London's Low Carbon Market Snapshot

Low Carbon Environmental Goods and Services (LCEGS)

Update for Financial Years
2021/22 & 2022/23

March 2024

kMatrix Data Services Ltd

Disclaimer

kMatrix

This information is provided to help the client identify opportunities in current and future Low Carbon Environmental Goods and Services (LCEGS) markets.

It does not constitute advice to the client as to what they should do, when, where or with whom.

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Executive Summary

London's Low Carbon and Environmental Goods and Services (LCEGS) sector was worth £50.0bn to London's economy in 2022/23, as indicated by the value of sales in the sector. These sales were generated by over 18,200 businesses that employed over 310,000 people in the sector in 2022/23.

Sales and growth

The Low Carbon and Environmental Goods and Services sector in London grew year on year between 2007/08 and 2019/20, and was worth £50.0bn in 2019/20, it then contracted to £42.9bn in 2020/21 during the Covid 19 pandemic and has since recovered to £50.0bn in 2022/23.

Historically, London's LCEGS sector has a higher growth rate than the UK:

Timeframe	London growth	UK growth
2007/08 to 2019/20	138%	120%
2019/20 to 2020/21	-14.1%	-9.0%
2020/21 to 2021/22	6.7%	5.8%
2021/22 to 2022/23	9.2%	8.6%

Employment

Employment in London's Low Carbon and Environmental Goods and Services sector in 2019/20 was 302,021, and fell to 269,714 in 2020/21, before growing to exceed pre-pandemic employment to 311,420 in 2022/23.

The annual growth rate in employment was 11.5% between 2018/19 and 2019/20; -10.7% between 2019/20 and 2020/21; 6.7% from 2020/21 to 2021/22; and 8.2% from 2021/22 to 2022/23. This rate of growth was stronger than the UK average of 7.3% between 2018/19 and 2019/20; and -13.1% between 2019/20 and 2020/21. London growth was stronger than the UK of 5.2% from 2020/21 to 2021/22; and slower than the UK growth of 10.4% from 2021/22 to 2022/23.

Companies

The number of companies in London's Low Carbon and Environmental Goods and Services sector in 2019/20 was 17,054 and fell to 16,376 in 2020/21, it then grew to 18,266 in 2022/23.

The annual growth rate in the number of companies was 11.0% between 2018/19 and 2019/20, and -4.0% between 2019/20 and 2020/21. This rate of growth was stronger than the UK of 10.3% between 2018/19 and 2019/20 and -13.3% between 2019/20 and 2020/21. London's growth was 7.0% between 2022/21 and 2021/22, stronger than the UK of 5.2% between 2022/21 and 2021/22; London's growth was 4.3% between 2021/22 and 2022/23, weaker than the UK at 9.5% between 2021/22 and 2022/23.

London's sub-sectors

In 2022/23 London's Low Carbon and Environmental Goods and Services sector was made up of the following proportions: Low Carbon 60%, Renewable Energy 30% and Environmental 10%. This is similar to the composition in 2019/20 and 2020/21 when it was: Low Carbon 58%, Renewable Energy 31% and Environmental 11%.

London's sub-sector strengths

In 2022/23 the five largest sub-sectors in the Low Carbon and Environmental Goods and Services sector by sales account for 73% of the London total sales (71% in 2019/20 and 2020/21) and are made up of:

- Carbon Finance (£18.89bn in 2022/23; £17.79bn in 2019/20; and £15.44bn in 2020/21) - this includes Carbon finance trading houses and consultancies
- Wind (£5.29bn in 2022/23; £5.27bn in 2019/20 and £4.48bn in 2020/21) – this includes control systems development and manufacture, drive train development, manufacture and systems integration and consulting houses
- Geothermal (£4.82bn in 2022/23; £4.91bn in 2019/20 and £4.25bn in 2020/21) – this includes head office functions, systems and design and international consultancy
- Building Technologies (£3.77bn in 2022/23; £3.92bn in 2019/20 and £3.27bn in 2020/21) – this includes head office functions, building systems design and consultancy and building systems providers and installers
- Alternative Fuels (£3.55bn in 2022/23; £3.70bn in 2019/20 and £3.13bn in 2020/21) – this includes R&D functions, alternative fuel providers and process implementation accounting.

The next six largest sub-sectors by sales account for a further 23% of London's total sales in (26% in 2019/20 and 24% in 2020/21) and are made up of:

- Photovoltaic (£2.88bn in 2022/23; £2.92bn in 2019/20 and £2.49bn in 2020/21) – this includes head office functions and providers and installers
- Alternative Fuel Vehicle (£2.18bn in 2022/23; £2.22bn in 2019/20 and £1.93bn in 2020/21) – this includes head office functions, prototype applications and vehicle sales
- Biomass (£1.88bn in 2022/23; £1.97bn in 2019/20) – this includes systems development and implementation and R&D
- Water Supply and Waste Water Treatment (£1.68bn in 2022/23; £1.85bn in 2019/20 and £1.61bn in 2020/21) – this includes systems implementation, maintenance and development
- Waste Management (£1.54bn in 2022/23; £1.68bn in 2019/20 and £1.43bn in 2020/21) – this includes process development and new process implementation and consulting
- Recovery and Recycling (£1.31bn in 2022/23; £1.39bn in 2019/20 and £1.21bn in 2020/21) – this includes waste collection, glass stock processing and paper feedstock processing

Sub-sector growth

London's five largest sub-sectors have all enjoyed high levels of growth in sales, number of employees and number of companies between 2020/21 and 2022/23:

- Carbon Finance – sales grew 22%; number of employees grew 15%; and number of companies grew 23%.
- Wind – sales grew 18%; number of employees grew 12%; and number of companies grew 18%.
- Geothermal – sales grew 14%; number of employees grew 10%; and number of companies grew 14%.
- Building Technologies – sales grew 15%; number of employees grew 11%; and number of companies grew 15%.
- Alternative Fuels – sales grew 14%; number of employees grew 11%; and number of companies grew 14%.

London's Exports

The value of exports in London's Low Carbon and Environmental Goods and Services sector in 2019/20 was £3.4bn, they fell to £2.8bn in 2020/21 and have recovered to £3.5bn in 2022/23. This accounted for 22% of the UK's LCEGS exports in 2022/23, slightly higher than London's 21% share of the overall UK LCEGS market (London's share of the market was 22% in 2019/20).

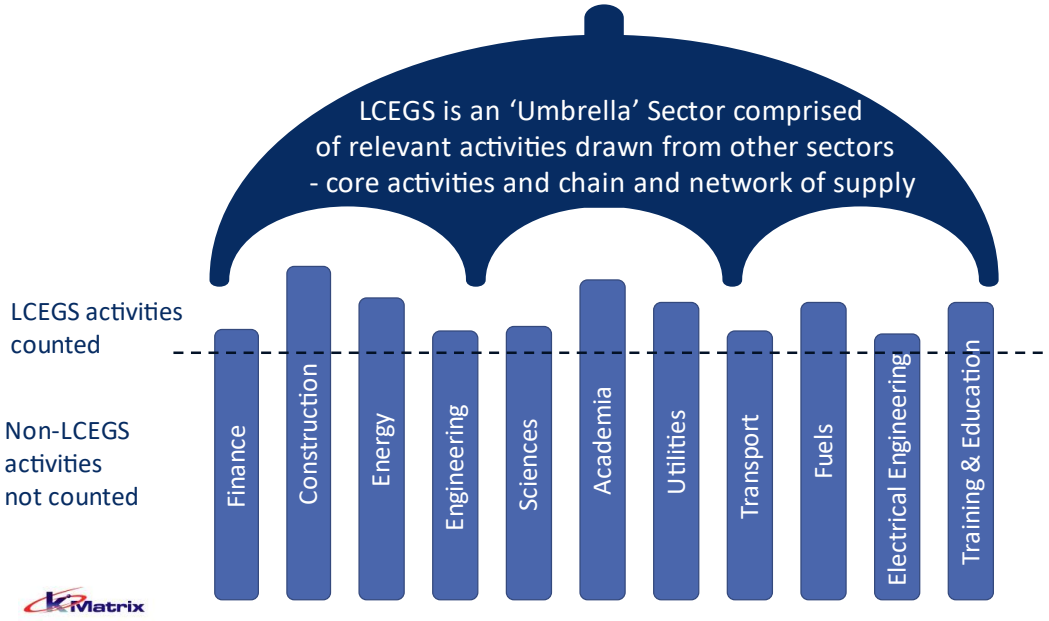
London experienced greater contraction in LCEGS exports between 2019/20 and 2020/21 of -15.6%, compared to the UK average of -6.4%. London's export market grew 7.8% between 2020/21 and 2021/22 and 13.7% between 2021/22 and 2022/23. This growth was stronger than the UK which grew 5.8% between 2020/21 and 2021/22 and 8.0% between 2021/22 and 2022/23.

Introduction to the Low Carbon and Environmental Goods and Services Sector

This section includes a summary definition of the Low Carbon Environmental Goods and Services sector, followed by a detailed description of the dataset that sits behind the data analysis and detail regarding the types of activities measured.

Summary Sector Definition

The Low Carbon Environmental Goods and Services sector comprises products and services from across the economy, which actively enable a shift towards a green economy. The LCEGS sector is considered an 'umbrella' or horizontal sector, crossing many other traditional sectors, counting products and services from those sectors which can reduce carbon emissions and improve the environment:



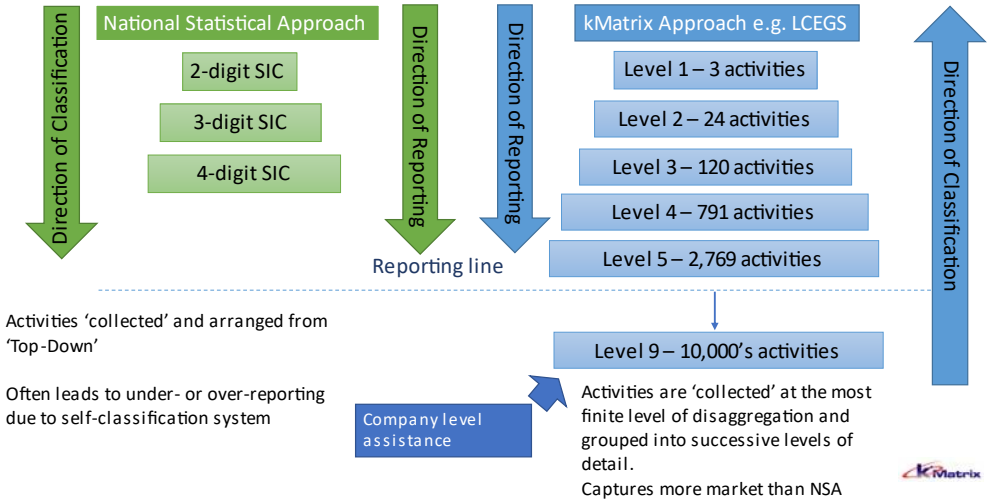
The sector is comprised of both core elements and those in the chain and network of supply, without whom the sector could not function.

Brief Methodology

kMatrix uses a unique data triangulation methodology, developed with Professor R. Jaikumar of Harvard University over 35 years ago.

The process was originally developed to look at individual companies, providing evidenced data for development. As such, sectors are classified from the 'bottom up', collecting activities from the most finite level of granulation and grouping them into successive levels of detail.

Example of bottom-up approach to classification – LCEGS Taxonomy



This is quite different to the National Statistical Approach, which classifies from the 'top down', with a company choosing their 2-digit code, then successive codes down through the classification system. The SIC system is very good as a national accounting system, but it struggles with hard to measure sectors such LCEGS. Here, the kMatrix system of data collection, which triangulates transactional data from many sources, up to 70,000 for this study, provides the flexibility of a definition tailored to the sector being studied. Although the sector is classified from the bottom up, the sector taxonomy is reported from the sector level down, through a series of levels of complexity.

This process has measured the LCEGS sector for the Greater London Authority and the UK for over a decade. kMatrix also collaborate with academic colleagues in several fields, co-authoring academic papers, which are peer-reviewed and published in academic journals including Nature, Climate Services and the Lancet.

Example sectors the process has been applied to, where evidence is available in the public domain via clients publishing reports or published peer-reviewed academic journals include:

- Cyber Security
- Low carbon environmental goods and services sector (London)
- Low carbon environmental goods and services sector (EM3)
- Low carbon environmental goods and services sector (Hertfordshire)
- Low carbon environmental goods and services sector (Midlands Net Zero Hub)
- The green Economy (Geo)
- The green economy (Nature)
- Adaptation economy (Nature)
- Carbon Finance (Nature)
- Weather and Climate (Science Advances)
- Climate Services (Climate Services)

The LCEGS Dataset

This report presents data for the fiscal years 2020/21, 2021/22 and 2022/23. It provides an update to the existing datasets that have been produced for London's Low Carbon and Environmental Goods and Services (LCEGS) sector in previous analyses covering the fiscal years 2007/08 through to 2020/21. This has allowed a multi-year dataset to be created that provides real insight into how the sector has developed since 2007/08.

The data used in this report is based upon the work and methodology used by kMatrix to provide datasets on the UK's Low Carbon Environmental Goods and Services (LCEGS) sector for UK Government reported annually by the Department for Business, Innovation and Skills (BIS) from 2008/09 to 2011/12 and further reported every 3 years for the UK and London by the Greater London Authority to 2017/18, representing a continuous annual timeseries of the LCEGS sector for over a decade.

