original data set developed and updated annually by kMatrix, which was the basis of the previous GM low carbon sector research undertaken in 2013 and national analysis undertaken for the UK government between 2007 – 2013. Its inclusion allows for an uninterrupted data series that can be used to continue the previous trend analysis. It is organised into three Level 1 sub-sectors (Environmental, Low Carbon and Renewable Energy) and a further twenty-four Level 2 sub-sectors.

Using the LCEGS definition, the sector was measured in four different ways to demonstrate the impact that low value-adding activities (supply and distribution) in Level 2 Alternative Fuels and Alternative Fuel Vehicles sub-sectors and the entire Level 2 Carbon Finance sub-sector, has on overall performance of the sector. The reason for the latter was to take into consideration how much the financial and professional services sector can distort the figures, especially when comparing the size of the sector between city regions / LEP areas in the UK. The analysis included:

- a. LCEGS as a whole
- b. LCEGS with the Carbon Finance sub-sector removed

- c. LCEGS with the low value-added activities of Alternative Fuels and Alternative Fuel Vehicles sub-sectors removed.
- d. LCEGS with b & c removed.

Most of the analysis based on (b) and (d) has not been reported since the removal of Carbon Finance did not present any significant findings. Data tables and charts presented in this document will therefore refer to LCEGS (a) and Filtered LCEGS (c), where appropriate.

## 2. LCEGSS: Low Carbon and Environmental Goods and Services Sector (updated and expanded)

LCEGSS is an updated and expanded version of LCEGS. The data set has twenty-six Level 2 sub-sectors due to the addition of Biodiversity and Energy from Waste into Level 1 Environmental, and the addition of new activities to existing sub-sectors. This new version is now more closely compliant with the Eurostat EGSS definition. In 2016, LCEGSS was successfully piloted with all 86 global cities from the C40 Cities Climate Leadership Group.

## 3. BGH: Business Growth Hub Low Carbon Network

This is a bespoke version of LCEGS developed by the BGH for its Low Carbon Network, with eight Level 1 sub-sectors and 47 Level 2 sub-sectors.

### **Sub-sectors of industry groupings**

#### 1. LCRE: Low Carbon and Renewable Energy

This is the LCEGS data set minus the Level 1 Environmental sub-sector. This data set is similar to the current Office for National Statistics (ONS) definition used to measure the Low Carbon sector in the UK, which excludes traditional environmental industries.

#### 2. EGSS: Environmental Goods and Services Sector

This is the LCEGSS data set minus Level 1 Low Carbon and Level 1 Renewable Energy sub-sectors and is more closely compliant with the Eurostat EGSS definition.

The first table below provides a breakdown of Level 1 and Level 2 sub-sectors against LCEGS, LCEGSS, LCRE and EGSS definitions and the second table maps the BGH definition to the LCEGS definition.

## Reported metrics

From analysis using all sector definitions, the following metrics have been reported:

- Number of companies – GM (GM and English LEPs for LCEGS)
- Number of employees – GM (GM and English LEPs for LCEGS)
- Sales (£m) – GM (GM, English LEPs and Global for LCEGS)
- Sector as a % of the GM business base (GVA) and ranking
- Growth rates – forecast growth (historical & forecast growth for LCEGS)

A fuller analysis was completed using the LCEGS data set. Additional metrics reported are:

- Imports – UK, Europe and Global
- Exports – GM, UK, Europe and Global
- Current market size – Europe and Global

## Breakdown of Level 1 and Level 2 sub-sectors for LCEGS, (LC)EGSS, LCRE and EGSS definitions

LCEGS Level 1	LCEGS / (LC)EGSS Level 2	Definitions			
		LCEGS	(LC)EGSS	LCRE	EGSS
Environmental	Air Pollution	•	•		•
Environmental	Bio-Diversity		•		•
Environmental	Contaminated Land	•	•		•
Environmental	Energy from Waste		•		•
Environmental	Environmental Consultancy	•	•		•
Environmental	Environmental Monitoring	•	•		•
Environmental	Marine Pollution Control	•	•		•
Environmental	Noise and Vibration Control	•	•		•
Environmental	Recovery and Recycling	•	•		•
Environmental	Waste Management	•	•		•
Environmental	Water and Waste Water Treatment	•	•		•
Low Carbon	Additional Energy Sources	•	•	•	
Low Carbon	Alternative Fuel Vehicle	•	•	•	
Low Carbon	Alternative Fuels	•	•	•	
Low Carbon	Building Technologies	•	•	•	
Low Carbon	Carbon Capture and Storage	•	•	•	
Low Carbon	Carbon Finance	•	•	•	
Low Carbon	Energy Management	•	•	•	
Low Carbon	Nuclear Power	•	•	•	
Renewable Energy	Biomass Geothermal	•	•	•	
Renewable Energy	Geothermal	•	•	•	
Renewable Energy	Hydro	•	•	•	
Renewable Energy	Photovoltaic	•	•	•	
Renewable Energy	Renewable Consultancy	•	•	•	
Renewable Energy	Wave and Tidal	•	•	•	
Renewable Energy	Wind	•	•	•	



## BGH definition mapped to the LCEGS definition

### LCEGS definition

### New BGH definition equivalent

Level 1	Level 2	Level 1	Level 2	Level 3
Environmental	Marine Pollution Control	Environmental monitoring and management	Marine pollution control	n/a
	Noise and Vibration Control	Environmental monitoring and management	Noise and vibration control	n/a
	Environmental Monitoring	Environmental monitoring and management	Environmental monitoring	n/a
	Air Pollution	Environmental monitoring and management	Air pollution	n/a
	Contaminated Land	Environmental monitoring and management	Contaminated land	n/a
	Recovery and Recycling	Waste management, recovery and recycling	Reprocess and treatment, Collection, Store, Waste handling	All
	Waste Management	Waste management, recovery and recycling	Other	All
	Water Supply and Waste Water Treatment	Water Management and treatment	All	All
Low Carbon Sector	Carbon Capture and Storage	Renewable and low carbon energy	Carbon, capture and storage	All
	Building Technologies	Energy efficiency	Building technologies and sustainable construction	All
	Alternative Fuels	Low emissions vehicles and infrastructure		Alternative fuels
		Energy efficiency	Energy storage systems	batteries
	Additional Energy Sources	Energy efficiency	Energy storage systems	Fuel cells, fly wheels and other
				Design and manufacture of low emissions vehicles, charging infrastructure, software and IT infrastructure to manage remote charging
	Alternative Fuel/Vehicle	Low emissions vehicles and infrastructure		
	Carbon Finance	Low carbon finance	n/a	n/a
	Energy Management	Energy efficiency	EE lighting	All
		Energy efficiency	EE heating an cooling	All
	Energy efficiency	Energy monitoring and control systems	All	
	Energy efficiency	Energy management consultancy etc	All	
	Nuclear Power		Nuclear Power	All
Renewable Energy	Wave and Tidal	Renewable and low carbon energy	Wave and tidal	All
	PV	Renewable and low carbon energy	PV	All
	Renewable Consulting	Renewable and low carbon energy	Renewable and low carbon consulting services	All
	Hydro	Renewable and low carbon energy	Hydro	All
	Geothermal	Renewable and low carbon energy	Heat pumps	All
	Biomass	Renewable and low carbon energy	Biomass	All
	Wind	Renewable and low carbon energy	Wind	All

### Not included in LCEGS definition but in the new BGH definition

Waste management, recovery and recycling	Manufacture of products with recycled content	All
Low emissions vehicles and infrastructure		Low carbon logistics
Energy efficiency	Energy efficiency products	All
Renewable and low carbon energy	Solar Thermal	All
Renewable and low carbon energy	Heat Networks	
Environmental monitoring and management	Environmental consultancy	
Smart grids	All	All

## Sector analysis summary (all definitions):

Comparative size of GM Economy and various definitions of the Low Carbon sector - 2015/16						
GM Total & Low Carbon sector definitions →	Total GM Economy	LCEGS	LCEGS less Carbon Finance	Filtered LCEGS	BGH	LCEGSS
Metric ↓						
GM Gross Domestic Product (£m)	£65,397					
Sector Sales (£m)		£6,759	£6,317	£5,666	£6,924	£8,460
Gross Value Added (£m)	£59,778	£8,111	£7,580	£6,799	£8,309	£10,152
GM Population	2,764,300					
GM Employment	1,389,162	45,115	44,964	39,272	46,562	53,627
Sector size as a % of GM Total (GVA)	100%	13.6%	12.7%	11.4%	13.9%	17.0%
Sector size (Employment) as a % of GM Total	100%	3.2%	3.2%	2.8%	3.4%	3.9%
# Companies		2,398	2,391	2,086	2,511	3,095

Size of GM LCEGS by sub-sector - 2015/16							
GM Total & LCEGS Level 1 and other sub-sectors →	Based on Full LCEGS data				Total GM Sub-sectors	LCRE	EGSS
	Total GM LCEGS	Environmental	Low Carbon	Renewable Energy			
Metric ↓							
Sector Sales (£m)	£6,759	1,230.90	3,572.00	1,955.63	£8,460	£6,176	£2,284
Gross Value Added (£m)	£8,111	1,477.08	4,286.40	2,346.76	£10,152	£7,411	£2,741
GM Employment	45,115	7,583	22,888	14,645	53,627	40,974	12,653
GM Companies	2,398	380	1,172	846	3,094	2,318	776
Subsector size as a % of GM sub-sector totals (Sales & GVA)	100%	18.2%	52.8%	28.9%	100.0%	73.0%	27.0%
Subsector size as a % of GM sub-sector totals (Employment)	100%	16.8%	50.7%	32.5%	100.0%	76.4%	23.6%
Subsector size as a % of GM sub-sector totals (Companies)	100%	15.9%	48.9%	35.3%	100.0%	74.9%	25.1%
Sector size as a % of GM Total (GVA)	-	2.5%	7.2%	3.9%	-	12.4%	4.6%
Sector size as a % of GM Total (Employment)	-	0.5%	1.6%	1.1%	-	2.9%	0.9%
Ranking vs. GM New Economy sub-sectors (GVA)		14th	3rd	9th		2nd	9th

Size of GM Filtered LCEGS by sub-sector - 2015/16				
GM Total & Level 1 sub-sectors (Filtered LCEGS) →	Total GM Filtered LCEGS	Environmental	Low Carbon	Renewable Energy
Metric ↓				
Sector Sales (£m)	£5,666	1,230.90	2,479.82	1,955.63
Gross Value Added (£m)	£6,799	1,477.08	2,975.78	2,346.76
GM Employment	46,562	7,583	17,043	14,645
GM Companies	2,086	380	860	846
Subsector size as a % of GM LCEGS Total (Sales & GVA)	100%	21.7%	43.8%	34.5%
Subsector size as a % of GM LCEGS Total (Employment)	100%	19.4%	43.6%	37.4%
Subsector size as a % of GM LCEGS Total (Companies)	100%	18.2%	41.2%	40.6%
Sub-sector size as a % of GM Total (GVA)	-	2.5%	5.0%	3.9%

## LCEGS analysis:

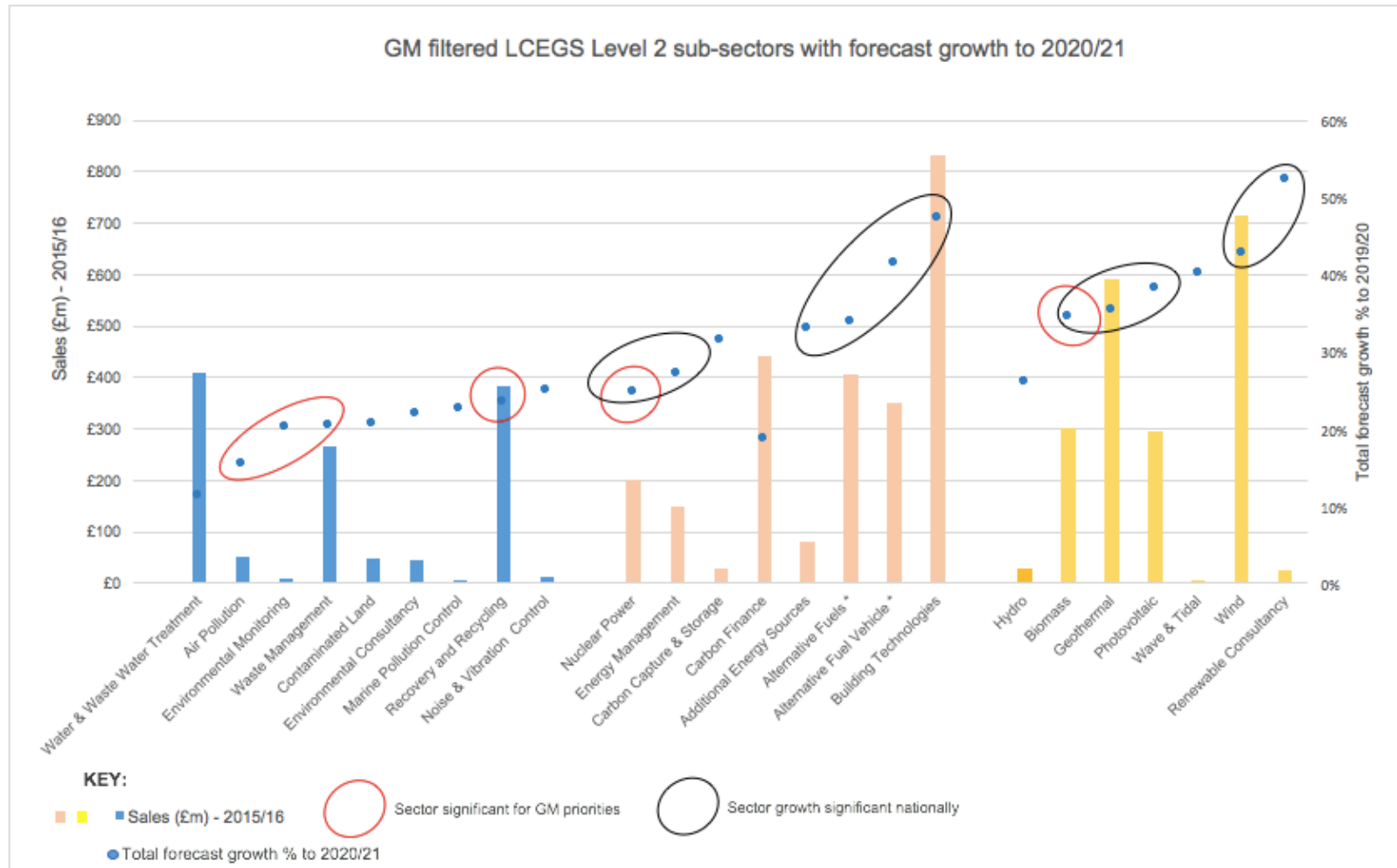
Full LCEGS Global to Level 1 and 2 sub-sector breakdown		2015/16							
		Sales and GVA			Employees		Companies		
Geography	Sales (£m)	GVA (£m)	% Geog Totals	#	% Geog Totals	#	% Geog Totals		
Global	£4,203,424	£5,044,109							
Greater Manchester ( & LEP)	£6,759	£8,111	13.6%	45,115	3.2%	2,398			
LCEGS ranking vs New Econ Industry Groupings			3rd		8th				
GM ranking among English LEPS	3rd		5%	4th	4%	4th	4%		
LEPS ahead of GM (Sales)	1) London 2) South East			1) London 2) South East 3) Leeds		1) London 2) South East 3) Leeds			
Sub-sectors within Greater Manchester	Sales (£m)	Sub-sector National Ranking Exceptions	GVA (£m)	% Geog Totals	#	Sub-sector National Ranking Exceptions	% Geog Totals	#	% Geog Totals
<b>Environmental</b>	<b>1231</b>		<b>1477.08</b>	<b>18.2%</b>	<b>7,583</b>		<b>16.8%</b>	<b>380.4</b>	<b>15.9%</b>
Water & Waste Water Treatment	409.64		491.568	6.1%	2594		5.7%	131	5.5%
Recovery and Recycling	384.06		460.872	5.7%	2171		4.8%	109	4.5%
Waste Management	264.73		317.676	3.9%	1690		3.7%	84	3.5%
Air Pollution	51.91		62.292	0.8%	367	3rd	0.8%	18	0.8%
Contaminated Land	49.27	4th	59.124	0.7%	307		0.7%	15	0.6%
Environmental Consultancy	43.54		52.248	0.6%	283		0.6%	14	0.6%
Noise & Vibration Control	12.14		14.568	0.2%	75		0.2%	4	0.2%
Environmental Monitoring	8.67		10.404	0.1%	56		0.1%	3	0.1%
Marine Pollution Control	6.94		8.328	0.1%	40		0.1%	2	0.1%
<b>Low Carbon</b>	<b>3,572</b>		<b>4,286.4</b>	<b>52.8%</b>	<b>22,888</b>		<b>50.7%</b>	<b>1,172</b>	<b>48.9%</b>
Alternative Fuels	1,099.13		1318.956	16.3%	6183	3rd	13.7%	314	13.1%
Building Technologies	829.7		995.64	12.3%	6191		13.7%	314	13.1%
Alternative Fuel Vehicle	747.12		896.544	11.1%	3241		7.2%	189	7.9%
Carbon Finance	441.49	2nd	529.788	6.5%	151	3rd	0.3%	7	0.3%
Nuclear Power	198.74		238.488	2.9%	1341	3rd	3.0%	44	1.8%
Energy Management	147.75		177.3	2.2%	3695		8.2%	183	7.6%
Additional Energy Sources	79.3		95.16	1.2%	693	3rd	1.5%	54	2.3%
Carbon Capture & Storage	28.96		34.752	0.4%	1392		3.1%	68	2.8%
<b>Renewable Energy</b>	<b>1,956</b>		<b>2,346.8</b>	<b>28.9%</b>	<b>14,645</b>		<b>32.5%</b>	<b>845.8</b>	<b>35.3%</b>
Wind	713.55		856.26	10.6%	6005	3rd	13.3%	360	15.0%
Geothermal	590.37		708.444	8.7%	3890		8.6%	216	9.0%
Biomass	301.36	4th	361.632	4.5%	1648		3.7%	94	3.9%
Photovoltaic	294.97	4th	353.964	4.4%	2132		4.7%	122	5.1%
Hydro	26.11	4th	31.332	0.4%	187		0.4%	9	0.4%
Renewable Consultancy	24.55	4th	29.46	0.4%	761		1.7%	44	1.8%
Wave & Tidal	4.72		5.664	0.1%	22		0.0%	1	0.0%

### GM LCEGS historical and forecast growth rates

Growth Rates	GM	UK	Global	Comments
Historical growth achieved 2011/12 - 2012/13	4.8%	4.8%	4.0%	* UK (which includes Scotland, Wales and Ireland) growth rates exceed Global growth rates.
Historical growth achieved 2012/13 - 2013/14	5.2%	5.5%	4.4%	
Historical growth achieved 2013/14 - 2014/15	5.7%	5.8%	5.1%	* GM achieved higher growth rates than the UK in 2014/15 - 2015/16
Historical growth achieved 2014/15 - 2015/16	6.3%	6.1%	5.9%	* GM historical growth is ahead of forecast growth for 2014/15-2015/16
Forecast growth rate 2015/16 to 2016/17	4.8%	5.4%	4.8%	* LEP forecast growth rates tend to understate larger LEP / Cities like London and Manchester so it is more accurate to relate the GM forecast growth to the UK growth rates.
Forecast growth rate 2016/17 to 2017/18	5.0%	5.8%	5.0%	
Forecast growth rate 2017/18 to 2018/19	5.2%	6.3%	5.2%	* GM is forecast to exceed Global growth rates (though not UK rates)
Forecast growth rate 2018/19 to 2019/20	5.4%	6.9%	5.4%	
Forecast growth rate 2019/20 to 2020/21	6.9%	7.4%	5.6%	

The chart presented overleaf shows the filtered LCEG Level 2 sub-sectors' size and growth potential.