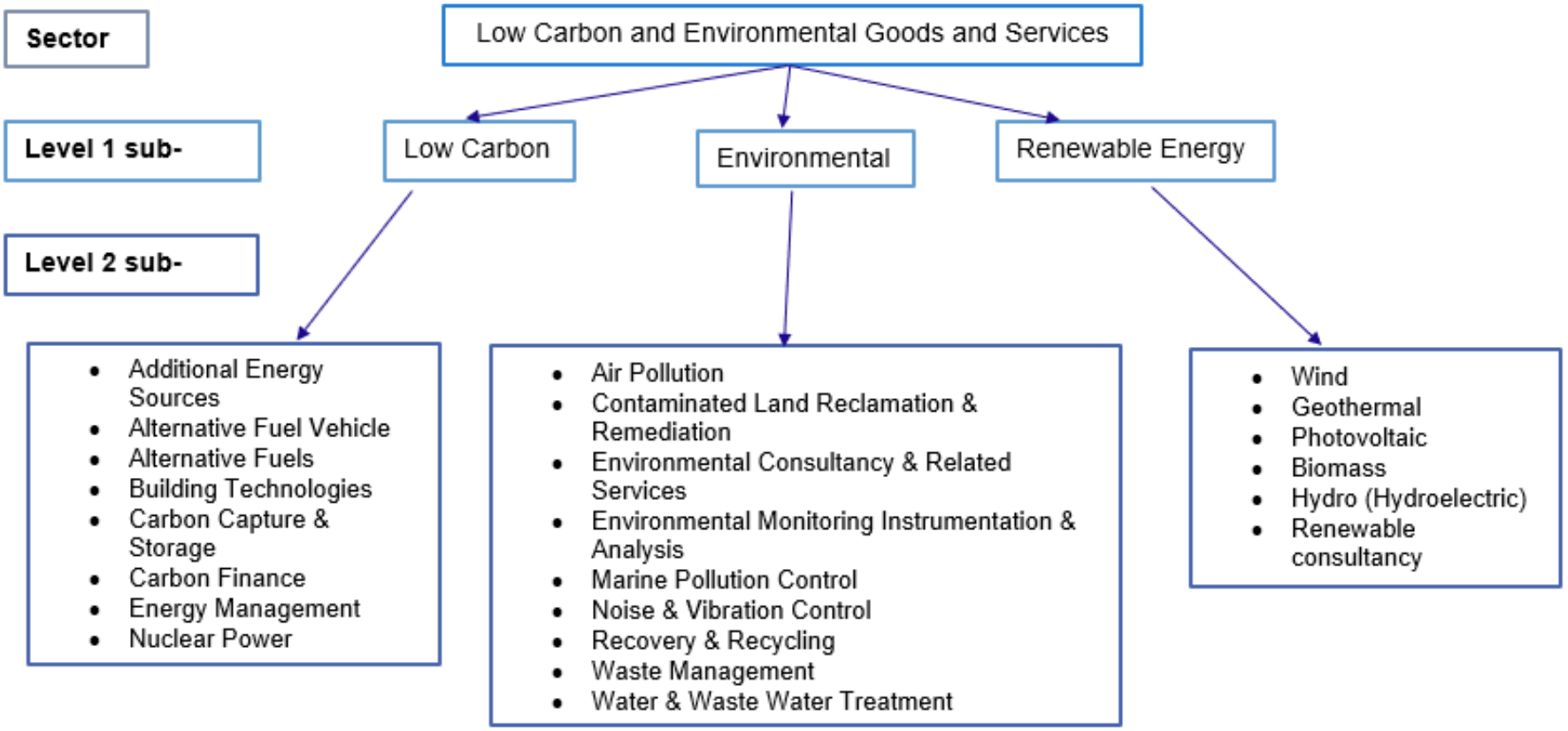
The LCEGS sector has been defined using 24 sub-sectors (or Level 2 markets) grouped into three broad categories (or Level 1 markets) - Environmental, Renewable Energy and Low Carbon. The addition of the Renewable Energy and Low Carbon groupings illustrates the evolution of the current LCEGS sector definition from its original Environmental roots and reflects developments in the market as sectors across the economy evolve to address the environmental challenges that they and the world is facing.

From 2017, the amended EU Regulation 691/2011 required that each Member State provides data compliant with the Eurostat definition of Environmental Goods and Services. It covers the output, employment, exports and value added generated in the production of goods and services that are used to measure, prevent, limit, minimise and correct environmental damage and manage natural resources in a sustainable way. The Office of National Statistics produced their 2015 Environmental Goods and Services Report in response to this update in the EU Regulation and they continue to evolve the methodology they have developed for producing this national level dataset.

The dataset measures the core activities of the sector along with those in the supply chain, without whom the LCEGS sector could not operate. For example, the Wind sector includes those companies which develop the systems integration software enabling the power generated though turbines to be integrated into the National Grid, but it also includes those companies installing and maintaining the system integration software itself. Another example would be the collection of household waste, where the collection, processing and recycling of the waste is included, along with those companies who design, manufacture and supply the waste collection equipment itself.

The time series provides 13 years of sales, companies and employment data and 12 years of growth rates for the LCEGS sector as a whole. The data is then broken down into three, Level 1 sub-sectors (Low Carbon, Environmental and Renewable Energy) and then those three sub-sectors are split into further Level 2 sub-sectors to provide greater resolution and insights for analysing the data.

The kMatrix methodology is based around the production of a taxonomy, similar to that used for biological taxonomic ranking, with similar products and services being grouped together. As an illustration (provided below), the LCEGS sector is broken down into three Level 1 sub-sectors, one of which is Renewable Energy, which is in turn broken down into seven Level 2 sub-sectors, one of which is Wind that is then broken down into a further three Level 3 sub-sectors and so on:



Although the taxonomy is reported and organised 'top down' as it goes from the sector to Level 1, to Level 2 etc., the data is gathered and organised from the 'bottom up'. The data is collected at the most finite disaggregation and then 'rolled up' to form the different levels. The current LCEGS sector definition, used in this report, includes 2,800 product and service activities at level 5 that are derived from sector supply chain activities (componentry & assemblies) and value chain activities (R&D, Supply & Training).

A glossary of economic activities included for each sub-sector of LCEGS is included as Appendix 1, a brief explanation of the LCEGS methodology as Appendix 2 and then a high-level comparison of data and methodologies between the Office of National Statistics (ONS) Environmental Goods and Services sector and LCEGS is presented in Appendix 3.

What is actually measured?

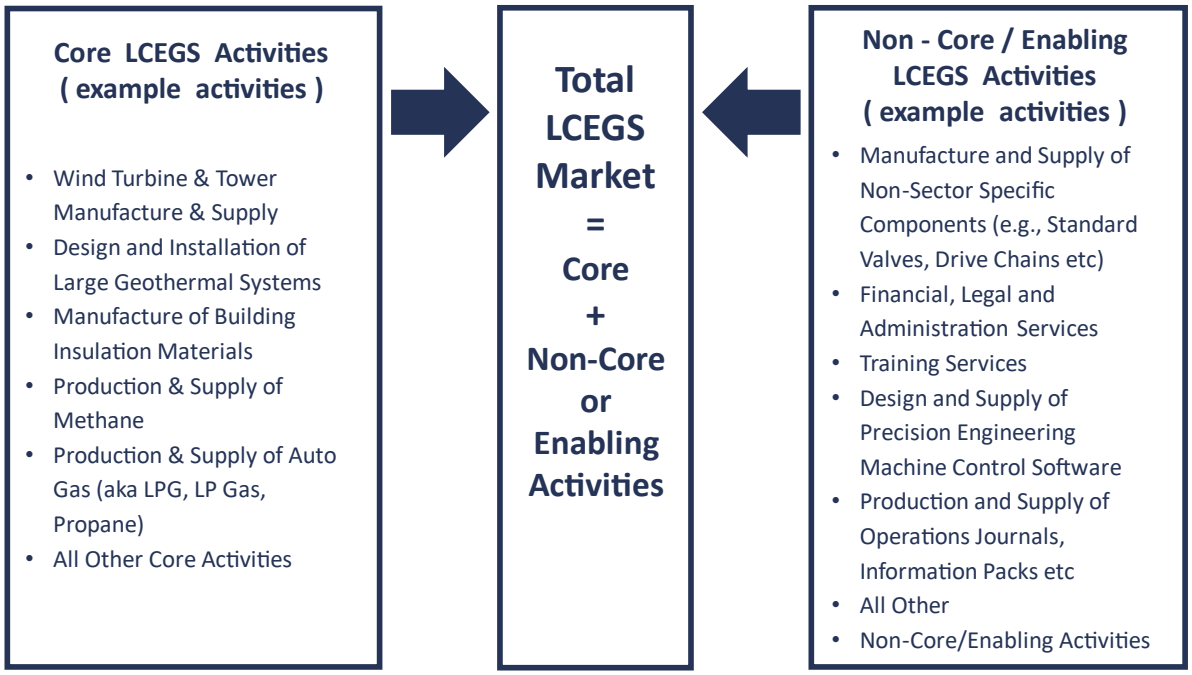
The dataset measures the core activities of the sector along with enabling activities in the supply chain, without whom the LCEGS sector could not operate. For example, the Wind sector includes those companies which develop the systems integration software enabling the power generated though turbines to be integrated into the National Grid, but it also includes those companies installing and maintaining the system integration software itself. Another example would be the collection of household waste, where the collection, processing and recycling of the waste is included, along with those companies who design, manufacture and supply the waste collection equipment itself.

The purpose of the LCEGS dataset in its original form, is to provide a standardised measure of the complete LCEGS sector. The whole dataset includes those 'core' activities, which would immediately come to mind such as the manufacture of a wind turbine blade, but also the less obvious 'non-core' activities, such as the manufacture of the bearings for the turbine. Non-Core activities can be considered "enablers" for the Core sector and are often companies who have diversified from existing strengths into new sector activities. Non-core activities also include mid-stream activities, R&D, finance, training and other activities which cross multiple other sectors, but without which the LCEGS sector could not function.

The definition of a sector is almost always open to debate, in terms of what is, or is not, considered to be part of the sector in question. The kMatrix methodology includes all aspects that can realistically be considered part of the LCEGS sector. The taxonomy is built and interrogated by assembling activities and services which are then grouped together under different headings. From the example taxonomy in figure 1, seven level 2 activities are grouped together to form the Renewable Energy Level 1 heading. There are five levels in total, comprising approximately 2,800 activities.

The following picture illustrates the two distinctive sides of the LCEGS market, the smaller Core market and the much larger Non-Core market, provided by enablers within the LCEGS sector. Examples give a simplistic overview of the types and differences between activities, with the Core side including activities such as manufacture of wind turbines and building insulation materials. The enablers providing Non-Core activities are offering components that are non-sector specific, such as valves, gaskets, drive chains etc., alongside financial, legal and administration activities.

In essence, Core activities are those products and services which are generally LCEGS specific, whereas the Non-Core activities, provided by enablers are products and services which are not LCEGS specific and can generally be found in other sectors. Core activities are considered vertical in nature, being sector specific, whereas Non-Core activities are horizontal, crossing other sectors. Both sides of the market are required for the sector to function.



The economic values provided are Sales values, which are transactions made within the sector, which have an economic footprint that can be measured. For companies which service multiple sectors, for example in finance, the sales value is the value of sales that company has in the LCEGS market, it does not include finance sales into other sectors.

1. London and the UK's LCEGS Timeseries

Figure 1: LCEGS London – Total Sales (£m)

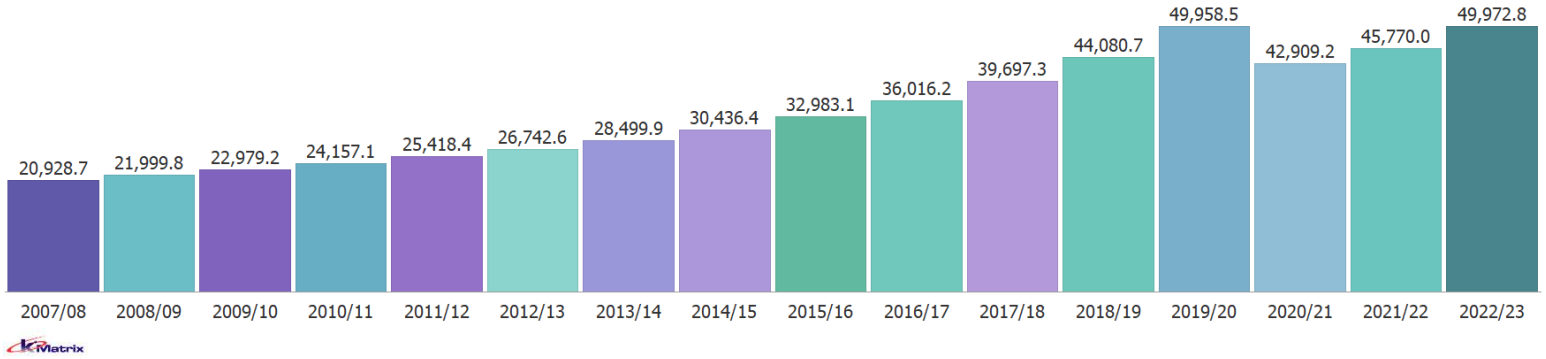
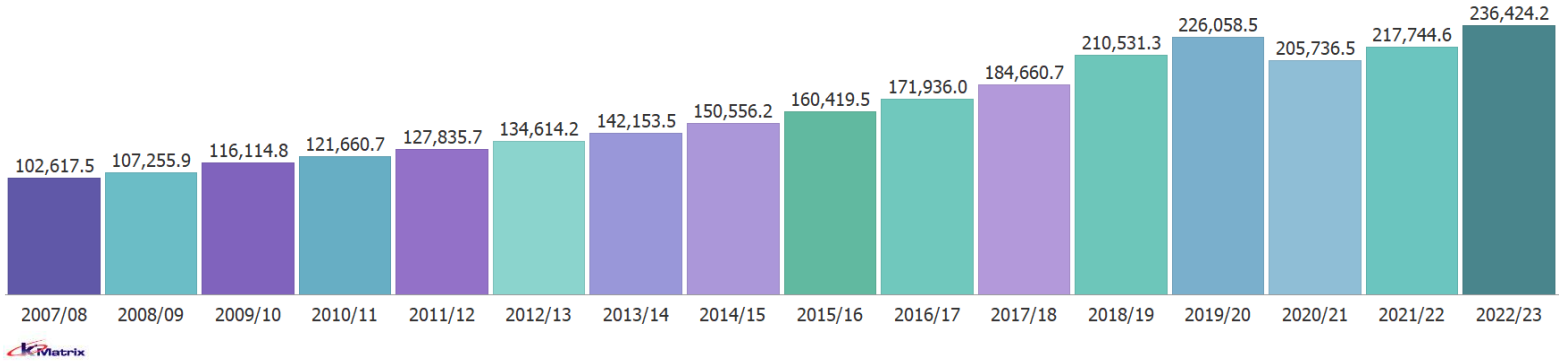


Figure 2: LCEGS UK – Total Sales (£m)



Figures 1 and 2 illustrate the year-on-year growth of sales for the LCEGS sector in both the UK and London between 2007/08 and 2019/20. The London market contracted 14% and the UK market by 9% between 2019/20 and 2020/21 when the pandemic was at its peak. The London market grew by 16% and the UK by 15% between 2020/21 and 2022/23. Overall, the London market has grown 139%, and the UK market has grown 130% between 2007/08 and 2022/23. If Carbon Finance is removed, growth was 96% in London and 113% in the UK between 2007/08 and 2022/23.

Figure 3: LCEGS London – Total Number of Companies

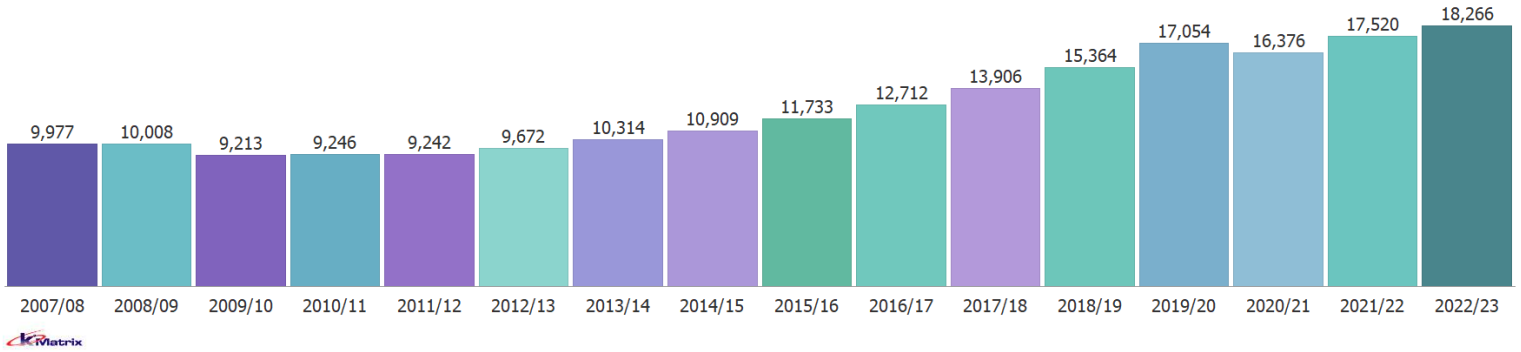
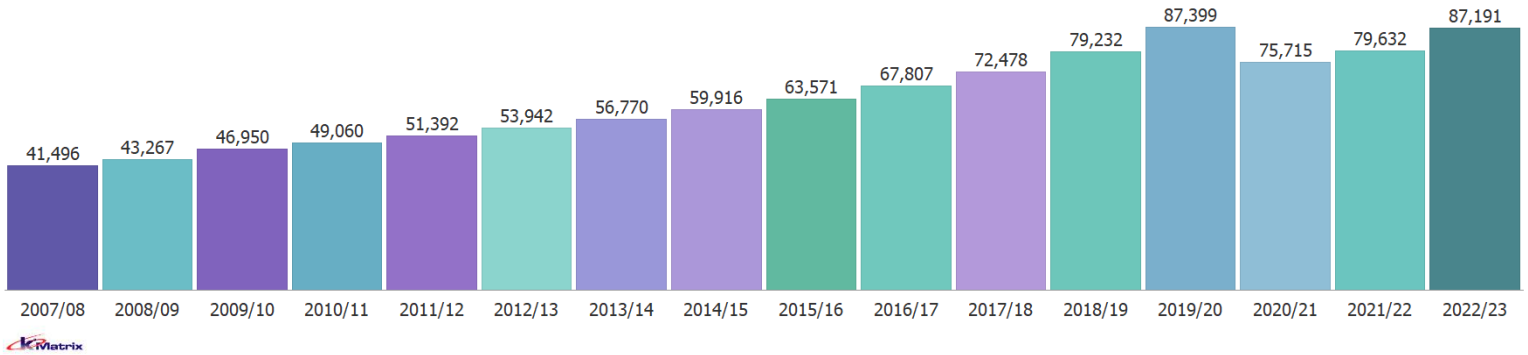


Figure 4: LCEGS UK – Total Number of Companies



Figures 3 and 4 illustrate the year-on-year growth in the number of companies in the LCEGS sector for the UK and generally for London too, apart from the dip in number of companies located in London in 2009/10 and the reduction in numbers in 2020/21. The reason for the dip in number of companies in London in 2009/10 and the difference in the overall growth rate of the number of companies in London compared to the UK is predominately due to the gradual movement of head offices out of London. In many cases the address of the head office of the company may remain the same but the operations themselves and in turn the bulk of the business has been moved out of London due to the higher cost of operations in the city. An example of this trend can be seen in the financial sector, where many companies are relocating their operations to Swindon. During the peak of the pandemic in the year between 2019/20 and 2020/21 the number of companies in the London market contracted by -4% and the UK market by -13.4% and this illustrates the resilience within the company base in London. The London company base grew by 12% and the UK by 15% between 2020/21 and 2022/23. Overall, the London company base has grown 83%, and the UK has grown 110% between 2007/08 and 2022/23.

Figure 5: LCEGS London – Total Number of Employees

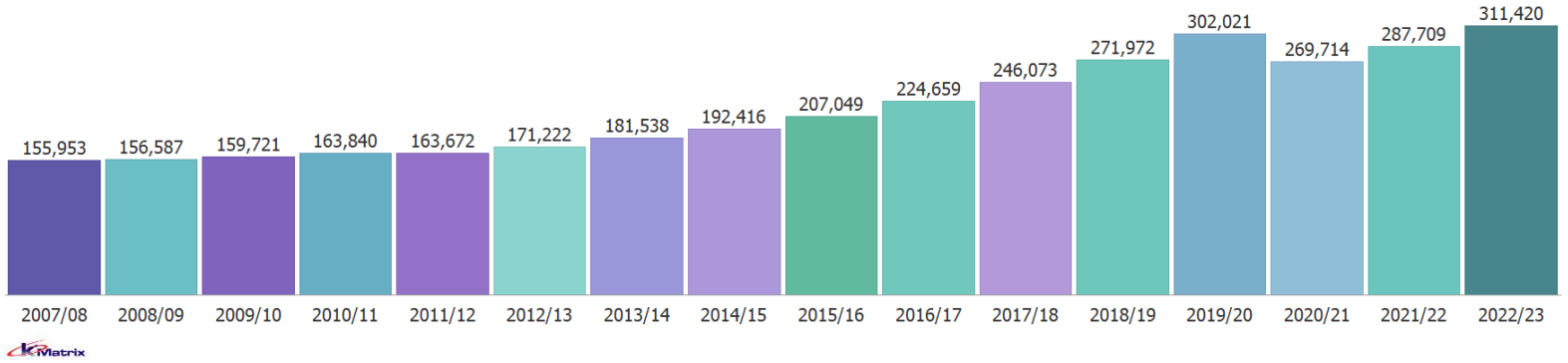
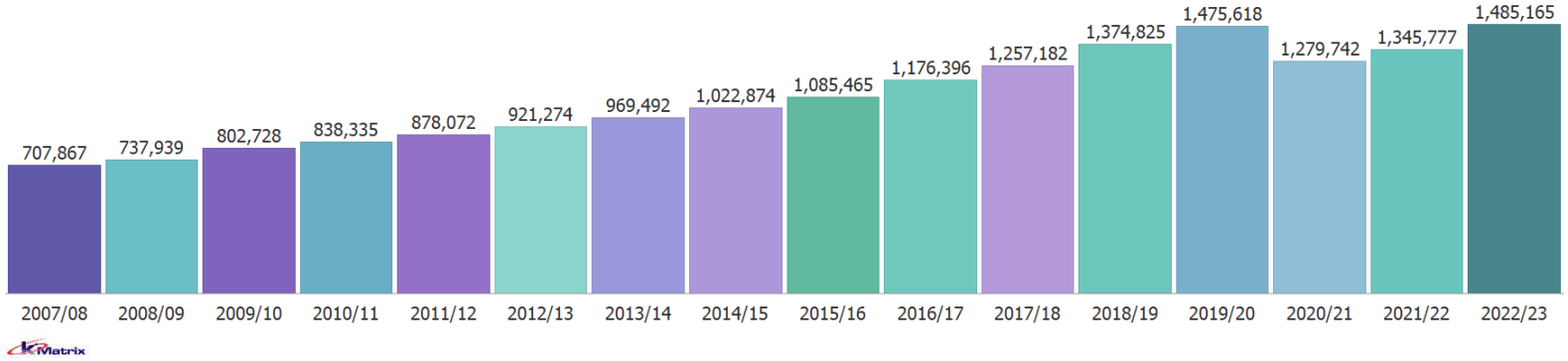


Figure 6: LCEGS UK – Total Number of Employees



Figures 5 and 6 illustrate the year-on-year growth in the number of employees within the LCEGS sector for both the UK and London. The UK saw a consistent increase in the number of employees year on year, however London saw a similar but slower increase in the number of employees that was also attributed, as with the companies above, to the movement of head offices out of London. During the peak of the pandemic in the year between 2019/20 and 2020/21 the number of employees in the London market contracted by -10.7% and the UK market by -13.3%. London employment grew by 15% and the UK by 16% between 2020/21 and 2022/23. Overall, the London employee base has grown 100%, and the UK has grown 110% between 2007/08 and 2022/23.

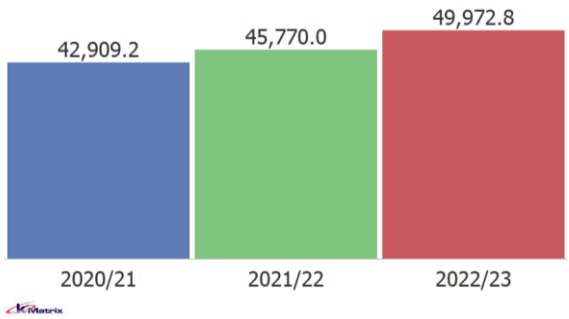
2. London's Low Carbon and Environmental Goods and Services (LCEGS) Analysis

This section of the report analyses London's LCEGS at Level 1 and Level 2.

2.1 LCEGS Compared by Year

In this section of the report London's LCEGS performance is compared for the last three years for the three key measures of Sales, Employment and Growth.

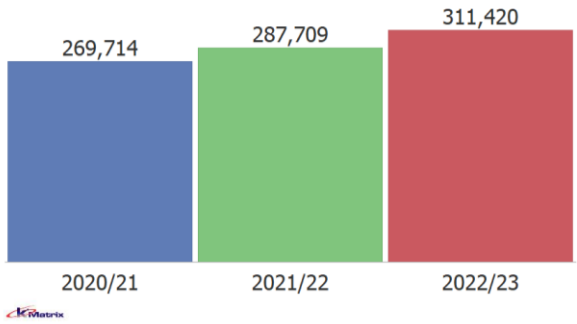
Figure 7: Sales 2020/21 to 2022/23 in £m



London's LCEGS sales in 2022/23 were £50.0bn, up from £42.9bn in 2020/21, which had contracted from ~ £50.0bn in 2019/20 due to the Covid-19 pandemic see previous report.

Annual sales growth in London's LCEGS sector was -14.1% from 2019/20 to 2020/21, 6.7% from 2020/21 to 2021/22 and 9.2% from 2021/22 to 2022/23. In comparison UK sales growth in LCEGS was -9.0%, 5.8% and 8.6% respectively.

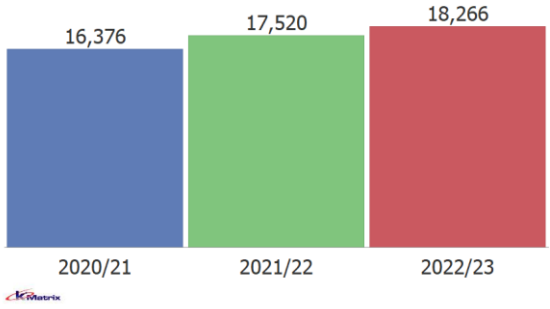
Figure 8: Employment 2020/21 to 2022/23



London's LCEGS employment in 2022/23 was 311,420, up from 269,714 in 2020/21, which had contracted from 302,021 in 2019/20 due to Covid-19 pandemic (see previous report).

Annual employment growth in London's LCEGS was -10.7% from 2019/20 to 2020/21, 6.7% from 2020/21 to 2021/22 and 8.2% from 2021/22 to 2022/23. In comparison UK employment growth in LCEGS was -13.3%, 5.2% and 10.4% respectively.

Figure 9: Companies 2020/21 to 2022/23



London's LCEGS company count in 2022/23 was 18,266 up from 16,376 in 2020/21, which had contracted from 17,054 in 2019/20 due to the Covid-19 pandemic (see previous report).

Annual company growth in London's LCEGS sector was -4.0% from 2019/20 to 2020/21, 7.0% from 2022/21 to 2021/22 and 4.3% from 2021/22 to 2022/23. In comparison UK company growth in LCEGS was -13.4%, 5.2% and 9.5% respectively.

2.2 London's LCEGS at Level 1

The analysis in this section of the report focuses on the Level 1 and Level 2 split of LCEGS in London for each of the last three years.

Figure 10: Sales 2020/21 to 2022/23in £m (Level 1)

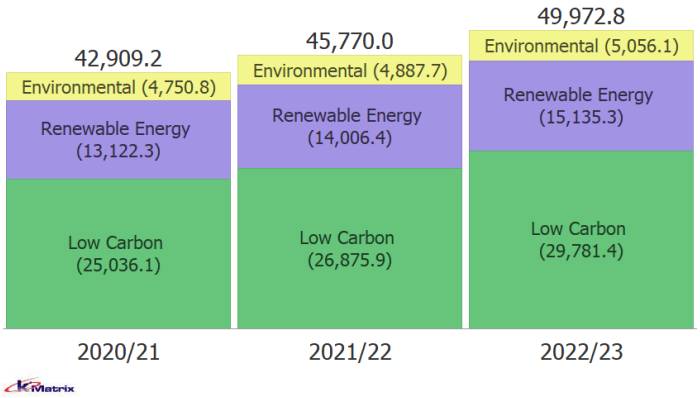


Figure 10 shows the three-year LCEGS sales split by Level 1.