## GM filtered LCEGS Level 2 sub-sectors analysis including growth



LCEGSS analysis:

LCEGSS Level 1 and 2 breakdown	2015/16							
				Employees		Companies		
	Geography	Sales (£m)	GVA (£m)	% Geog Totals	#	% Geog Totals	#	% Geog Totals
<b>Greater Manchester</b>	£8,460	£10,152	17.0%	53,627	3.9%	3,095		
LCEGSS ranking vs New Econ Industry Groupings			3rd		8th			
GM forecast growth rate 2015/16 to 2016/17				3.7%				
GM forecast growth rate 2016/17 to 2017/18				3.8%				
GM forecast growth rate 2017/18 to 2018/19				4.0%				
GM forecast growth rate 2018/19 to 2019/20				4.2%				
GM forecast growth rate 2019/20 to 2020/21				5.3%				
<b>Sub-sectors within Greater Manchester</b>								
<b>Environmental</b>								
Air Pollution	73	87.6	0.9%	400	0.7%	21	0.7%	
Bio-diversity +	96	115.2	1.1%	292	0.5%	21	0.7%	
Contaminated Land	49	58.8	0.6%	307	0.6%	15	0.5%	
Energy from Waste +	487	584.4	5.8%	3340	6.2%	256	8.3%	
Environmental Consultancy	151	181.2	1.8%	654	1.2%	41	1.3%	
Environmental Monitoring	9	10.8	0.1%	56	0.1%	3	0.1%	
Marine Pollution Control	7	8.4	0.1%	40	0.1%	2	0.1%	
Noise & Vibration Control	18	21.6	0.2%	96	0.2%	5	0.2%	
Recovery and Recycling	428	513.6	5.1%	2302	4.3%	118	3.8%	
Waste Management	287	344.4	3.4%	1756	3.3%	89	2.9%	
Water & Waste Water Treatment	678	813.6	8.0%	3410	6.4%	205	6.6%	
<b>Low Carbon</b>								
Additional Energy Sources	102	122.4	1.2%	721	1.3%	56	1.8%	
Alternative Fuel Vehicle	754	904.8	8.9%	3348	6.2%	197	6.4%	
Alternative Fuels	1099	1318.8	13.0%	6183	11.5%	314	10.1%	
Building Technologies	904	1084.8	10.7%	7395	13.8%	420	13.6%	
Carbon Capture & Storage	29	34.8	0.3%	1392	2.6%	68	2.2%	
Carbon Finance	441	529.2	5.2%	151	0.3%	7	0.2%	
Energy Management	689	826.8	8.1%	5791	10.8%	367	11.9%	
Nuclear Power	199	238.8	2.4%	1345	2.5%	44	1.4%	
<b>Renewable Energy</b>								
Biomass	301	361.2	3.6%	1648	3.1%	94	3.0%	
Geothermal	590	708	7.0%	3890	7.3%	216	7.0%	
Hydro	26	31.2	0.3%	187	0.3%	9	0.3%	
Photovoltaic	297	356.4	3.5%	2134	4.0%	122	3.9%	
Renewable Consultancy	25	30	0.3%	761	1.4%	44	1.4%	
Wave & Tidal	5	6	0.1%	22	0.0%	1	0.0%	
Wind	714	856.8	8.4%	6005	11.2%	360	11.6%	

## BGH analysis:

BGH Level 1 breakdown (Based on full LCEGS)				2015/16			
Geography	Sales (£m)	GVA (£m)	% GM Totals	Employees		Companies	
				#	% GM Totals	#	% GM Totals
<b>Greater Manchester</b>	£6,924	£8,309	13.9%	46,562	3.4%	2,511	
LCEGS ranking vs New Econ Industry Groupings			3rd		8th		
Forecast growth rate 2015/16 to 2016/17				4.8%			
Forecast growth rate 2016/17 to 2017/18				5.0%			
Forecast growth rate 2017/18 to 2018/19				5.2%			
Forecast growth rate 2018/19 to 2019/20				5.4%			
Forecast growth rate 2019/20 to 2020/21				6.9%			
<b>Sub-sectors within Greater Manchester</b>							
<b>BGH Coding using Full LCEGS</b>	<b>6923</b>	<b>8307.6</b>		<b>46562</b>		<b>2511</b>	
Energy Efficiency	977	1172.4	14.1%	9886	21.2%	497	19.8%
Environmental Monitoring & Management	172	206.4	2.5%	1128	2.4%	56	2.2%
Low Carbon Finance	441	529.2	6.4%	151	0.3%	7	0.3%
Low Emission Vehicles & Infrastructure	1846	2215.2	26.7%	9424	20.2%	502	20.0%
Renewable & Low Carbon Energy	2263	2715.6	32.7%	18071	38.8%	1011	40.3%
Smart Grids	165	198	2.4%	1447	3.1%	113	4.5%
Waste Management, Recovery and Recycling	649	778.8	9.4%	3861	8.3%	194	7.7%
Water Management & Treatment	410	492	5.9%	2594	5.6%	131	5.2%



## LCRE analysis:

LCRE Level 1 and 2 breakdown (Based partly on full LCEGS)	2015/16						
				Employees		Companies	
Geography	Sales (£m)	GVA (£m)	% Geog Totals	#	% Geog Totals	#	% Geog Totals
<b>Greater Manchester</b>	£6,176	£7,411	12.4%	40,974	2.9%	2,318	
LCRE ranking vs New Econ Industry sub-sectors			2nd		11th		
GM forecast growth rate 2015/16 to 2016/17				5.7%			
GM forecast growth rate 2016/17 to 2017/18				6.0%			
GM forecast growth rate 2017/18 to 2018/19				6.2%			
GM forecast growth rate 2018/19 to 2019/20				6.6%			
GM forecast growth rate 2019/20 to 2020/21				8.4%			
<b>Sub-sectors within Greater Manchester</b>							
<b>Low Carbon</b>							
Additional Energy Sources	102	122.4	1.7%	721	1.8%	56	2.4%
Alternative Fuel Vehicle	754	904.8	12.2%	3348	8.2%	197	8.5%
Alternative Fuels	1099	1318.8	17.8%	6183	15.1%	314	13.5%
Building Technologies	904	1084.8	14.6%	7395	18.0%	420	18.1%
Carbon Capture & Storage	29	34.8	0.5%	1392	3.4%	68	2.9%
Carbon Finance	441	529.2	7.1%	151	0.4%	7	0.3%
Energy Management	689	826.8	11.2%	5791	14.1%	367	15.8%
Nuclear Power	199	238.8	3.2%	1345	3.3%	44	1.9%
<b>Renewable Energy</b>							
Biomass	301	361.2	4.9%	1648	4.0%	94	4.1%
Geothermal	590	708	9.6%	3890	9.5%	216	9.3%
Hydro	26	31.2	0.4%	187	0.5%	9	0.4%
Photovoltaic	297	356.4	4.8%	2134	5.2%	122	5.3%
Renewable Consultancy	25	30	0.4%	761	1.9%	44	1.9%
Wave & Tidal	5	6	0.1%	22	0.1%	1	0.0%
Wind	714	856.8	11.6%	6005	14.7%	360	15.5%

## EGSS analysis:

EGSS Level 1 and 2 breakdown (Based partly on (LC)EGSS)				2015/16			
Geography	Sales (£m)	GVA (£m)	% Geog Totals	Employees		Companies	
				#	% Geog Totals	#	% Geog Totals
<b>Greater Manchester</b>	£2,284	£2,741	4.6%	12,653	0.9%	776	
EGSS ranking vs New Econ Industry sub-sectors			9th		19th		
GM forecast growth rate 2015/16 to 2016/17				2.3%			
GM forecast growth rate 2016/17 to 2017/18				2.4%			
GM forecast growth rate 2017/18 to 2018/19				2.5%			
GM forecast growth rate 2018/19 to 2019/20				2.5%			
GM forecast growth rate 2019/20 to 2020/21				3.2%			
<b>Sub-sectors within Greater Manchester</b>							
<b>Enviromental</b>							
Air Pollution	73	87.6	3.2%	400	3.2%	21	2.7%
Biodiversity +	96	115.2	4.2%	292	2.3%	21	2.7%
Contaminated Land	49	58.8	2.1%	307	2.4%	15	1.9%
Energy from Waste +	487	584.4	21.3%	3340	26.4%	256	33.0%
Environmental Consultancy	151	181.2	6.6%	654	5.2%	41	5.3%
Environmental Monitoring	9	10.8	0.4%	56	0.4%	3	0.4%
Marine Pollution Control	7	8.4	0.3%	40	0.3%	2	0.3%
Noise & Vibration Control	18	21.6	0.8%	96	0.8%	5	0.6%
Recovery and Recycling	428	513.6	18.7%	2302	18.2%	118	15.2%
Waste Management	287	344.4	12.6%	1756	13.9%	89	11.5%
Water & Waste Water Treatment	678	813.6	29.7%	3410	27.0%	205	26.4%

## Comparative analysis methodology and data

The GM low carbon sector's performance was compared nationally, globally and with the GM business base. Throughout the analysis, comparative performance was generally only reported where it was above (or significantly below) the national/global/GM average.

### Nationally:

GM was compared with other English LEPs using the LCEGS definition.

### Sector sales:

GM is ranked 3rd of all English LEPs (behind London and South East) with 5% of total LCEGS sales (£6,759m). Exceptions to this ranking can be found within the Level 2 sub-sectors:

- Within Environmental, the Contaminated Land sub-sector ranks 4<sup>th</sup> (behind London, South East and Leeds).
- Within Low carbon, the Carbon Finance sub-sector ranks 2<sup>nd</sup> (behind London and ahead of South East (3<sup>rd</sup>) and Leeds (4<sup>th</sup>)).
- Within Renewable Energy, the Biomass, Photovoltaic, Hydro and Renewable Consultancy sub-sectors rank 4<sup>th</sup> (behind London, South East and Leeds).

### Sector employment:

GM is ranked 4th of all English LEPs (behind London, South East and Leeds) with 4% of total LCEGS employment (45,100). Exceptions to this ranking can be found within the Level 2 sub-sectors:

- Within Environmental, the Air Pollution sub-sector ranks 3<sup>rd</sup> (behind London and South East).
- Within Low carbon, the Alternative Fuels, Carbon Finance, Nuclear Power and Additional Energy Storage sub-sectors are ranked 3<sup>rd</sup> (behind London and South East).
- Within Renewable Energy, the Wind sub-sector ranks 3<sup>rd</sup> (behind London and South East).

### Sector companies:

GM is ranked 4th of all English LEPs (behind London, South East and Leeds) with 4% of total LCEGS companies (2,400). There is no significant variation to this in the Level 2 sub-sectors.

### Globally:

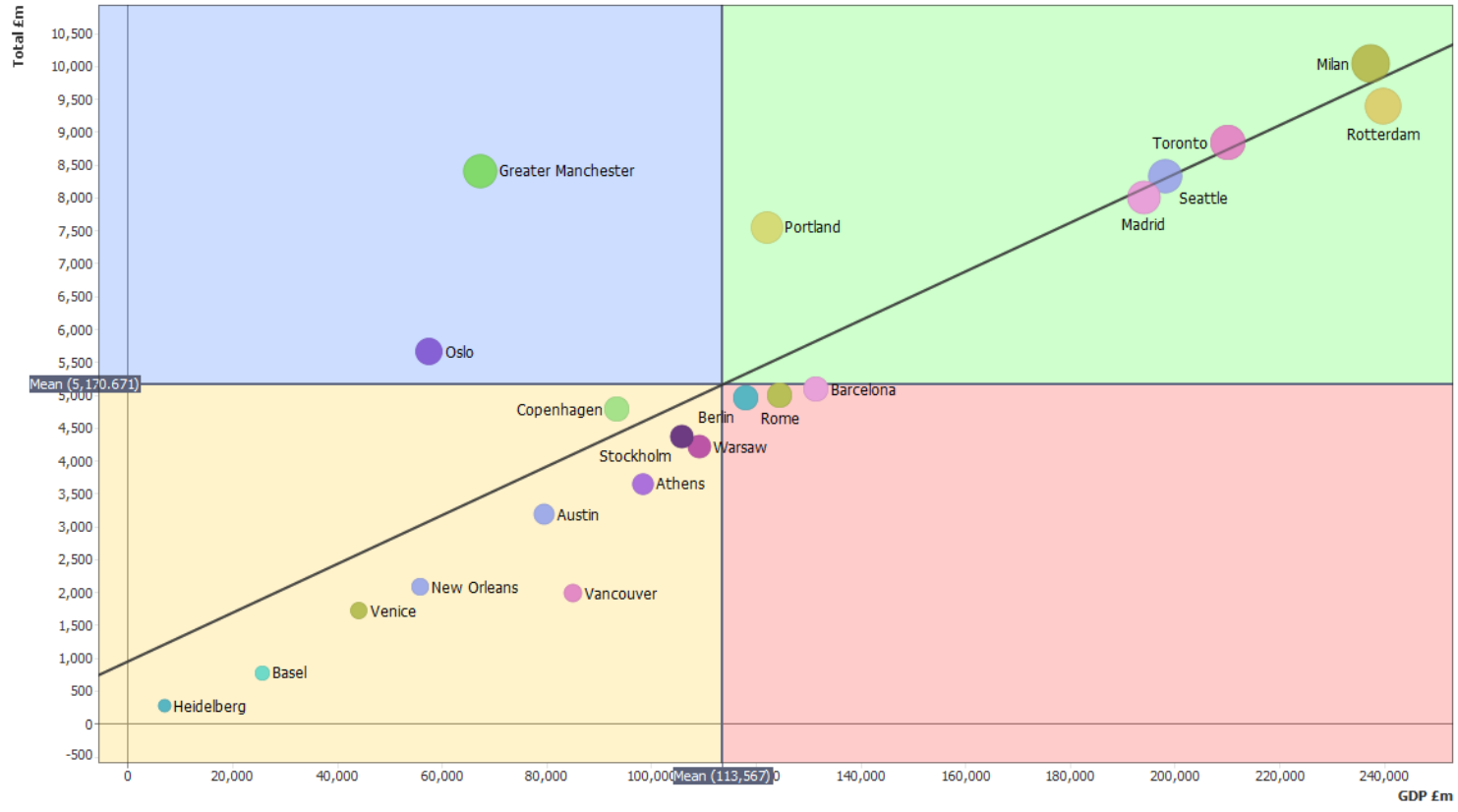
The work that kMatrix recently completed for the C40 Cities Climate Leadership Group made it possible to compare GM with a number of similar sized global cities. The research is based upon comparison between (LC)EGSS sales and Gross Domestic Product (GDP) figures for 2015/ 16. All values have been converted to Sterling.

The comparison cities have been drawn from C40 cities in Europe and in North America. The largest cities have been filtered out to ensure that the comparisons are relevant to the size of the GM economy. For example, London would not be comparable in this analysis.

The Business Growth Hub requested that GM be compared with eight global cities. Twenty-one cities in total were selected for the comparison, as listed below. Those in blue text are the cities that the Business Growth Hub specified, in order of priority. Those in black text, also in priority order, were also specified but are not comparable in size to GM and therefore could not be included in the analysis.

Amsterdam (3)	Heidelberg	Seattle
Athens	Madrid	Stockholm (5)
Austin	Milan (2)	Toronto (7)
Barcelona (1)	New Orleans	Vancouver
Basel	Portland	Venice
Berlin	Rome	Warsaw
Chicago (6)	Rotterdam	Yokohama (8)
Copenhagen (4)	Oslo	

### Mapping 21 cities by LCEGSS total sales (£m) and total GDP (£m)



The bubble chart above maps the 21 cities by total LCEGSS sales on the vertical axis and total GDP on the horizontal axis. The four zones are calculated using the mean value on each axis. A line of best fit runs from bottom left to top right of the chart.

When the same bubble chart is filtered for each of the three main activity blocks, GM is well above average for Level 1 Low Carbon, above average for Level 1 Environmental and average for Level 1 Renewable Energy.

When the data is filtered by the 26 sub sectors of LCEGSS (excluding Carbon Finance), then GM performs as follows:

<b>Well Above Average</b>	<b>Above Average</b>	<b>Average</b>
<ul style="list-style-type: none"> <li>• Alternative Energy Sources</li> <li>• Alternative Fuel Vehicles</li> <li>• Alternative Fuels</li> <li>• Carbon Capture &amp; Storage</li> <li>• Contaminated Land</li> <li>• Energy from Waste</li> <li>• Marine Pollution Control</li> <li>• Nuclear Power</li> </ul>	<ul style="list-style-type: none"> <li>• Air Pollution</li> <li>• Bio-diversity</li> <li>• Building Technologies</li> <li>• Energy Management</li> <li>• Environmental Monitoring</li> <li>• Recovery &amp; Recycling</li> <li>• Renewable Consulting</li> <li>• Waste Management</li> <li>• Water &amp; Waste Water</li> <li>• Wave &amp; Tidal</li> <li>• Wind</li> </ul>	<ul style="list-style-type: none"> <li>• Biomass</li> <li>• Environmental Consulting</li> <li>• Geothermal</li> <li>• Hydro</li> <li>• Noise &amp; Vibration Control</li> <li>• Photovoltaic's</li> </ul>

**The rest of the GM business base:**

This analysis used two different sources of data – the LCEGS data set (from which Gross Value Added (GVA) figures were calculated) and the Greater Manchester Forecasting Model (GMFM). GMFM is compiled by New Economy to provide an analysis of GM’s overall economy on a regular basis (but this does not cover the low carbon sector). This tool shows a breakdown of the GM economy as measured by GVA (based on sales), employees and companies and organised by:

- Broad Industry Groupings (based on Standard Industry Classification (SIC) codes)
- New Economy Industry Groupings

The New Economy Industry Groupings are further split by sub-sector, some of which are recognisable priority sectors for the Business Growth Hub, including Advanced Manufacturing, Textiles, etc.

GMFM groupings and sub-sector definitions were compared to LCEGS and its sub-sectors at comparable levels, using “% of GM total” for the metrics GVA, employees and companies (where known).

The data tables and graphs that follow present the results of the analysis.

## Industry Grouping ranking and comparison – LCEGS and filtered LCEGS, LCEGSS and BGH definitions

Overall Low Carbon sector ranking tables by GVA at various levels.

Overall Low Carbon sector ranking vs. various industry Grouping definitions (by % total GM GVA)		Rank	Broad Industry Groups (% of GM Total GVA)		Rank	New Economy Industry Groupings (% of GM Total GVA)		Rank
Business, financial & professional services	31.74%	1	L: Real estate activities	14.77%	1	Business, financial & professional services	31.7%	1
Public Sector	17.82%	2	G: Wholesale and retail trade; repair of motor vehicles and motorcycles	11.68%	2	Public Sector	17.8%	2
LCEGSS	16.98%		C: Manufacturing	10.23%	3	Wholesale & Retail Trade	13.2%	3
L: Real estate activities	14.77%	1	M: Professional, scientific and technical activities	8.16%	4	Manufacturing	11.9%	4
BGH Coding using Full LCEGS	13.90%		Q: Human health and social work activities	7.73%	5	Cultural & Creative	10.6%	5
LCEGS	13.57%		P: Education	6.45%	6	Construction	6.1%	6
Wholesale & Retail Trade	13.25%	3	F: Construction	6.06%	7	Transport & Storage	5.0%	7
Manufacturing	11.90%	4	N: Administrative and support service activities	5.92%	8	Primary Industries	2.6%	8
G: Wholesale and retail trade; repair of motor vehicles and motorcycles	11.68%	2	K: Financial and insurance activities	5.72%	9	Science and R & D (excl Manuf)	0.9%	9
Filtered LCEGS	11.37%		H: Transportation and storage	5.04%	10			
Cultural & Creative	10.65%	5	J: Information & Communication	4.91%	11	Full kMatrix industry groupings data		
C: Manufacturing	10.23%	3	O: Public administration and defence; compulsory social security	3.65%	12	LCEGSS	17.0%	
M: Professional, scientific and technical activities	8.16%	4	S: Other service activities	2.89%	13	BGH Coding using Full LCEGS	13.9%	
Q: Human health and social work activities	7.73%	5	I: Accommodation and food service activities	2.53%	14	LCEGS	13.6%	
P: Education	6.45%	6	R: Arts, entertainment and recreation	1.61%	15	Filtered LCEGS	11.4%	
F: Construction	6.06%	7	D: Electricity, gas, steam & air conditioning supply	1.38%	16			
Construction	6.05%	6	E: Water supply; sewerage, waste management and remediation activities	1.14%	17			
N: Administrative and support service activities	5.92%	8	A: Agriculture, Forestry & Fishing	0.10%	18			
K: Financial and insurance activities	5.72%	9	B: Mining & quarrying	0.02%	19			
H: Transportation and storage	5.04%	10						
Transport & Storage	5.04%	7						
J: Information & Communication	4.91%	11						
O: Public administration and defence; compulsory social security	3.65%	12						
S: Other service activities	2.89%	13						
Primary Industries	2.64%	8						
I: Accommodation and food service activities	2.53%	14						
R: Arts, entertainment and recreation	1.61%	15						
D: Electricity, gas, steam & air conditioning supply	1.38%	16						
E: Water supply; sewerage, waste management and remediation activities	1.14%	17						
Science and R & D (excl Manuf)	0.91%	9						

KEY	Value	Rank
<span style="background-color: #f08080; border: 1px solid black; padding: 2px;">18.4%</span>	18.4%	Largest
<span style="background-color: #f0e68c; border: 1px solid black; padding: 2px;">13.6%</span>	13.6%	2nd largest
<span style="background-color: #f0e68c; border: 1px solid black; padding: 2px;">9.4%</span>	9.4%	3rd largest
<span style="background-color: #ffff00; border: 1px solid black; padding: 2px;">3.6%</span>	3.6%	4th largest

Overall Low Carbon sector ranking tables by Employment at various levels.