In 2020/21 the split was 58% Low Carbon, 31% Renewable Energy and 11% Environmental. This changed slightly by 2022/23 to 60%, 30% and 10% respectively.

Figure 11: Employment 2020/21 to 2022/23 (Level 1)

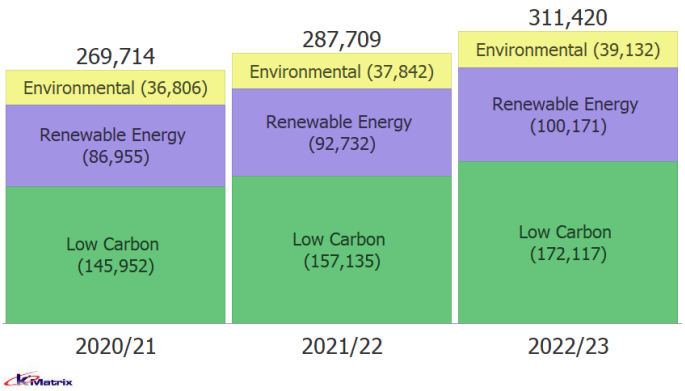


Figure 11 shows the three-year employment split by Level 1.

In 2020/21 the split was 54% Low Carbon, 32% Renewable Energy and 14% Environmental. This changed slightly by 2022/23 to 55%, 32% and 13% respectively.

Figure 12: Companies 2020/21 to 2022/23 (Level 1)

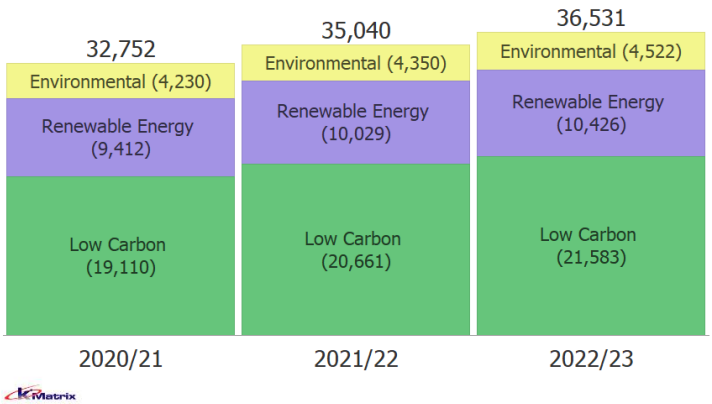


Figure 12 shows the three-year company split by Level 1.

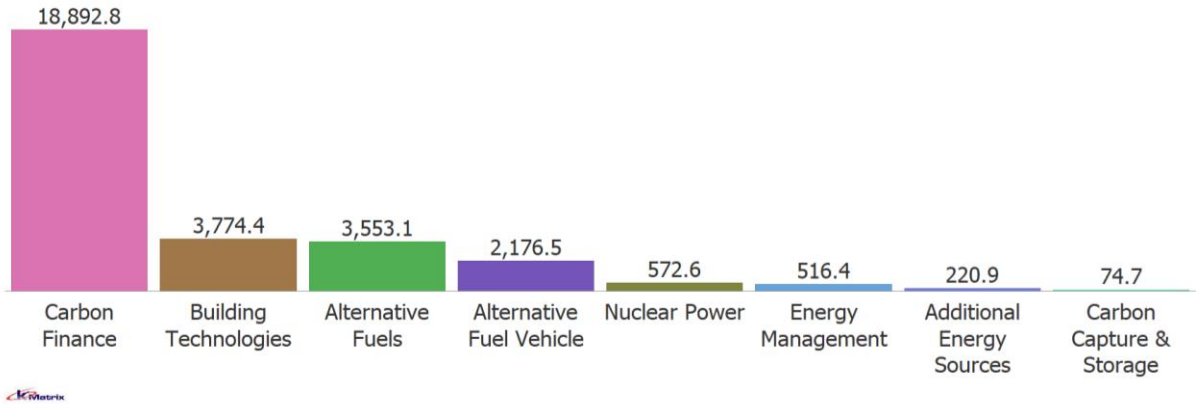
In 2020/21 the split was 58% Low Carbon, 29% Renewable Energy and 13% Environmental. This changed slightly by 2022/23 to 59%, 29% and 12% respectively.

This compares with the UK LCEGS sales split in 2022/23 - Low Carbon 50%, Renewable Energy 36% and Environmental 14%.

2.3 London's LCEGS Level 1 - Low Carbon Level 2 Sub-sectors

In this section we look at the Low Carbon market in greater detail by splitting the market into eight further sub-sectors (Level 2).

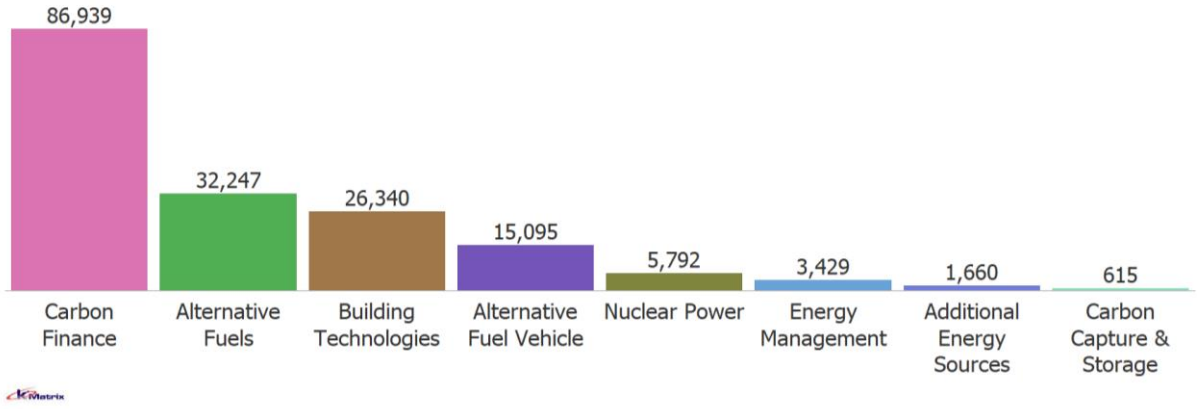
Figure 13: Sales 2022/23 in £m (Level 2)



Low Carbon is further sub-divided into eight sub-sectors, of which four account for 95% of sales (Figure 13). These four are made up of Carbon Finance 63% (62% in 2020/21), Building Technologies 13% (13% in 2020/21), Alternative Fuels 12% (12% in 2020/21) and Alternative Fuel Vehicle 7% (8% in 2020/21).

All four of these sub-sectors have growth between 2020/21 and 2022/23: Carbon Finance from £15.44bn in 2020/21 to £18.89bn in 2022/23; Building Technologies from £3.27bn to £3.77bn; Alternative Fuels from £3.13bn to £3.55bn; and Alternative Fuel Vehicles from £1.93bn to £2.18bn.

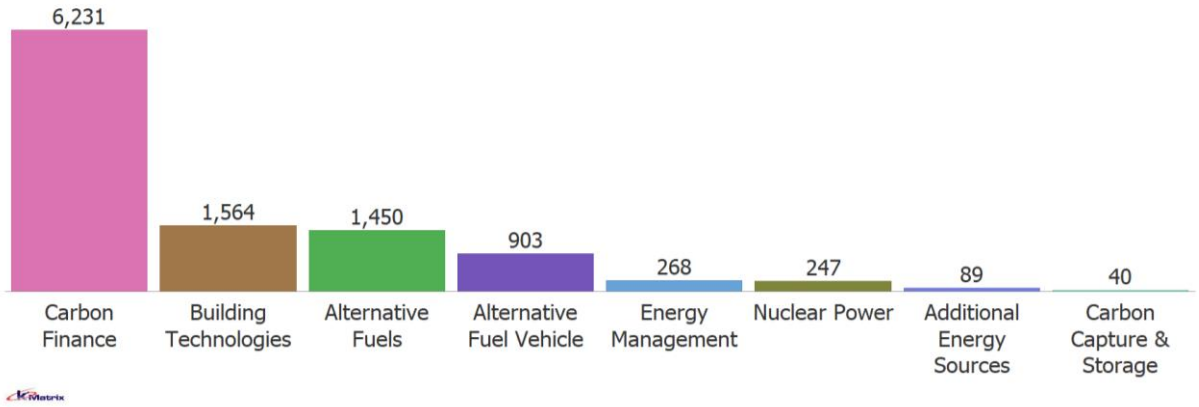
Figure 14: Employment 2022/23 (Level 2)



The same four sub-sectors account for 92% of employment (Figure 14). They are Carbon Finance 51% (48% in 2020/21), Alternative Fuels 19% (19% in 2020/21), Building Technologies 14% (16% in 2020/21) and Alternative Fuel Vehicles 9% (9% in 2020/21).

All four of these sub-sectors grew between 2020/21 and 2022/23: Carbon Finance from 70,762 to 86,939; Alternative Fuels from 28,350 to 32,247; Building Technologies from 22,898 to 26,340 and Alternative Fuel Vehicles from 13,394 to 15,095.

Figure 15: Companies 2022/23 (Level 2)



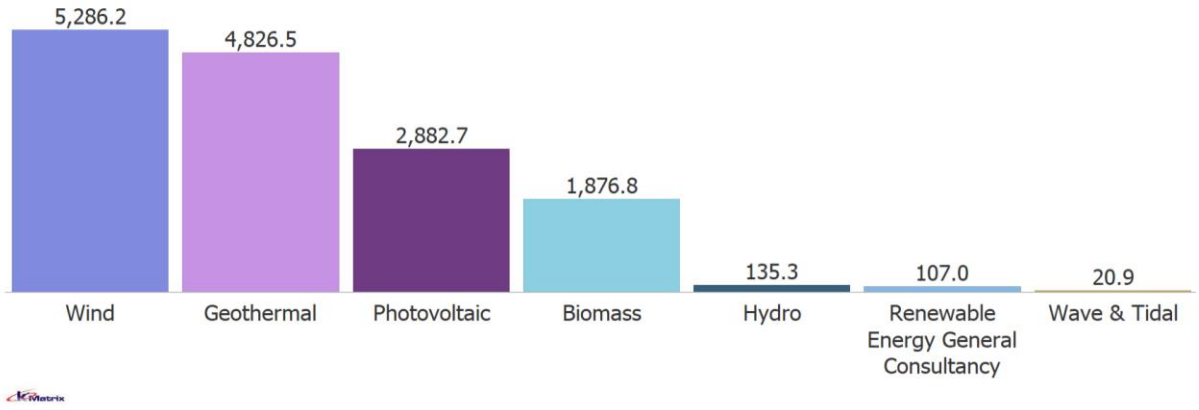
The same four sub-sectors again account for 94% of companies (Figure 15). They are Carbon Finance 58% (57% in 2020/21), Building Technologies 14% (15% in 2020/21), Alternative Fuels 13% (14% in 2020/21) and Alternative Fuel Vehicles 8% (9% in 2020/21).

All four of these sub-sectors grew between 2020/21 and 2022/23: Carbon Finance from 5,420 to 6,231; Building Technologies from 1,409 to 1.564; Alternative Fuels 1,308 to 1,450; and Alternative Fuel Vehicles from 824 to 903.

2.4 London's LCEGS Level 1 - Renewable Energy Level 2 Sub-sectors

In this section we look at the Renewable Energy market in greater detail, by splitting the market into seven further sub-sectors, Level 2.

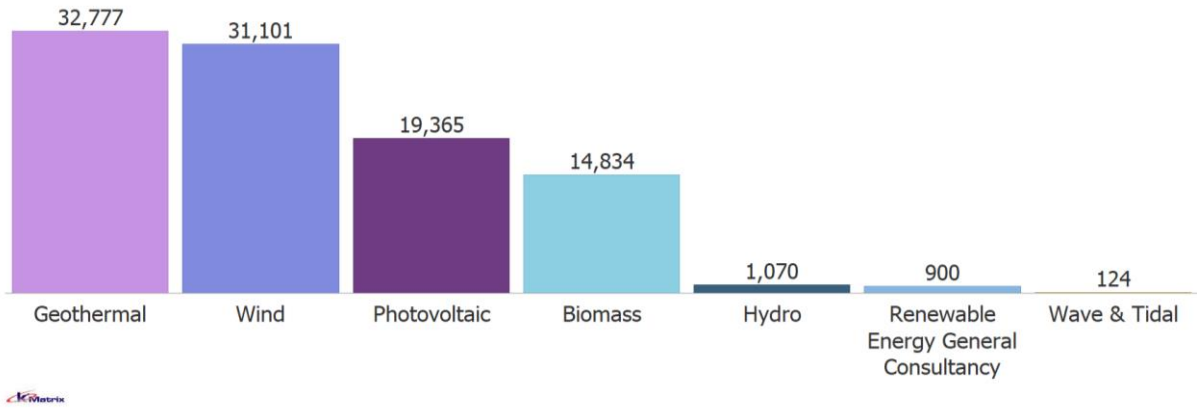
Figure 16: Sales 2022/23 in £m (Level 2)



Renewable Energy is split into seven sub-sectors, of which four account for 98% of sales (Figure 16). These four are made up of Wind 35% (34% in 2020/21), Geothermal 32% (32% in 2020/21), Photovoltaic 19% (19% in 2020/21) and Biomass 12% (13% in 2020/21).

All four of these sub-sectors grew between 2020/21 and 2022/23: Wind from £4.48bn to £5.29bn; Geothermal from £4.25bn to £4.83bn; Photovoltaic from £2.49bn to £2.88bn; and Biomass from £1.67bn to £1.88bn.