Overall Low Carbon sector ranking vs. various industry grouping definitions (by % of GM Total Employment)		Rank	Broad Industry Groups (% of GM Total Employment)		Rank	New Economy Industry Groupings (% of GM Total Employment)		Rank
Public Sector	25.14%	1	G: Wholesale and retail trade; repair of motor vehicles and motorcycles	14.77%	1	Public Sector	25.14%	1
Business, financial & professional services	22.05%	2	Q: Human health and social work activities	12.75%	2	Business, financial & professional services	22.05%	2
Wholesale & Retail Trade	16.40%	3	M: Professional, scientific and technical activities	9.98%	3	Wholesale & Retail Trade	16.40%	3
G: Wholesale and retail trade; repair of motor vehicles and motorcycles	14.77%	1	N: Administrative and support service activities	9.41%	4	Cultural & Creative	13.90%	4
Cultural & Creative	13.90%	4	P: Education	8.60%	5	Manufacturing	8.89%	5
Q: Human health and social work activities	12.75%	2	C: Manufacturing	7.95%	6	Construction	5.78%	6
M: Professional, scientific and technical activities	9.98%	3	I: Accommodation and food service activities	6.08%	7	Transport & Storage	5.46%	7
N: Administrative and support service activities	9.41%	4	F: Construction	5.78%	8	Primary Industries	1.28%	8
Manufacturing	8.89%	5	H: Transportation and storage	5.46%	9	Science and R & D (excl Manuf)	1.11%	9
P: Education	8.60%	5	O: Public administration and defence; compulsory social security	3.79%	10			
C: Manufacturing	7.95%	6	K: Financial and insurance activities	3.31%	11	Full kMatrix industry groupings data		
I: Accommodation and food service activities	6.08%	7	J: Information & Communication	3.31%	12	LCEGSS	3.86%	
F: Construction	5.78%	8	S: Other service activities	2.96%	13	BGH Coding using LCEGS	3.35%	
Construction	5.78%	6	R: Arts, entertainment and recreation	2.57%	14	LCEGS	3.25%	
H: Transportation and storage	5.46%	9	L: Real estate activities	2.01%	15	S: Other service activities	2.96%	
Transport & Storage	5.46%	7	E: Water supply; sewerage, waste management and remediation activities	0.61%	16	Filtered LCEGS	2.83%	
LCEGSS	3.86%		D: Electricity, gas, steam & air conditioning supply	0.40%	17			
O: Public administration and defence; compulsory social security	3.79%	10	A: Agriculture, Forestry & Fishing	0.24%	18			
BGH Codings using LCEGS	3.35%		B: Mining & quarrying	0.02%	19			
K: Financial and insurance activities	3.31%	11						
J: Information & Communication	3.31%	12						
LCEGS	3.25%							
S: Other service activities	2.96%	13						
Filtered LCEGS	2.83%							
R: Arts, entertainment and recreation	2.57%	14						
L: Real estate activities	2.01%	15						
Primary Industries	1.28%	8						
Science and R & D (excl Manuf)	1.11%	9						
E: Water supply; sewerage, waste management and remediation activities	0.61%	16						
D: Electricity, gas, steam & air conditioning supply	0.40%	17						
A: Agriculture, Forestry & Fishing	0.24%	18						
B: Mining & quarrying	0.02%	19						

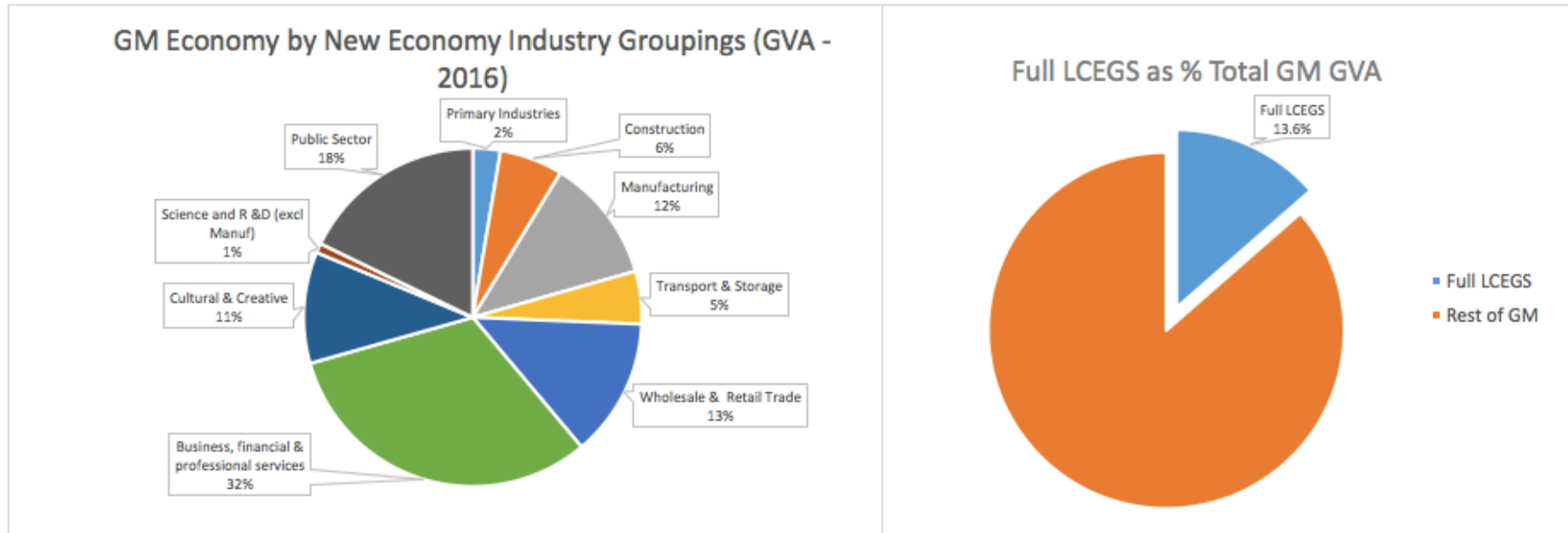
KEY	Percentage	Ranking
<span style="background-color: #c00000; color: white; padding: 2px;">18.4%</span>	18.4%	Largest
<span style="background-color: #ffc000; padding: 2px;">13.6%</span>	13.6%	2nd largest
<span style="background-color: #ffc000; padding: 2px;">9.4%</span>	9.4%	3rd largest
<span style="background-color: #ffff00; padding: 2px;">3.6%</span>	3.6%	4th largest



## Industry sub-sectors ranking and comparison – LCRE and EGSS definitions

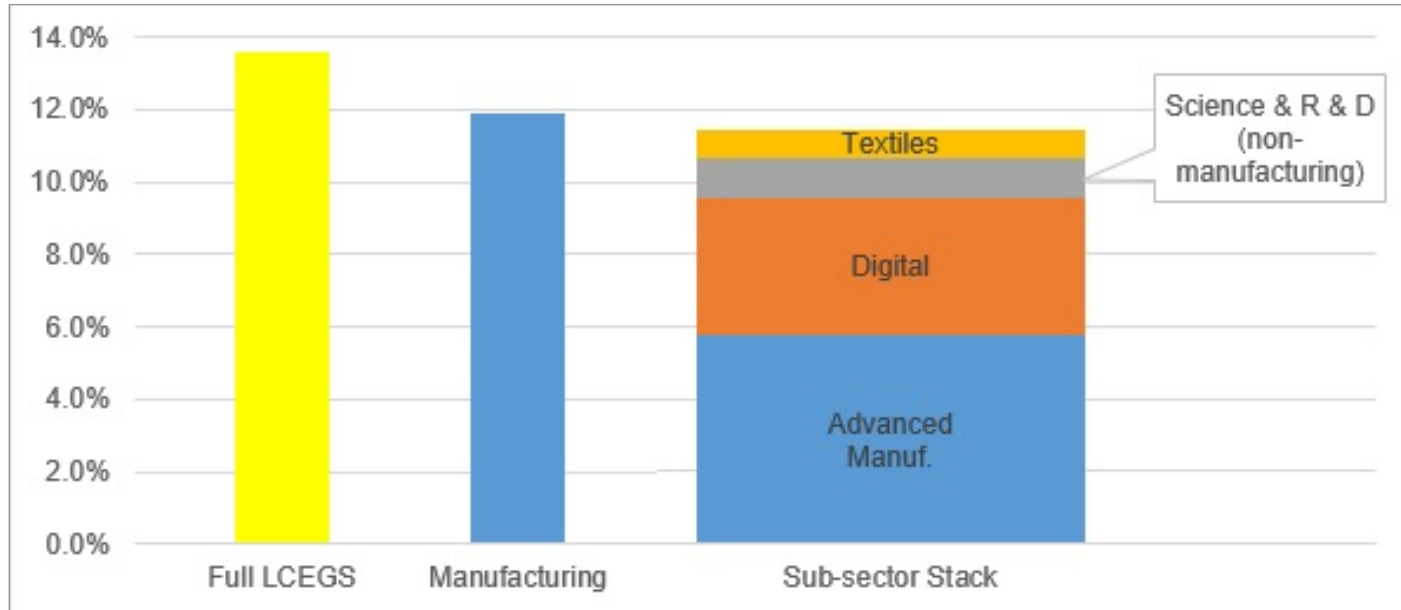
Overall ONS and Low Carbon sub-sector ranking vs. <u>Top New Economy sub-sectors</u> (% of GM Total GVA)		Rank	<u>Top New Economy Industry Sectors</u> (% of GM Total GVA)		Rank	Overall ONS and Low Carbon sub-sector ranking vs. <u>New Economy sub-sectors</u> (% of GM Total Employment)		Rank	<u>Top New Economy Industry Sectors</u> (% of GM Total Employment)		Rank
Professional Services	18.7%	1	Professional Services	18.7%	1	Health & Social Care	12.75%	1	Health & Social Care	12.75%	1
LCRE	12.40%		Health & Social Care	7.7%	2	Retail	9.25%	2	Retail	9.25%	2
Health & Social Care	7.7%	2	Education	6.4%	3	Education	8.60%	3	Education	8.60%	3
Low Carbon	7.2%		Advanced Manuf.	5.8%	4	Professional Services	8.42%	4	Professional Services	8.42%	4
Education	6.4%	3	Financial Services	5.7%	5	Business Services	7.48%	5	Business Services	7.48%	5
Advanced Manuf.	5.8%	4	Retail	5.7%	6	Tourism & Culture	7.08%	6	Tourism & Culture	7.08%	6
Financial Services	5.7%	5	Business Services	5.6%	7	Wholesale	4.14%	7	Wholesale	4.14%	7
Retail	5.7%	6	Wholesale	4.8%	8	Advanced Manuf.	3.90%	8	Advanced Manuf.	3.90%	8
Business Services	5.6%	7	Digital	3.7%	9	Public Administration	3.78%	9	Public Administration	3.78%	9
Wholesale	4.8%	8	Public Administration	3.7%	10	Financial Services	3.31%	10	Financial Services	3.31%	10
EGSS	4.58%		Other Manuf.	3.6%	11	LCRE	2.95%		Employment activities	2.84%	11
Renewable Energy	3.9%		Tourism & Culture	3.5%	12	Employment activities	2.84%	11	Other Manuf.	2.78%	12
Digital	3.7%	9	Creative Industries	2.5%	13	Other Manuf.	2.78%	12	Creative Industries	2.68%	13
Public Administration	3.7%	10	Employment activities	1.7%	14	Creative Industries	2.68%	13	Digital	2.45%	14
Other Manuf.	3.6%	11	Food & Drink Manuf.	1.7%	15	Digital	2.45%	14	Sport	1.69%	15
Tourism & Culture	3.5%	12	Personal Services	1.6%	16	Sport	1.69%	15	Personal Services	1.64%	16
Creative Industries	2.5%	13	Motor Trades	1.3%	17	Low Carbon	1.65%		Food & Drink Manuf.	1.46%	17
Environmental	2.5%		Sport	0.9%	18	Personal Services	1.64%	16	Motor Trades	1.37%	18
Employment activities	1.7%	14	Textiles	0.8%	19	Food & Drink Manuf.	1.46%	17	Textiles	0.74%	19
Food & Drink Manuf.	1.7%	15	The rest	14.6%	-	Motor Trades	1.37%	18	The rest	13.62%	-
Personal Services	1.6%	16	<b>Full LCEGS Subsectors (% GM Total GVA)</b>			Renewable Energy	1.05%		<b>Full LCEGS Subsectors (% GM Total Employment)</b>		
Motor Trades	1.3%	17	Environmental	2.5%		EGSS	0.91%		Low Carbon	1.6%	
Sport	0.9%	18	Low Carbon	7.2%		Textiles	0.74%	19	Renewable Energy	1.1%	
Textiles	0.8%	19	Renewable Energy	3.9%		Environmental	0.55%		Environmental	0.5%	
The rest	14.6%	-	<b>ONS Low Carbon sub-sectors (% GM Total GVA)</b>			The rest	13.62%	-	<b>ONS Low Carbon sub-sectors (% GM Total Employment)</b>		
			LCRE	12.4%					LCRE	2.9%	
			EGSS	4.6%					EGSS	0.9%	

## GM LCEGS comparison with New Economy industry groupings



**Note:** The LCEGS definition of the sector cuts across all the New Economy sector groupings shown on the left, therefore cannot be included in this pie chart.

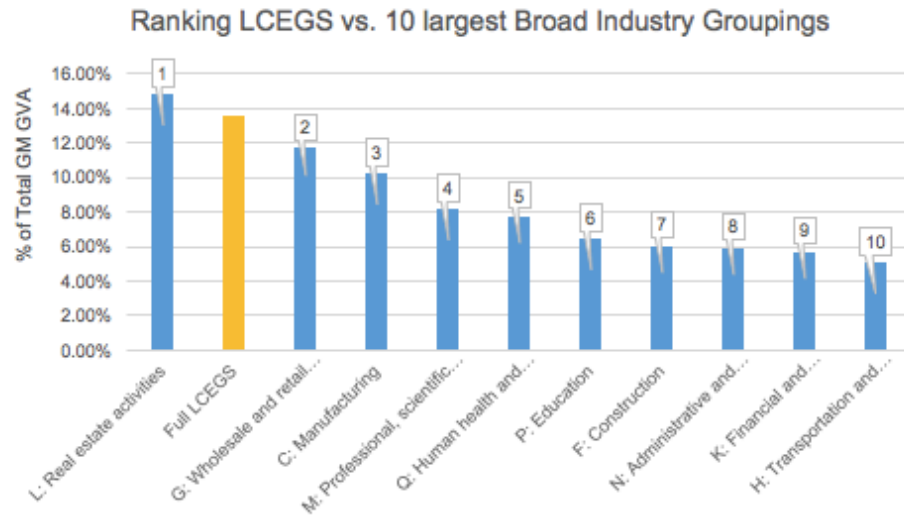
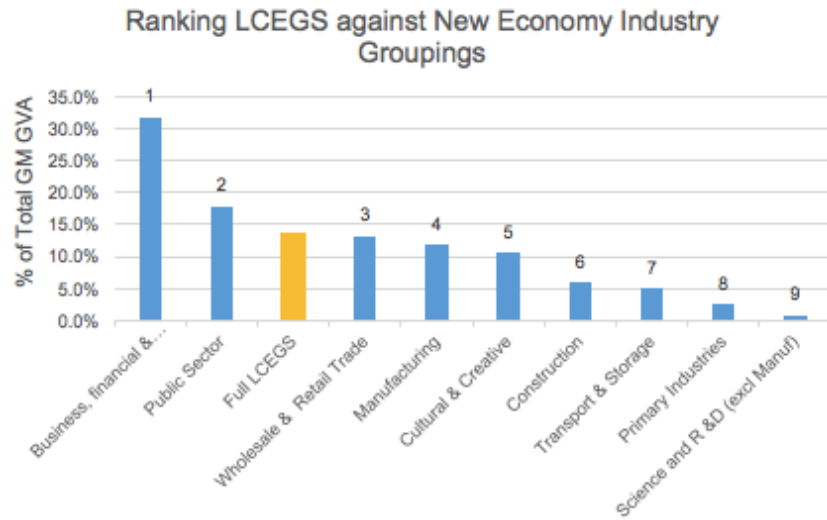
### GM LCEGS comparison with New Economy sub-sectors in aggregate



GM LCEGS is larger than the New Economy Manufacturing industry grouping (13.6 % vs. 11.9%).

GM LCEGS is larger than the New Economy sub-sectors of Advanced Manufacturing, Digital and Textiles plus the New Economy industry grouping of Science & R & D (non-manufacturing) COMBINED.

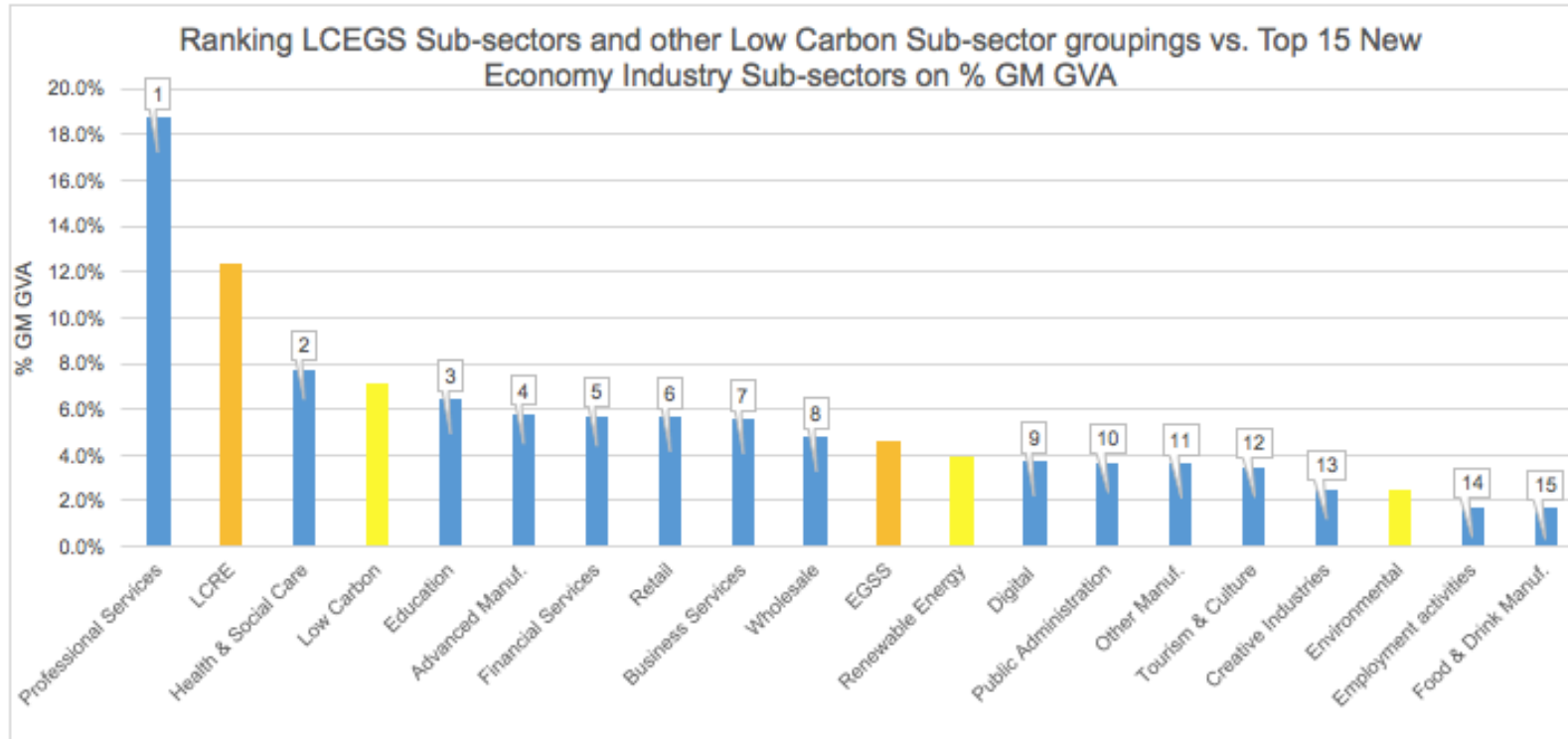
## Ranking LCEGS against New Economy and broad industry groupings (% total GM GVA)



**KEY:**

- New Economy Forecast Model industry grouping and sub-sector definitions
- kMatrix LCEGS industry grouping

## Ranking LCEGS sub-sectors and other low carbon groupings vs. Top 15 New Economy sub-sectors



**KEY:**



New Economy Forecast Model industry grouping and sub-sector definitions



Business Growth Hub Low Carbon Industry Definitions



kMatrix industry grouping and sub-sector definitions

## Diversification analysis methodology and data

LCEGS is a very diverse sector that incorporates a wide range of technologies and skills. As a growing sector, it offers opportunities for companies with the right core technologies or skills to diversify into new markets. The diversification analysis followed several stages:

1. 128 Level 3 markets within LCEGS were identified as sharing technologies, skills and know-how with the General Engineering, Manufacturing, Process Engineering and Professional Services sectors.
2. Within these four sectors 42 different technologies, industrial processes or skill set were identified as being relevant to the 128 LCEGS markets. The “fit” between the technologies etc. and the LCEGS markets was then expressed in percentage terms i.e. a high percentage equals a good fit between the industrial process and those used within the LCEGS market.
3. The next stage was to populate this market/ industry matrix with the number of relevant companies within the GM geography. It is not possible to place an exact value on the number of companies within the diversification matrix because a single company operating one or multiple industrial processes could be relevant to several LCEGS markets. This would lead to significant double counting.
4. To create a “diversification index” the percentage “fit” was then applied to the company numbers, producing a number between 0 (low diversification potential) and 0.5 (high diversification potential). This is a reasonable proxy for diversification potential in the context of this research project. Conditional formatting was then applied to the results to provide a visual colour coding of the index where Red = Low and Green = High. This provides the basis for filtering the data to produce more meaningful and usable results.
5. The result of the first data filtering reduced the LCEGS market opportunity from £160,248m down to £108,393, the number of LCEGS markets down to 68 and the number of industrial processes down to 29.
6. The second data filtering produced a matrix that matches the strongest diversification potential with the largest available UK markets for LCEGS (see table below).