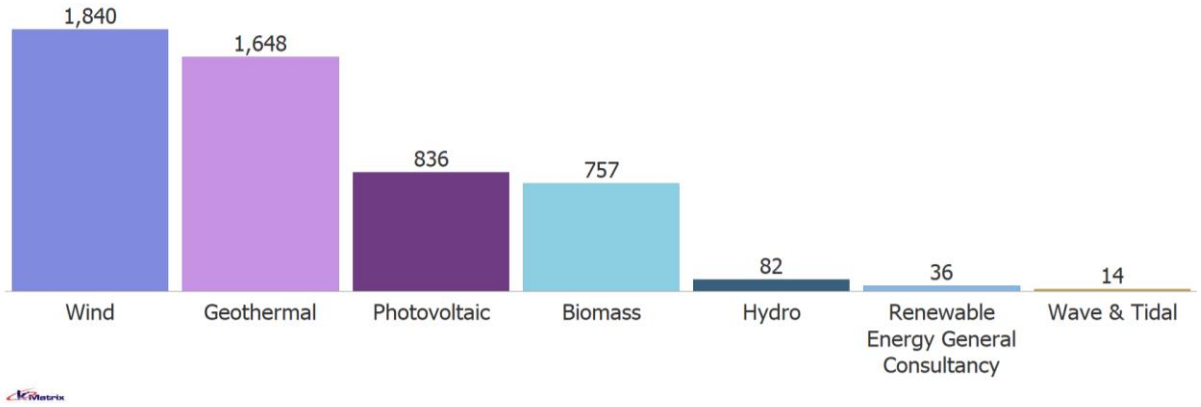
Figure 17: Employment 2022/23 (Level 2)



The same four sub-sectors account for 98% of employment (Figure 17). They are made up of Geothermal 33% (33% in 2020/21), Wind 31% (30% in 2020/21), Photovoltaic 19% (19% in 2020/21) and Biomass 15% (15% in 2020/21).

All four of these sub-sectors grew between 2020/21 and 2022/23: Geothermal from 28,819 to 32,777; Wind from 26,351 to 31,101; Photovoltaic from 16,654 to 19,365 and Biomass from 13,195 to 14,834.

Figure 18: Companies 2022/23 (Level 2)



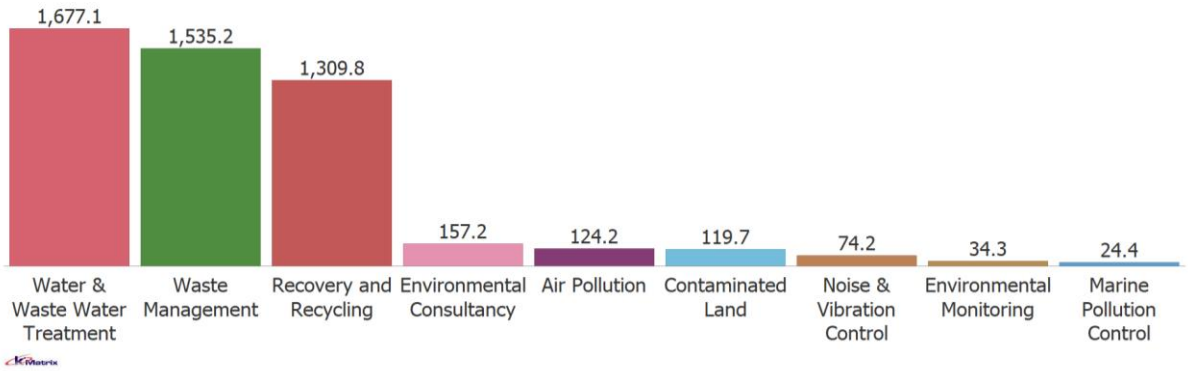
And the same four sub-sectors also account for 97% of companies (Figure 18). They are made up of Wind 35% (35% in 2020/21), Geothermal 32% (32% in 2020/21), Photovoltaic 16% (16% in 2020/21) and Biomass 15% (15% in 2020/21).

Each of these four sub-sectors grew between 2020/21 and 2022/23: Wind from 1,642 to 1,840; Geothermal from 1,498 to 1,648; Photovoltaic from 753 to 836; and Biomass from 692 to 757.

2.5 London's LCEGS Level 1 - Environmental Level 2 Sub-sectors

In this section we look at the Environmental market in greater detail, by splitting the market into nine further sub-sectors, Level 2.

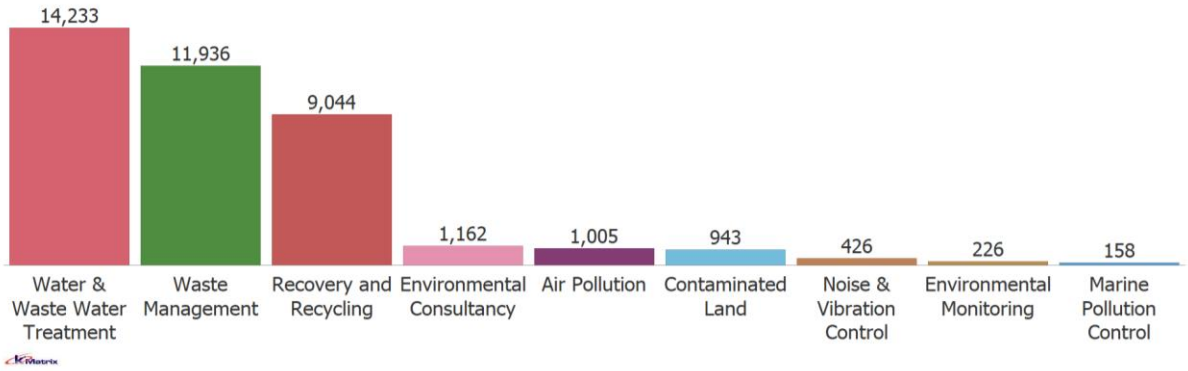
Figure 19: Sales 2022/23 in £m (Level 2)



Environmental is split into nine sub-sectors, of which three account for 89% of sales (90% in 2020/21) (Figure 19). These three are made up of Water Supply & Waste Water Treatment 33% (34% in 2020/21), Waste Management 30% (30% in 2020/21) and Recovery & Recycling 26% (25% in 2020/21).

Each of these three sub-sectors grew between 2020/21 and 2022/23: Water Supply and Waste Water Treatment from £1.61bn to £1.68bn; Waste Management from £1.43bn to £1.54bn; and Recovery and Recycling from £1.20bn to £1.31bn.

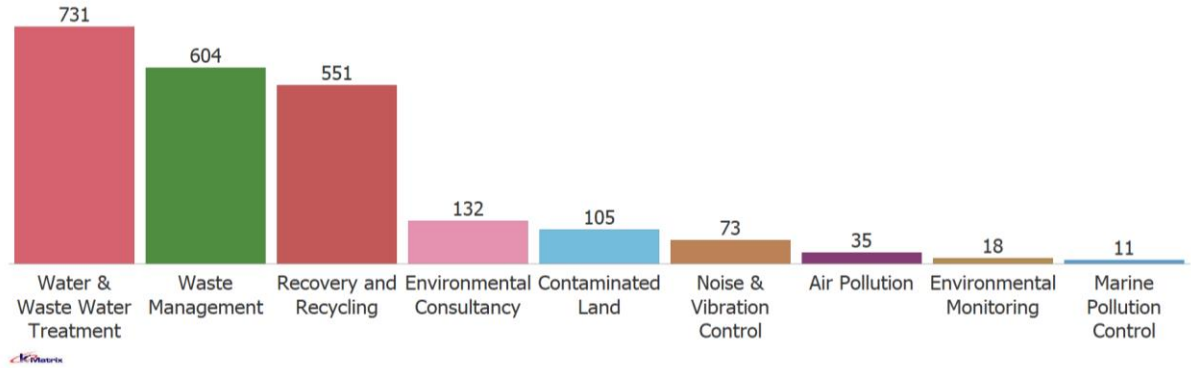
Figure 20: Employment 2022/23 (Level 2)



The same three sub-sectors account for 90% of employment (Figure 20). They are made up of Water Supply & Waste Water Treatment 36% (37% in 2020/21), Waste Management 31% (30% in 2020/21) and Recovery & Recycling 23% (23% in 2020/21).

Each of these three sub-sectors grew between 2020/21 and 2022/23: Water & Waste Water Treatment from 13,652 to 14,233; Waste Management from 11,164 to 11,936; and Recovery and Recycling from 8,343 to 9,044.

Figure 21: Companies 2022/23 (Level 2)



The same three sub-sectors also account for 83% of companies (83% in 2020/21) (Figure 21). They are made up of Water Supply & Waste Water Treatment 32% (33% in 2020/21), Waste Management 27% (27% in 2020/21) and Recovery & Recycling 24% (24% in 2020/21).

Each of these three sub-sectors grew between 2020/21 and 2022/23: Water & Waste Water Treatment from 691 to 731; Waste Management from 563 to 604; and Recovery and Recycling from 512 to 551.

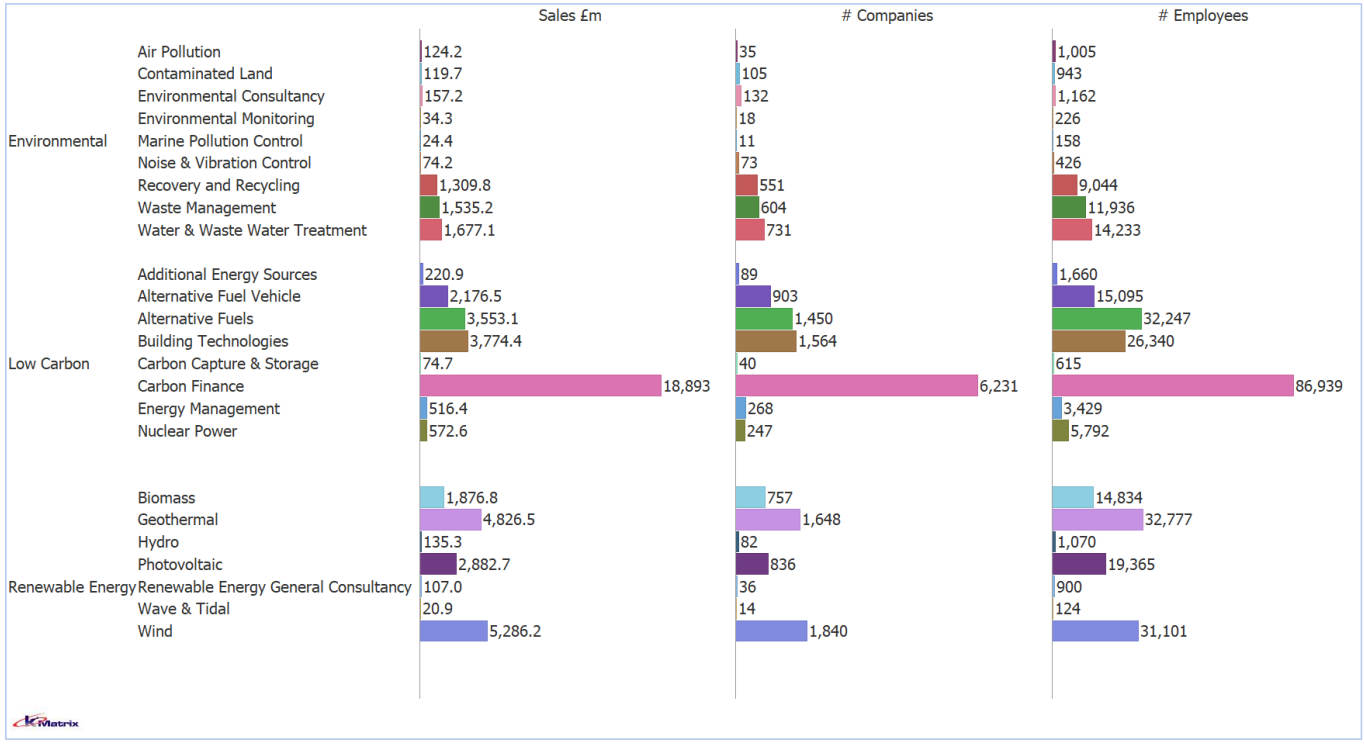
2.6 London's LCEGS Level 2 Summary

Figure 22 compares all 24 sub-sectors of LCEGS and shows that the five leading sub-sectors: Carbon Finance (37%), Wind (11%), Geothermal (10%), Building Technologies (8%) and Alternative Fuels (7%) have the largest share in terms of sales, company numbers and employment and accounted for 73% of London's LCEGS sector activity in 2022/23 (71% in 2020/21).

There is then a second grouping of six sub-sectors that are: Photovoltaic 6%, Alternative Fuel Vehicles 4%, Biomass 4%, Water and Waste Water Treatment 4%, Waste Management 3%, and Recovery and Recycling 3%; that make up a further 23% of the LCEGS sector sales in 2022/23 (24% in 2020/21).

These 11 sub-sectors dominate the LCEGS sector sales and together made up 96% of its overall sales in 2022/23 (95% in 2020/21).