In the final analysis, the LCEGS market opportunity was £82,460m (half of the original available market value), the number of LCEGS markets reduced to 28 and the number of industrial processes reduced to 17. The strongest diversification opportunities, primarily for General Engineering companies, are:

- Fabrication, Electrical, Instrumentation, Design and Project Management processes into LCEGS Renewable Energy markets for Biomass, Wind and Geothermal/Renewable Heating (market value £28,660m)
- Fabrication, Machining, Electrical, Instrumentation, Design, Civil Engineering and Project Management processes into Environmental markets for Waste Management, Water Treatment and Recovery & Recycling (market value £15,989m)
- Professional Services companies into Carbon Finance and Energy Management (market value £684m).

## Results of the second data filtering of the diversification matrix

Date	Level 2	Level 3	Gtr Manchester Total £m	UK Total £m	UK- GM £m
2015/16	Waste Management	Construction & Operation of Waste Treatment	108.40	2598.84	2490.43
2015/16	Waste Management	Equipment For Waste Treatment	86.64	2234.55	2147.91
2015/16	Water Supply and Waste Water Treatment	Water Treatment and Distribution	284.37	7048.60	6764.24
2015/16	Water Supply and Waste Water Treatment	Engineering	112.72	2640.15	2527.43
2015/16	Recovery and Recycling	Engineering & Equipment	16.56	374.48	357.93
2015/16	Recovery and Recycling	Textiles Feed Stock Processing	28.12	648.35	620.24
2015/16	Recovery and Recycling	Composting Feed Stock Processing	18.96	444.91	425.95
2015/16	Recovery and Recycling	Paper Feed Stock Processing	29.75	684.39	654.64
2015/16	Biomass	Manufacturing Of Boilers and Related System	38.64	1046.32	1007.68
2015/16	Biomass	Boilers and Related Systems	103.78	2628.60	2524.81
2015/16	Biomass	Biomass Furnace Systems	37.62	1035.80	998.19
2015/16	Biomass	Biomass Energy Systems	121.03	3404.91	3283.89
2015/16	Wind	On Shore Wind Farm Systems	130.25	3753.95	3623.70
2015/16	Wind	On Shore Large Wind Turbine	173.38	4550.69	4377.31
2015/16	Wind	Off Shore Wind Farm Systems	80.52	2090.26	2009.74
2015/16	Wind	Off Shore Large Wind Turbine	93.93	2333.26	2239.33
2015/16	Geothermal	Whole Systems Manufacture	240.84	5728.44	5487.60
2015/16	Geothermal	Manufacture and Supply of Specialist Equipen	111.36	3219.11	3107.75
2015/16	Photovoltaic	Chemicals	9.14	228.00	218.86
2015/16	Alternative Fuels	Other Bio Fuels	797.02	17997.00	17199.99
2015/16	Alternative Fuel Vehicle	Alternative Fuels (main Stream) for Vehicles	655.91	15761.37	15105.46
2015/16	Nuclear Power	Commissioning Engineering Services	23.05	538.93	515.88
2015/16	Nuclear Power	Nuclear Safety Engineering Services	41.98	913.25	871.27
2015/16	Nuclear Power	Nuclear Power Plant Operations	68.69	1776.69	1708.00
2015/16	Nuclear Power	Manufacture of Cooling Equipment for the N	21.72	516.81	495.08
2015/16	Carbon Finance	Carbon Credits Journals and Press Periodicals	15.51	339.19	323.69
2015/16	Energy Management	Energy Saving Lighting Equipment	44.76	1087.21	1042.45
2015/16	Energy Management	Consulting, Education & Training	13.74	373.86	360.11
					82489.55

Engineering % of company stock																
Fabrication Services	Machining & CNC Services	Electrical Installation Services	Instrumentation & Control Providers	Engineering Design Services	Software Houses	Materials Handling Engineers	Plumbing Services	Monitoring Services	Civil Engineers	Engineering Project Management	Process Engineers	Rollery Moulders	Electric Motor Manufacturers	Composite Materials Manufacturers	Professional Services Financial	Professional Services Business Consultancy
0.2	0.2	0.1	0.2	0.3	0.0	0.1	0.0	0.0	0.2	0.2	0.0	0.0	0.0	0.0	0.0	0.0
0.3	0.1	0.1	0.1	0.2	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0
0.3	0.0	0.1	0.1	0.2	0.0	0.0	0.0	0.2	0.2	0.2	0.0	0.1	0.0	0.0	0.0	0.0
0.0	0.0	0.2	0.1	0.0	0.0	0.1	0.2	0.0	0.1	0.2	0.0	0.0	0.1	0.0	0.0	0.0
0.3	0.2	0.1	0.0	0.4	0.1	0.1	0.2	0.0	0.0	0.1	0.1	0.0	0.1	0.0	0.1	0.0
0.2	0.0	0.3	0.2	0.1	0.0	0.1	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0
0.1	0.0	0.1	0.1	0.2	0.0	0.2	0.0	0.0	0.0	0.2	0.0	0.0	0.0	0.0	0.0	0.0
0.4	0.0	0.2	0.2	0.1	0.0	0.1	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0
0.2	0.4	0.2	0.1	0.5	0.0	0.0	0.1	0.0	0.0	0.2	0.0	0.1	0.0	0.0	0.0	0.0
0.2	0.1	0.1	0.1	0.1	0.0	0.0	0.2	0.0	0.0	0.3	0.0	0.0	0.0	0.0	0.0	0.0
0.2	0.2	0.2	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.2	0.0	0.0	0.0	0.0	0.0	0.0
0.1	0.3	0.3	0.1	0.2	0.0	0.0	0.3	0.0	0.0	0.3	0.0	0.0	0.0	0.0	0.0	0.0
0.1	0.1	0.0	0.3	0.2	0.0	0.0	0.0	0.0	0.0	0.3	0.0	0.0	0.0	0.0	0.0	0.0
0.1	0.1	0.1	0.1	0.4	0.1	0.0	0.0	0.1	0.2	0.1	0.0	0.0	0.0	0.1	0.0	0.0
0.2	0.1	0.1	0.1	0.2	0.0	0.0	0.0	0.0	0.0	0.2	0.0	0.0	0.1	0.1	0.0	0.0
0.1	0.0	0.2	0.1	0.3	0.0	0.0	0.0	0.0	0.0	0.2	0.0	0.0	0.1	0.0	0.0	0.0
0.0	0.0	0.2	0.3	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.1	0.0	0.0	0.0	0.0
0.0	0.0	0.2	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.1	0.0	0.0	0.2	0.1	0.0	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0
0.2	0.4	0.2	0.3	0.3	0.2	0.0	0.2	0.1	0.0	0.2	0.2	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.1	0.1	0.0	0.2	0.0	0.0	0.2	0.0	0.1	0.1	0.0	0.0	0.0	0.0	0.0
0.1	0.1	0.4	0.1	0.3	0.0	0.0	0.1	0.0	0.0	0.3	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.3	0.0
0.0	0.0	0.0	0.2	0.0	0.0	0.0	0.0	0.1	0.0	0.1	0.0	0.1	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2

# Appendix 2: Research

## Methodology and findings

The aim of the research was to identify and assess the threats and trends impacting the future growth of GM’s Low Carbon sector. Gyron used a combination of desk research and interviews with key stakeholders to achieve a high level but robust evidence base to identify the most significant threats and trends impacting the potential of the sector. The table below summarises the scope of research and sources of information consulted, which includes local and national strategies and engagement with key stakeholders.

**Scope and sources of research**

Theme	Scope of research	Research sources
Regulation & Policy	<b>Upcoming legislation and direction of travel for the major policy areas impacting the sector:</b> this research focused on developments at the local and national level.	<ul style="list-style-type: none"> <li>• Defra – UK Draft Air Quality Plan (2017)</li> <li>• BEIS – Building our Industrial Strategy Green Paper (2017)</li> <li>• ARUP – UK Legislation Timeline for Energy (updated 2017)</li> <li>• Committee on Climate Change - Meeting Carbon Budgets: Implications of Brexit for UK climate policy (2016)</li> <li>• Greater Manchester Sustainable Urban Development Strategy (2014-2020)</li> <li>• Climate Change and Low Emission Strategies’: Whole Place Implementation Plan for Greater Manchester (2016-2020)</li> <li>• Greater Manchester Spatial Energy Plan: Evidence Base Study (2017)</li> <li>• Stakeholder engagement:               <ul style="list-style-type: none"> <li>○ Business Growth Hub - Low Carbon Sector Team</li> <li>○ Department for Business, Energy and Industrial Strategy (BEIS)</li> <li>○ Greater Manchester Combined Authority</li> <li>○ Electricity North West</li> <li>○ Energy Technologies Institute</li> <li>○ Wheeldon Brothers Limited</li> </ul> </li> </ul>
Technology	<b>The latest technology developments and where R&amp;D and innovation finance is being invested:</b> this research focused on public-funded R&D and innovation in the UK.	<ul style="list-style-type: none"> <li>• Innovate UK Delivery Plan (2016-2017)</li> <li>• Catapult programme – Offshore Renewable Energy (ORE), Energy Systems, Future Cities etc.</li> <li>• Central Government</li> <li>• Ofgem</li> <li>• Stakeholder engagement:               <ul style="list-style-type: none"> <li>○ Electricity North West</li> <li>○ Energy Technologies Institute</li> <li>○ The University of Manchester</li> </ul> </li> </ul>
GM Activities	<b>Specific activities in GM that may impact the sector:</b> this research focused on the project pipeline.	<ul style="list-style-type: none"> <li>• Stakeholder engagement:               <ul style="list-style-type: none"> <li>○ Business Growth Hub - Low Carbon Sector Team</li> <li>○ Electricity North West</li> <li>○ Greater Manchester Combined Authority</li> <li>○ Wheeldon Brothers Limited</li> </ul> </li> </ul>



To enable an assessment of the parts of the sector these developments will impact the most, any significant developments and major policy areas identified were organised by Low Carbon sub-sector (using the Business Growth Hub sector definition – see Appendix 1). This approach was less straight forward when assessing the impact of technology developments, since there has been a general shift from a sector focus to a technology focus in R&D and innovation investments in the UK, particularly with regard to Innovate UK funding. None the less, the overall assessment concluded that four sub-sectors will be impacted the most by all types of development: Renewable and Low Carbon Energy, Energy Efficiency, Low Emission Vehicles and Infrastructure and Smart Grids. These assessments have been summarised in the tables below.

Threats and trends were identified for other sub-sectors, for example the current focus on air quality might increase demand for services in the Energy Monitoring and Management sub-sector in the future. There was a lack of information about threats and trends impacting the Waste Management, Recovery and Recycling sub-sector in the information sources consulted, for example there has been a shift in national policy away from this sub-sector in recent years.

### Threats and trends impacting four Low Carbon sub-sectors

#### Energy Efficiency sub-sector

Green - positive impact Amber - could be positive or negative Red - negative impact

Development	Impact on sector
<b>Policy and Legislation</b>	
GMs collective carbon emissions to be reduced by 48% between 1990 and 2020 - Energy efficiency and renewable generation to provide over 50% of the potential opportunity required to meet the target	
National Industrial Strategy - emphasis on reducing the cost of energy to business and greater energy efficiency.	
From 1st Apr 2018, no new tenancies to be granted for properties with EPC rating F or below, unless all relevant energy efficiency improvements have been made.	
4th and 5th Carbon Budgets - Improving business energy efficiency will be essential if the Government is to meet the Carbon Budgets in a cost effective way.	
BREXIT - uncertainty about the outcome of the Great Repeal Bill on legislation relating to the sector and future policy commitments impacting the sector.	
<b>Technology</b>	
Government has committed up to £9.2 million for an Industrial Energy Efficiency Accelerator, which will seek industry-specific solutions which are close to commercialisation by leveraging private sector investment and strengthening UK supply chains to reduce energy costs for UK industry.	
<b>GM Activities</b>	
By 2035 GM is forecast to have 233,000 new homes (an increase of 17 %) and 6.6 million m2 of additional commercial and industrial floor space (an increase of 22 %). Without intervention, this will result in an increasing demand on the local energy system and poses a significant additional challenge to meeting GM decarbonisation targets.	
Innovation and demonstration programmes e.g. Triangulum and CityVerve Smart City projects.	
Sustainable Urban Development Plan ESIF funding commitment - 2 strands will be funded by ESIF (£18m) under this plan: 1.) Develop GM's whole place low carbon infrastructure to deliver resilient/well adapted places to support the low carbon transition, including energy & waste to energy infrastructure and investment in GM's strategic transport network/systems; 2.) Develop and demonstrate whole building energy efficiency/low carbon energy generation based on the strengths of Greater Manchester's research institutions in development of power and smart metering systems, energy management and low carbon sustainability.	

Renewable and Low Carbon Energy sub-sector

Green - positive impact Amber - could be positive or negative Red - negative impact

Development	Impact on sector
<b>Policy and Legislation</b>	
Greater Manchester's collective carbon emissions to be reduced by 48% between 1990 and 2020 - Energy efficiency and renewable generation to provide over 50% of the potential opportunity required to meet the target	
National Industrial Strategy - support for affordable, clean energy including finding ways to further reduce the cost of offshore wind, exploring potential for hydrogen fuel technologies across heating, energy storage, nuclear new build and nuclear skills.	
Changes to FIT, RHI, Renewables Obligation and Contracts for Difference from April 2017.	
BREXIT - uncertainty in relation to the outcome of the Great Repeal Bill on legislation relating to the sector and future policy commitments impacting the sector.	
<b>Technology</b>	
Investment by Innovate UK in innovative infrastructure systems e.g. flexibility and resilience in energy networks, in 2016-17 was £150m (27% of total budget) including establishing Energy Systems Catapult and continuing to invest in Offshore Renewable Energy Catapult.	
Investment by Innovate UK in emerging and enabling technologies e.g. robotics and autonomous systems for extreme environments associated with nuclear power, in 2016-17 was £86m (15% of total budget).	
Investment by Innovate UK in advanced manufacturing and materials e.g. light-weighting to achieve cost reduction in offshore wind, in 2016-17 was £137m (24% of total budget).	
UK hydrogen for heat demonstration - government have committed £25 million to explore the potential use of hydrogen gas for heating UK homes and businesses. This programme will run from 2017 to 2020 and aims to define a hydrogen quality standard, and to develop and trial domestic and commercial hydrogen appliances.	
Over £20 million committed by government to support innovation in the civil nuclear sector from 2016-18.	
<b>GM Activities</b>	
By 2035 GM is forecast to have 233,000 new homes (an increase of 17 %) and 6.6 million m2 of additional commercial and industrial floor space (an increase of 22 %). Without intervention, this will result in an increasing demand on the local energy system and poses a significant additional challenge to meeting GM decarbonisation targets.	
Innovation and demonstration programmes e.g. Manchester Fuel Cell Innovation Centre will provide R&D facilities for SMEs and start-ups to produce advanced materials for fuel cells and next generation energy storage, and the Triangulum and CityVerve Smart City projects.	
21 district heat network projects planned across the city region at various stages of development - 8 techno-economic feasibility studies; 6 masterplanning studies; 4 close to development; 2 early investigation. Largely based on fossil-fule solutions e.g. natural gas, high efficiency and low emission CHP units. It is felt that these will generate limited opportunities for the local SME supply chain but maybe opportunities for larger consulting engineering firms.	
The District Energy Procurement Agency (DEPA) is a proposed municipal not-for-profit procurement cooperative specialising in goods and services in the district energy market. It is modelled on and is being developed in collaboration with VÄRMEK, a similar existing organisation in Sweden. DEPA will conduct two activities: 1) Procure OJEU compliant frameworks of relevant goods and services; 2) Manage procurements on behalf of members. Manchester City Council has received a grant from DBEIS for the initial activity in establishing DEPA.	
Sustainable Urban Development Plan ESIF funding commitment - 2 strands will be funded by ESIF (£18m) under this plan: 1.) Develop GM's whole place low carbon infrastructure to deliver resilient/well adapted places to support the low carbon transition, including energy & waste to energy infrastructure and investment in GM's strategic transport network/systems; 2.) Develop and demonstrate whole building energy efficiency/low carbon energy generation based on the strengths of Greater Manchester's research institutions in development of power and smart metering systems, energy management and low carbon sustainability.	
Plans to progress solar roof installations across GM, particularly on Birley Fields and with MMU and UoM estates as part of Triangulum project.	

### Low Emission Vehicles and Infrastructure sub-sector

Green - positive impact Amber - could be positive or negative Red - negative impact

Development	Impact on sector
<b>Policy and Legislation</b>	
Transport for Greater Manchester priorities and commitments e.g. reducing emissions from heavy goods vehicles, increasing alternative fuel and fueling infrastructure network, specifying low emission vehicles and clean air zones.	
National Industrial Strategy - commitments to transport infrastructure upgrades e.g. hydrogen refuelling, 'sector deal' for ultra low emission vehicles sector (£600m), roll-out of public charging points for electric vehicles, etc.	
Air Quality Plan (consultation) - e.g. proposals for Real Driving Emissions (RDE) tests by vehicle manufacturers, requiring innovative technologies to bring forward new, cleaner vehicles to lower NOx emissions; regulatory changes to support the take up of alternatively fuelled light commercial vehicles (vans).	
BREXIT - uncertainty in relation to the outcome of the Great Repeal Bill on legislation relating to the sector and future policy commitments impacting the sector.	
<b>Technology</b>	
Investment by Innovate UK in innovative infrastructure systems e.g. smarter, greener and more efficient transport systems, in 2016-17 was £150m (27% of total budget) including continuing to invest in Transport Systems Catapult and Future Cities Catapult.	
£109.7 million of government funding, alongside significant funding from industry, to help develop the next generation of driverless and low carbon vehicles.	
<b>GM Activities</b>	
Innovation and demonstration programmes e.g. Manchester Fuel Cell Innovation Centre will provide R&D facilities for SMEs and start-ups to produce advanced materials for fuel cells and next generation energy storage, and the Triangulum and CityVerve Smart City projects.	
Sustainable Urban Development Plan ESIF funding commitment - 2 strands will be funded by ESIF (£18m) under this plan: 1.) Develop GM's whole place low carbon infrastructure to deliver resilient/well adapted places to support the low carbon transition, including energy & waste to energy infrastructure and investment in GM's strategic transport network/systems; 2.) Develop and demonstrate whole building energy efficiency/low carbon energy generation based on the strengths of Greater Manchester's research institutions in development of power and smart metering systems, energy management and low carbon sustainability.	

### Smart Grids sub-sector

Green - positive impact Amber - could be positive or negative Red - negative impact

Development	Impact on sector
<b>Policy and Legislation</b>	
Government is requiring energy suppliers to offer interactive smart meters to every household and small business site in Great Britain by the end of 2020 but take-up of smart meters is optional.	
National industrial Strategy - addressing the challenges the low carbon transition will create for energy networks by taking steps to ensure the UK is one of the most advanced economies for mainstream Smart Grids.	
BREXIT - uncertainty in relation to the outcome of the Great Repeal Bill on legislation relating to the sector and future policy commitments impacting the sector.	
<b>Technology</b>	
Investment by Innovate UK in emerging and enabling technologies e.g. use of sensors and internet of things in Smart Grids, in 2016-17 was £86m (15% of total budget).	
<b>GM Activities</b>	
Innovation and demonstration programmes e.g. Triangulum and CityVerve Smart City projects.	
Sustainable Urban Development Plan ESIF funding commitment - 2 strands will be funded by ESIF (£18m) under this plan: 1.) Develop GM's whole place low carbon infrastructure to deliver resilient/well adapted places to support the low carbon transition, including energy & waste to energy infrastructure and investment in GM's strategic transport network/systems; 2.) Develop and demonstrate whole building energy efficiency/low carbon energy generation based on the strengths of Greater Manchester's research institutions in development of power and smart metering systems, energy management and low carbon sustainability.	



Call 0161 359 3050  
Email. [bgh@growthco.uk](mailto:bgh@growthco.uk)

**GC Business Growth Hub**, Lee House,  
90 Great Bridgewater Street, Manchester, M1 5JW



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