Figure 22: LCEGS Summary 2022/23 for Sales, Number of Companies and Number of Employees



2.7 London and the UK's LCEGS compared

Figure 23: London Measures 2022/23 by Level 1

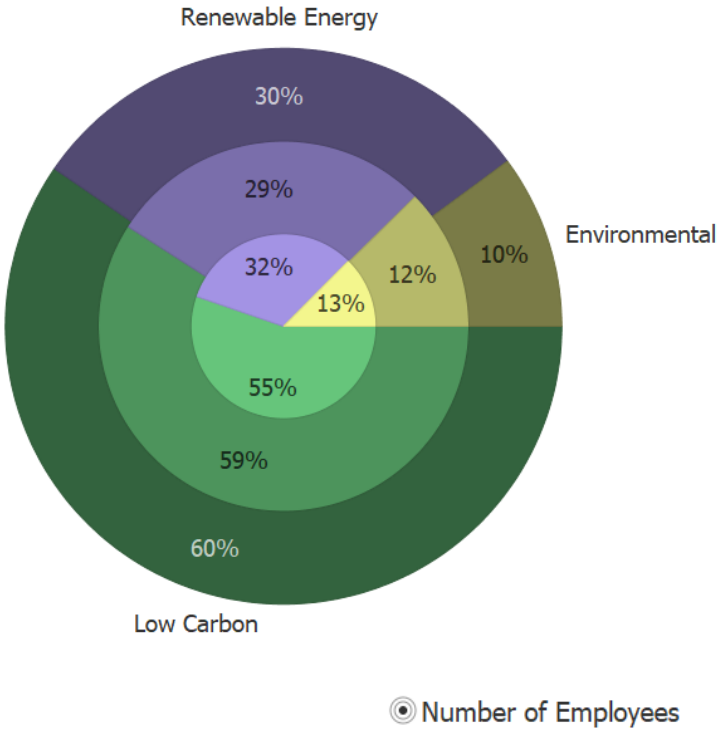
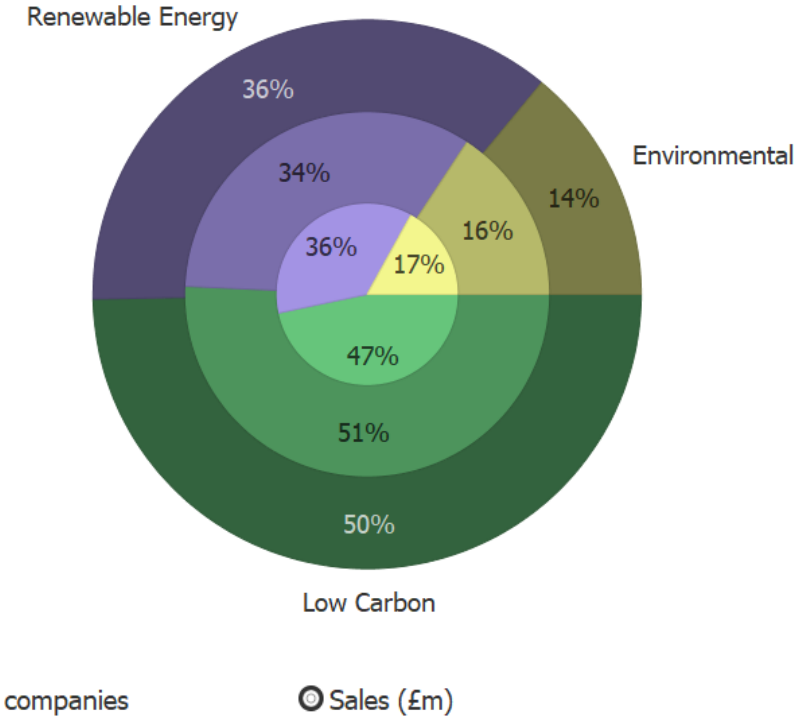
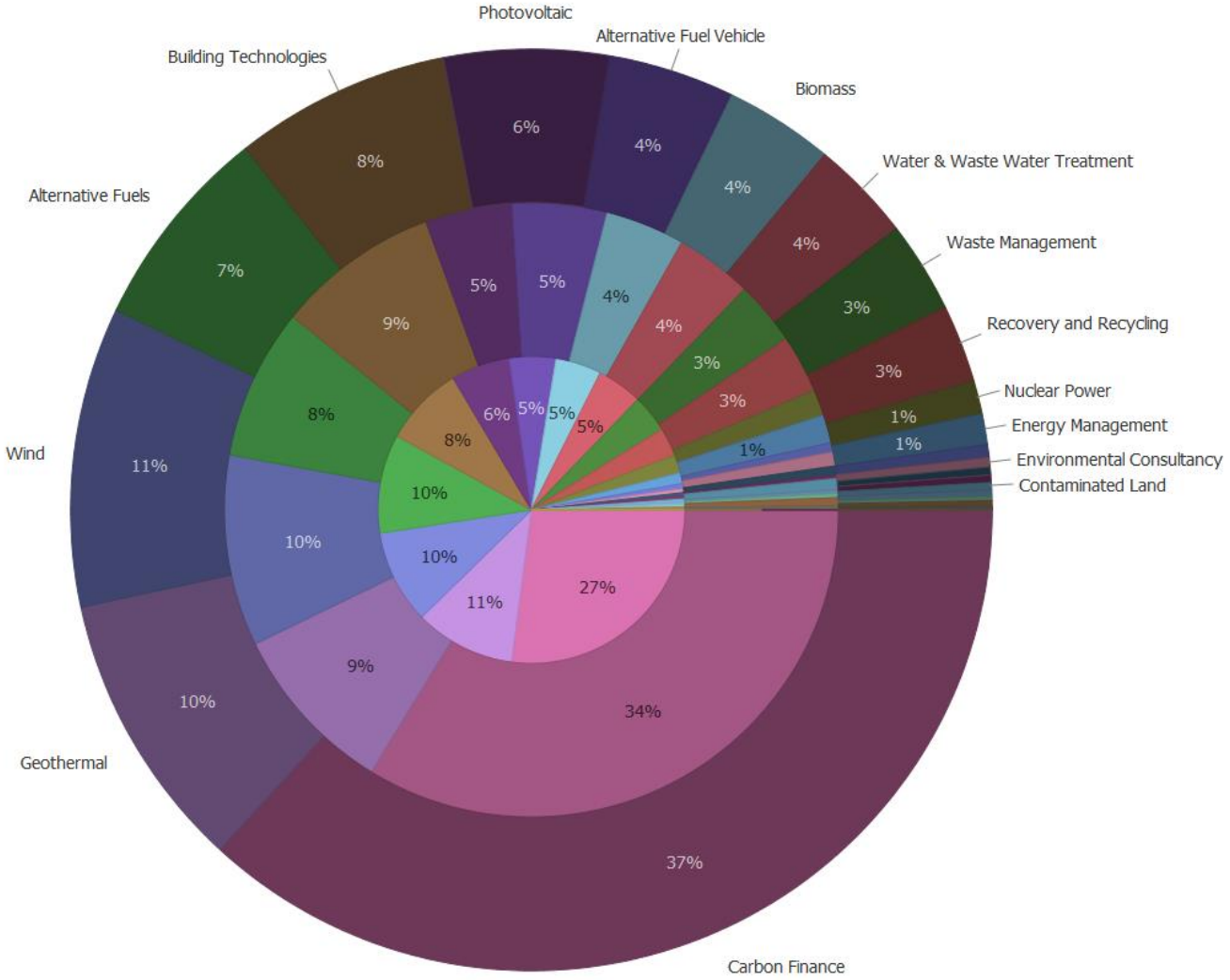


Figure 24: UK Measures 2022/23 by Level 1



Figures 23 and 24 compare the profile of London and UK's LCEGS activities at Level 1 for sales (outer circle), companies (middle circle) and employment (inner circle). London's relative strength is in the Low Carbon sub-sector.

Figure 25: London's LCEGS sub-sectors for 2022/23 at Level 2



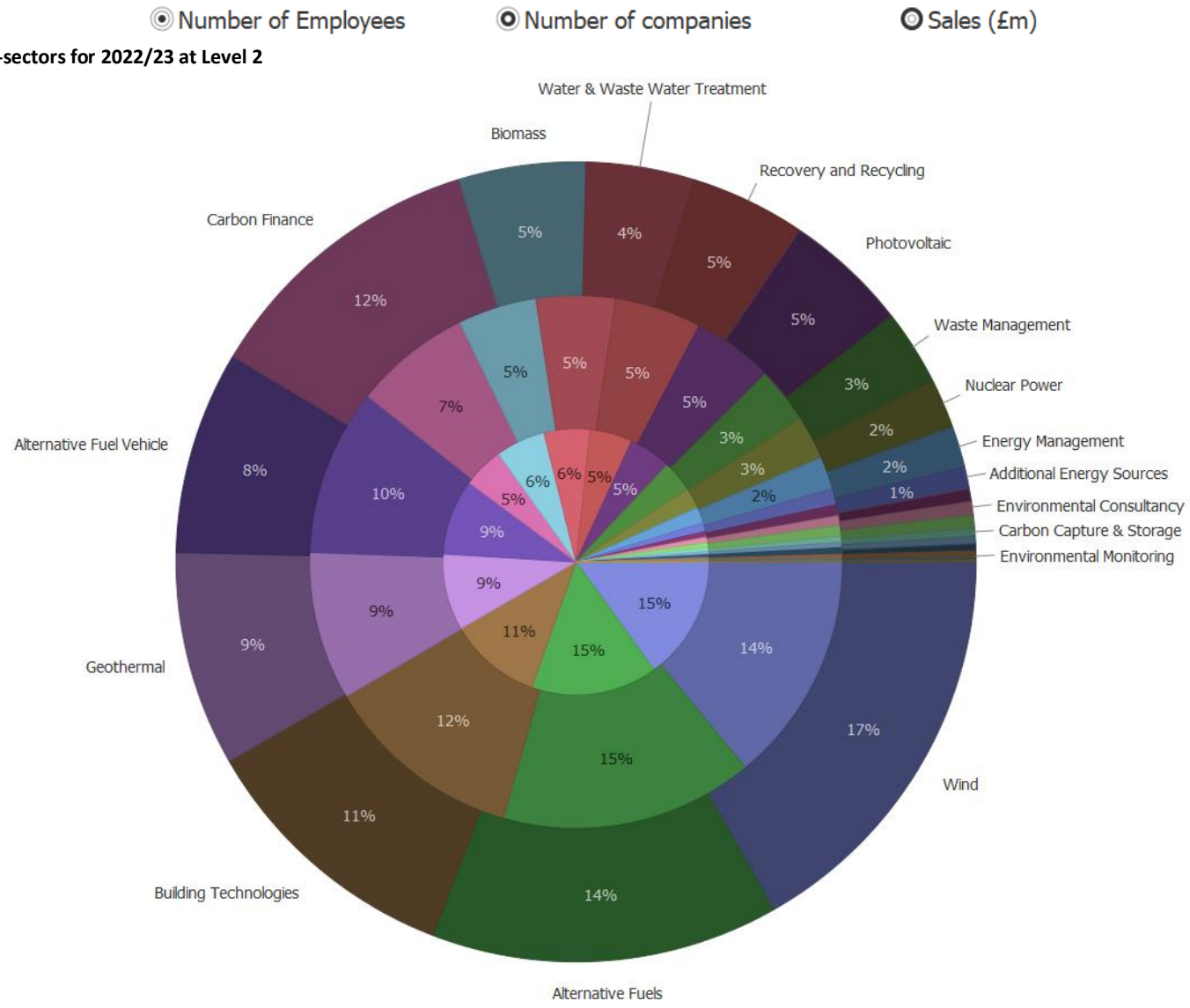
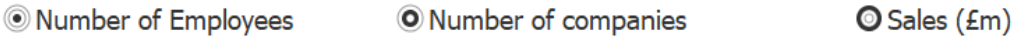


Figure 26: UK's LCEGS sub-sectors for 2022/23 at Level 2



Figures 25 and 26 extends the analysis by comparing the profile of London and UK's LCEGS activities at Level 2 for sales (outer circle), companies (middle circle) and employment (inner circle). There are significant differences between the two that gives London a distinctive LCEGS profile compared to the overall UK profile. These differences are mainly accounted for by the fact that Carbon Finance is London's largest LCEGS sub-sector and a function of the financial services sector in the City and Canary Wharf and shows negligible activity outside of London. Other regional strengths include Building Technologies in the South East Region and Alternative Fuels and Alternative Fuel Vehicles in the East of England, West Midlands and the North West.

2.8 London's LCEGS Growth

In Section 2.1 annual growth in London's LCEGS sales, companies and employment was compared with growth in the UK's LCEGS sector as a whole for 2020/21 to 2022/23. This section includes summaries of how sub-sector growth in London compares with the UK, followed by analysis of London's annual growth in more detail, by breaking it down into sub-sectors for those years in Table 5. Growth between one year and the next is shown in red.

While annual growth in the LCEGS sector as a whole has varied between 4.3 and 9.3% for each of the three parameters, Table 1 shows that there is considerable variation in growth between the Level 2 sub-sectors. This reflects London's strengths and its share of these sub-sector markets, all of which are growing at different rates.

The higher growth rates for sub-sectors in London are a reflection of higher growth rates in the UK market and the opportunities that are being created by drivers of growth including policy, regulation and consumer choices. Most sub-sectors in London have growth rates within one percentage point of the UK growth rates. The four main exceptions where London sales growth was stronger than the UK for at least one year are shown in Table 1 and are:

- Alternative Fuel Vehicle, where the London sales growth rates were 5.6% between 2020/21 and 2021/22 and 6.8% between 2021/22 and 2022/23 and the UK growth rates were 4.0% between 2020/21 and 2021/22 and 5.8% between 2021/22 and 2022/23
- Alternative Fuels, where the London sales growth rates were 6.0% between 2020/21 and 2021/22 and 7.2% between 2021/22 and 2022/23 and the UK growth rates were 4.8% between 2020/21 and 2021/22 and 6.7% between 2021/22 and 2022/23
- Building Technologies, where the London sales growth rates were 6.6% between 2020/21 and 2021/22 and 8.2% between 2021/22 and 2022/23 and the UK growth rates were 5.0% between 2020/21 and 2021/22 and 7.6% between 2021/22 and 2022/23
- Nuclear Power, where the London sales growth rates were 3.9% between 2020/21 and 2021/22 and 4.7% between 2021/22 and 2022/23 and the UK growth rates were 2.5% between 2020/21 and 2021/22 and 3.6% between 2021/22 and 2022/23

Table 1: Sub-sectors where London's LCEGS Sales growth was stronger than the UK for at least one year between 2020/21 to 2022/23

Level 2 sub-sector	Sales Growth 2020/21 to 2021/22		Sales Growth 2021/22 to 2022/23	
	London	UK	London	UK
Alternative Fuel Vehicle	5.6%	4.0%	6.8%	5.8%
Alternative Fuels	6.0%	4.8%	7.2%	6.7%
Building Technologies	6.6%	5.0%	8.2%	7.6%
Nuclear Power	3.9%	2.5%	4.7%	3.6%

The two main exceptions where London growth was weaker than the UK for at least one year are shown in Table 2 and are:

- Carbon Finance, where the London sales growth rates were 8.3% between 2020/21 and 2021/22 and 13.0% between 2021/22 and 2022/23 and the UK growth rates were 12.2% between 2020/21 and 2021/22 and 18.1% between 2021/22 and 2022/23

- Biomass, where the London sales growth rates were 5.5% between 2020/21 and 2021/22 and 6.7% between 2021/22 and 2022/23 and the UK growth rates were 7.1% between 2020/21 and 2021/22 and 10.8% between 2021/22 and 2022/23

Table 2: Sub-sectors where London's LCEGS Sales growth was weaker than the UK for at least one year between 2020/21 to 2022/23

Level 2 sub-sector	Sales Growth 2020/21 to 2021/22		Sales Growth 2021/22 to 2022/23	
	London	UK	London	UK
Carbon Finance	8.3%	12.2%	13.0%	18.1%
Biomass	5.5%	7.1%	6.7%	10.8%

Growth in London sub-sectors across the 3-year reporting period is generally within two percentage points of growth in the UK. The three exceptions where London growth is more than two percentage points stronger than the UK are shown in Table 3 and are:

- Alternative Fuel Vehicle, where the London sales growth rate was 12.8% between 2020/21 and 2022/23 and the UK growth rate was 10.0% between 2020/21 and 2022/23
- Building Technologies, where the London sales growth rate was 15.4% between 2020/21 and 2022/23 and the UK growth rate was 13.0% between 2020/21 and 2022/23
- Nuclear Power, where the London sales growth rate was 8.8% between 2020/21 and 2022/23 and the UK growth rate was 6.3% between 2020/21 and 2022/23

Table 3: Sub-sectors where London's LCEGS average Sales growth across the 3-year reporting period was stronger than the UK between 2020/21 to 2022/23

Level 2 sub-sector	Sales Growth 2020/21 to 202/23	
	London	UK
Alternative Fuel Vehicle	22.8%	10.0%
Building Technologies	15.4%	13.0%
Nuclear Power	8.8%	6.3%

The two exceptions where London growth is less than two percentage points weaker than the UK are shown in Table 4 and are:

- Carbon Finance, where the London sales growth rate was 22.4% between 2020/21 and 2022/23 and the UK growth rate was 32.5% between 2020/21 and 2022/23
- Biomass, where the London sales growth rate was 12.6% between 2020/21 and 2022/23 and the UK growth rate was 18.7% between 2020/21 and 2022/23

Table 4: Sub-sectors where London's LCEGS average Sales growth across the 3-year reporting period was weaker than the UK between 2020/21 to 2022/23

Level 2 sub-sector	Sales Growth 2020/21 to 202/23	
	London	UK
Carbon Finance	22.4%	32.5%
Biomass	12.6%	18.7%

Table 5 shows that the highest levels of actual growth in London LCEGS occurred in Carbon Finance (Low Carbon); Wind (Renewable Energy); Photovoltaic (Renewable Energy); Building Technologies (Low Carbon); Wave & Tidal (Renewable Energy); Alternative Fuels (Low Carbon); Geothermal (Renewable Energy); Alternative fuel Vehicle (low Carbon); Biomass (Renewable Energy); and Additional Energy Sources (Low Carbon) between 2020/21 and 2022/23.

Table 5: London's LCEGS Sales (£m), Company and Employment Growth 2020/21 to 2022/23

		Sales £m					# Companies					# Employees				
L 1	Level 2	2020/21	*Growth %	2021/22	*Growth %	2022/23	2020/21	*Growth %	2021/22	*Growth %	2022/23	2020/21	*Growth %	2021/22	*Growth %	2022/23
Environmental	Air Pollution	117.1	2.7%	120.2	3.3%	124.2	33	2.6%	34	4.1%	35	949	2.7%	974	3.2%	1,005
	Contaminated Land	111.1	3.4%	114.9	4.2%	119.7	97	3.5%	101	4.0%	105	876	3.4%	906	4.1%	943
	Environmental Consultancy	145.8	3.6%	151.1	4.1%	157.2	123	3.5%	127	4.1%	132	1,074	3.6%	1,113	4.4%	1,162
	Environmental Monitoring	31.8	3.6%	32.9	4.1%	34.3	17	4.3%	17	3.9%	18	209	3.6%	217	4.4%	226
	Marine Pollution Control	22.5	3.8%	23.4	4.5%	24.4	10	3.8%	10	4.1%	11	145	3.8%	151	4.6%	158
	Noise & Vibration Control	68.7	3.7%	71.3	4.2%	74.2	68	3.9%	71	4.1%	73	393	3.7%	408	4.4%	426
	Recovery and Recycling	1,207.2	3.7%	1,252.0	4.6%	1,309.8	512	3.7%	530	3.9%	551	8,343	3.7%	8,653	4.5%	9,044
	Waste Management	1,434.6	3.1%	1,479.4	3.8%	1,535.2	563	3.2%	581	3.8%	604	11,164	3.1%	11,511	3.7%	11,936
	Water & Waste Water Treatment	1,612.0	1.9%	1,642.5	2.1%	1,677.1	691	1.6%	702	4.0%	731	13,652	1.9%	13,910	2.3%	14,233
Lo	Additional Energy Sources	200.3	4.5%	209.4	5.5%	220.9	82	4.5%	86	4.0%	89	1,507	4.5%	1,575	5.4%	1,660

	Alternative Fuel Vehicle	1,930.3	5.6%	2,037.6	6.8%	2,176.5	824	5.5%	870	3.8%	903	13,394	5.6%	14,140	6.8%	15,095
	Alternative Fuels	3,125.9	6.0%	3,314.4	7.2%	3,553.1	1,308	6.6%	1,393	4.0%	1,450	28,350	6.0%	30,054	7.3%	32,247
	Building Technologies	3,271.0	6.6%	3,487.2	8.2%	3,774.4	1,409	6.5%	1,501	4.3%	1,564	22,898	6.6%	24,413	7.9%	26,340
	Carbon Capture & Storage	69.0	3.7%	71.6	4.3%	74.7	37	3.7%	38	3.9%	40	568	3.7%	589	4.4%	615
	Carbon Finance	15,438.2	8.3%	16,715.4	13.0%	18,892.8	5,420	9.8%	5,948	4.8%	6,231	70,762	9.6%	77,558	12.1%	86,939
	Energy Management	475.0	3.9%	493.6	4.6%	516.4	248	3.9%	257	3.9%	268	3,150	3.9%	3,273	4.7%	3,429
	Nuclear Power	526.3	3.9%	546.7	4.7%	572.6	228	3.8%	237	4.2%	247	5,324	3.9%	5,532	4.7%	5,792
Renewable Energy	Biomass	1,666.7	5.5%	1,758.8	6.7%	1,876.8	692	5.5%	730	3.7%	757	13,195	5.5%	13,921	6.6%	14,834
	Geothermal	4,250.8	6.0%	4,506.0	7.1%	4,826.5	1,498	5.9%	1,587	3.9%	1,648	28,819	6.0%	30,548	7.3%	32,777
	Hydro	124.7	3.9%	129.5	4.5%	135.3	75	4.1%	79	4.3%	82	984	3.9%	1,022	4.7%	1,070
	Photovoltaic	2,485.7	7.2%	2,663.5	8.2%	2,882.7	753	7.0%	805	3.9%	836	16,654	7.1%	17,843	8.5%	19,365
	Renewable Consultancy	99.9	3.0%	102.9	4.0%	107.0	34	3.0%	35	4.2%	36	843	2.9%	868	3.7%	900
	Wave & Tidal	18.3	6.4%	19.5	7.2%	20.9	12	6.1%	13	4.1%	14	109	6.3%	116	7.6%	124
	Wind	4,476.3	7.8%	4,826.2	9.5%	5,286.2	1,642	7.6%	1,766	4.1%	1,840	26,351	7.8%	28,415	9.5%	31,101
Total		**42,909.2**	**6.7%**	**45,770.0**	**9.2%**	**49,972.8**	**16,376**	**7.0%**	**17,520**	**4.3%**	**18,266**	**269,714**	**6.7%**	**287,709**	**8.2%**	**311,420**

* Growth between one year and the next is shown in red

Table 6 shows sales growth forecasts (annual percentage growth from the previous year) for 2023/24 through to 2026/27. The growth rates refer to the growth expected during the financial year listed. Forecast growth for the majority of sub-sectors is generally consistent with levels of historical growth, but as forecasts stretch out beyond 2026/27, they inevitably tend to be less robust. The growth rates would be applied to the year indicated, so for example, the 2023/24 growth rate indicates the expected growth between the 2022/23 and 2023/24 sales figures.

Table 6: London's LCEGS Forecast Sales (£m) Growth 2023/24 to 2026/27

Level 1	Level 2	2023/24	2024/25	2025/26	2026/27
Environmental	Air Pollution	3.9	4.1	4.4	4.7
	Contaminated Land	4.9	5.2	5.5	5.8
	Environmental Consultancy	5.3	5.6	5.9	6.3
	Environmental Monitoring	5.3	5.6	6.0	6.3
	Marine Pollution Control	5.7	5.9	6.3	6.7
	Noise & Vibration Control	5.5	5.8	6.1	6.5
	Recovery and Recycling	5.4	5.8	6.1	6.5
	Waste Management	4.5	4.8	5.0	5.4
	Water & Waste Water Treatment	2.8	3.0	3.2	3.3
Low Carbon	Additional Energy Sources	6.6	7.0	7.4	7.8
	Alternative Fuel Vehicle	8.3	8.8	9.4	9.9
	Alternative Fuels	8.7	9.2	9.8	10.4
	Building Technologies	9.6	10.2	10.8	11.5
	Carbon Capture & Storage	5.2	5.6	5.9	6.3
	Carbon Finance	12.6	13.5	14.5	15.4
	Energy Management	5.6	6.0	6.3	6.7
	Nuclear Power	5.7	6.0	6.4	6.8
Renewable Energy	Biomass	8.1	8.6	9.1	9.7
	Geothermal	8.7	9.3	9.8	10.4
	Hydro	5.7	6.1	6.4	6.8
	Photovoltaic	10.2	10.9	11.5	12.3
	Renewable Energy General Consultancy	4.4	4.6	4.9	5.2
	Wave & Tidal	8.9	9.7	10.3	11.0
	Wind	11.5	12.3	13.0	13.8

Figure 27 shows the annual forecast growth for London's LCEGS to 2023/24-2026/27 based upon the values in Table 15, which includes the forecast for Carbon Finance. The growth rates refer to the growth expected during the financial year listed.

Figure 27: London's LCEGS Forecast Sales Growth 2022/23-2023/24 to 2025/26-2026/27 (including Carbon Finance)

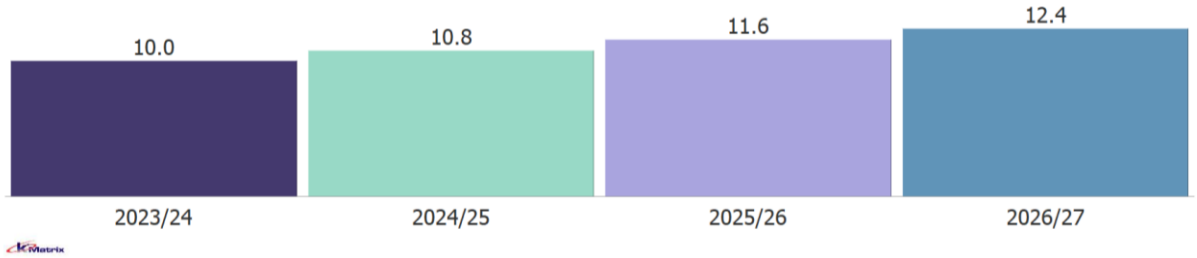
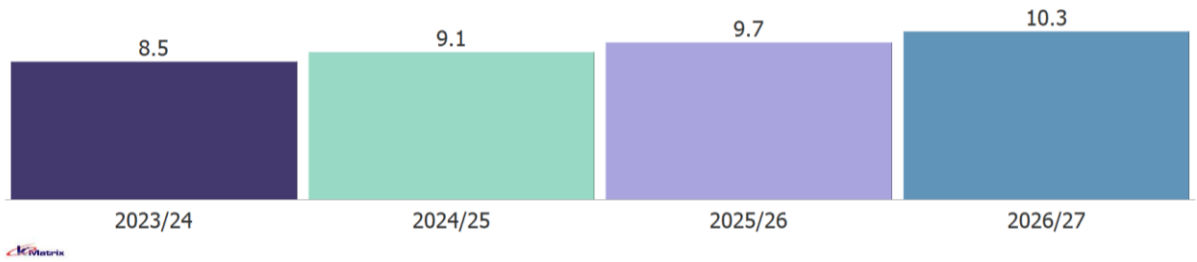


Figure 28 shows forecast growth for London's LCEGS if Carbon Finance is excluded from the predictions. This demonstrates that the sector is no longer as reliant on Carbon Finance for growth as it was in previous years.

Figure 28: London's LCEGS Forecast Sales Growth 2022/23-2023/24 to 2025/26-2026/27 (excluding Carbon Finance)



The previous report (2019/20 figures) indicated that Carbon Finance did not impact significantly on expected growth rates, however Figures 27 and 28 illustrate this has changed, with a 1.5 to 2.1 percentage point decrease in growth rates when Carbon Finance is excluded.

Table 10 indicates that the growth rates for Carbon Finance are expected to be strong, but that the growth rates for other sub-sectors such as Photovoltaic, Wind, Building Technologies, Geothermal and Wave and Tidal are also expected to be strong.

Despite this, Carbon Finance appears to be more dominant in terms of growth, with historic deviation of London's growth forecasts from those of the UK (both including and excluding carbon finance) more prominent.

Although London has become less dependent on Carbon Finance, the strength of the sub-sector coming out of the pandemic suggests it is currently helping to drive the sector. Whether London becomes less reliant on Carbon Finance as the other sub-sectors grow post-pandemic, in line with pre-pandemic trends is unknown at present.

Figure 29 shows the annual growth forecast for the UK's LCEGS from 2023/24-2026/27 and illustrates that the forecast growth for the UK is expected to be slower than that for London.

Figure 29: UK's LCEGS Forecast Sales Growth 2022/23-2023/24 to 2025/26-2026/27

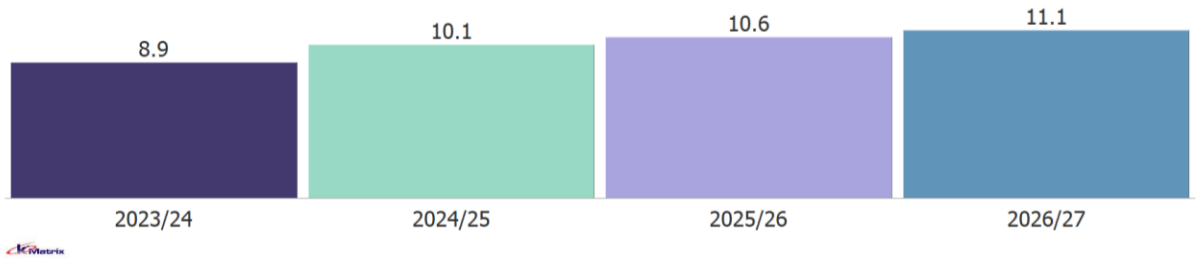
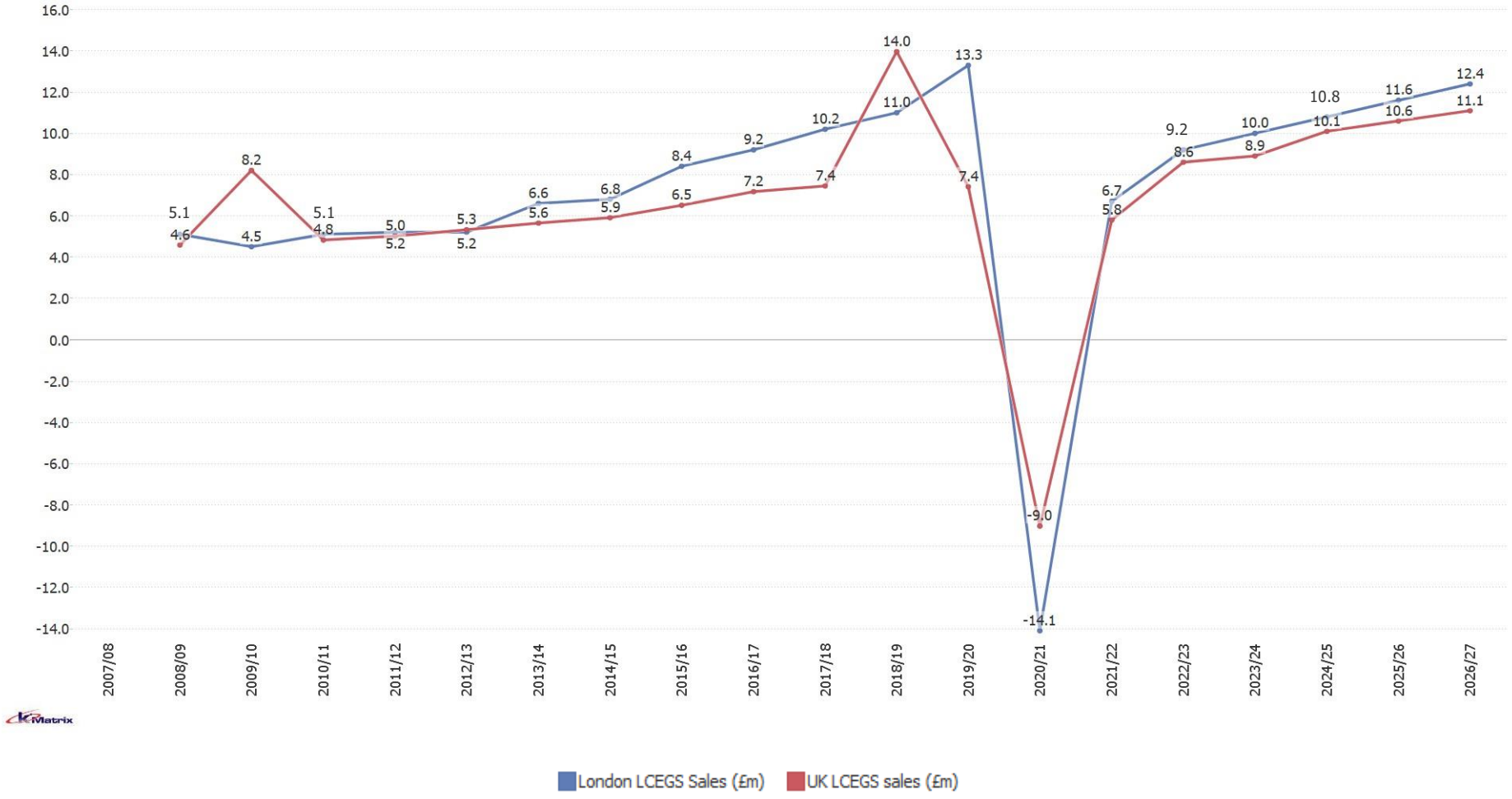

8.9
10.1
10.6
11.1
2023/24
2024/25
2025/26
2026/27

Figure 30 shows the timeline for year-on-year growth for the UK and London Sales for LCEGS from 2007-08 to 2021/22-2022/23, combined with forecast growth to 2025/26-2026/27. London has generally seen stronger growth than the rest of the UK between 2007/08 to 2022/23, had a larger contraction in 2020/21 than the rest of the UK due to the pandemic, but is expected to have stronger growth than the UK average from 2023/24 to 2026/27.

Figure 30: London's and UK's LCEGS Historical Sales Growth and Forecast Sales Growth 2023/24-2024/25 to 2025/26-2026/27

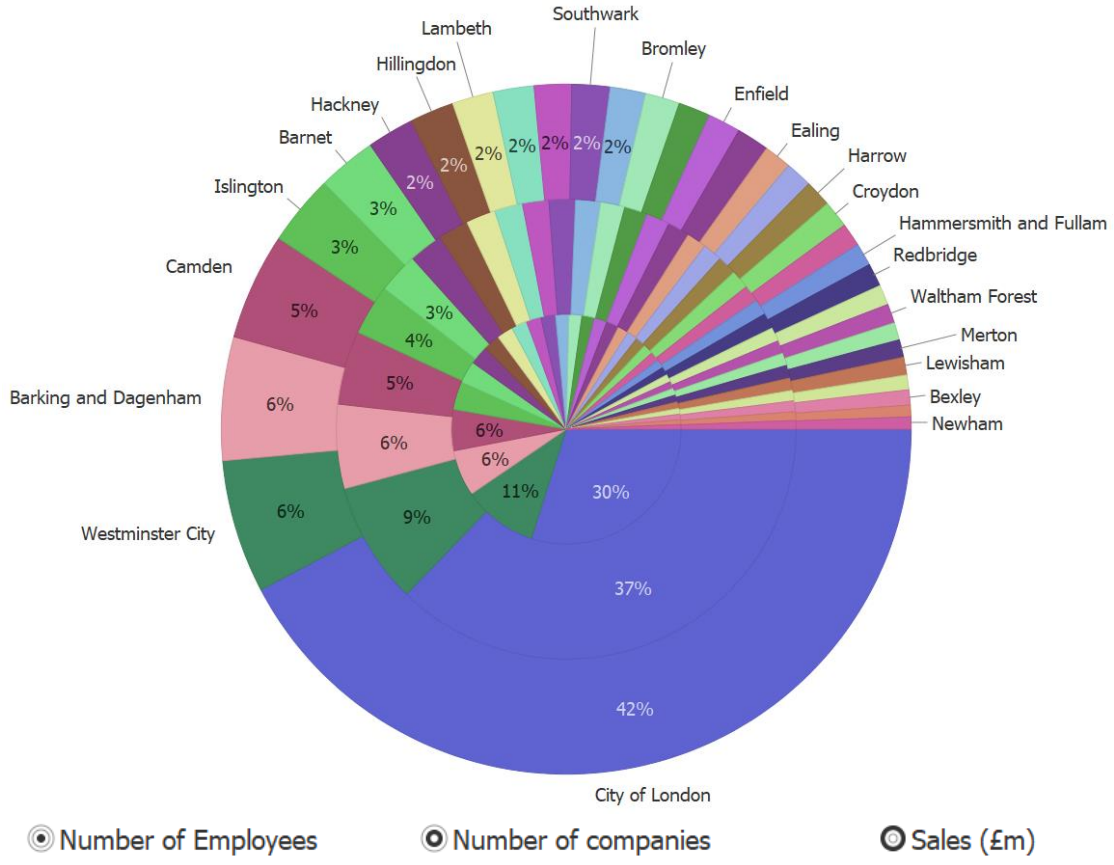


3. London's LCEGS by Local Authority

3.1 LCEGS by Local Authority

This section of the report continues the analysis of London's Local Authorities, which began in the 2014/15 report. Figure 31 shows LCEGS for 2022/23 split by Local Authority for sales (outer circle), companies (middle circle) and employment (inner circle). The City of London accounts for 42% of London LCEGS sales (40% in 2020/21), 37% of companies (36% in 2020/21) and 30% of employment (29% in 2020/21). If Carbon Finance is excluded from the analysis, then the percentage of London's LCEGS sales associated with the City of London reduces to 8% of the total sales and it is ranked fourth behind Westminster City, Barking and Dagenham and Camden (the same pattern as 2020/21). This highlights that although Carbon Finance is having a lower impact on the overall LCEGS growth rates for London than in previous years, the size of this sub-sector means it has a significant impact on the size of LCEGS within the City of London and its ranking with other Local Authorities in London.

Figure 31: London's LCEGS 2022/23 by Local Authority for Sales, Companies and Employment



Local Authorities are analysed in more detail, by year, by economic measure and by LCEGS activity in the following section.

3.2 Local Authority Analysis by Year and Sub-Sector

Table 7 shows the two years of data for Local Authorities for sales, companies and employment. Growth between years is shown in red. Growth between 2020/21 and 2022/23 across all metrics is generally similar at between 4-9% for all Local Authorities, with the City of London being an exception at 5-12%.

Table 7: Local Authorities Sales, Companies and Employment from 2020/21 to 2022/23

	Sales £m					# Companies					# Employees				
Local Authority	**2020/21**	***Growth %**	**2021/22**	***Growth %**	**2022/23**	**2020/21**	***Growth %**	**2021/22**	***Growth %**	**2022/23**	**2020/21**	***Growth %**	**2021/22**	***Growth %**	**2022/23**
Barking and Dagenham	2,549	5.8%	2,697	7.1%	2,888	986	5.4%	1,039	4.2%	1,083	17,795	5.7%	18,813	6.9%	20,106
Barnet	1,216	6.0%	1,289	7.2%	1,382	474	6.1%	503	4.1%	524	8,560	5.9%	9,064	7.1%	9,704
Bexley	313	5.8%	331	7.5%	356	126	5.9%	134	4.0%	139	2,158	5.4%	2,276	6.6%	2,425
Brent	553	6.2%	587	6.9%	628	225	6.7%	240	4.1%	250	4,000	6.0%	4,241	7.2%	4,547
Bromley	712	5.9%	754	7.1%	807	281	6.1%	298	4.0%	310	5,002	5.8%	5,292	7.1%	5,667
Camden	2,208	5.8%	2,335	7.2%	2,503	861	6.0%	913	4.0%	950	15,857	5.6%	16,751	6.8%	17,892
City of London	17,277	9.1%	18,850	12.1%	21,136	5,962	9.3%	6,513	4.6%	6,814	78,281	9.0%	85,320	11.2%	94,898
Croydon	559	5.9%	592	7.1%	634	221	5.9%	234	3.8%	243	3,952	5.7%	4,179	7.0%	4,471
Ealing	572	5.8%	605	6.5%	644	230	5.5%	243	4.2%	254	4,127	5.7%	4,363	6.9%	4,666
Enfield	672	5.9%	711	7.6%	765	276	5.8%	292	4.0%	304	4,842	5.7%	5,120	7.0%	5,477
Greenwich	305	5.6%	322	6.6%	343	122	5.7%	129	4.0%	134	2,193	5.4%	2,311	6.3%	2,456
Hackney	975	5.4%	1,028	6.6%	1,096	401	5.5%	423	4.1%	441	7,258	5.2%	7,637	6.3%	8,120
Hammersmith and Fulham	462	5.8%	489	8.1%	529	181	6.7%	193	4.4%	201	3,338	5.7%	3,529	7.1%	3,778
Haringey	363	5.5%	383	6.5%	408	147	5.3%	155	4.0%	161	2,690	5.2%	2,830	6.4%	3,010
Harrow	547	6.1%	580	7.7%	625	224	5.7%	237	3.8%	246	3,975	5.8%	4,206	7.1%	4,505
Havering	243	5.4%	256	6.5%	273	101	5.5%	107	4.5%	111	1,820	5.3%	1,916	6.6%	2,042
Hillingdon	912	5.9%	966	7.3%	1,036	355	6.0%	376	3.7%	390	6,416	5.9%	6,794	7.1%	7,280
Hounslow	485	5.8%	513	6.9%	548	197	5.5%	208	4.0%	216	3,586	5.7%	3,790	6.9%	4,052
Islington	1,458	5.5%	1,539	7.2%	1,650	591	5.6%	624	3.8%	647	10,798	5.4%	11,377	6.6%	12,128
Kensington and Chelsea	668	5.8%	707	7.4%	759	258	5.9%	273	3.8%	283	4,851	5.8%	5,130	7.1%	5,493
Kingston upon Thames	415	5.9%	439	7.2%	471	165	5.7%	174	4.0%	181	2,974	5.6%	3,141	6.9%	3,359
Lambeth	850	5.8%	899	7.5%	966	348	5.4%	367	4.0%	381	6,263	5.8%	6,625	7.0%	7,090
Lewisham	366	6.3%	389	7.2%	417	144	6.3%	153	4.1%	160	2,534	6.2%	2,691	7.5%	2,893
Merton	366	5.7%	387	6.6%	413	150	6.3%	160	4.1%	166	2,660	5.5%	2,807	6.8%	2,997
Newham	251	5.5%	265	7.2%	284	101	5.6%	106	3.9%	110	1,780	5.5%	1,877	6.9%	2,006

Redbridge	472	6.2%	501	7.8%	541	181	6.3%	193	4.3%	201	3,139	6.1%	3,330	7.3%	3,574
Richmond upon Thames	847	5.8%	896	6.8%	957	330	6.0%	350	3.6%	362	6,078	5.7%	6,423	6.8%	6,863
Southwark	786	5.8%	832	7.4%	894	311	5.4%	328	3.9%	341	5,632	5.7%	5,952	6.9%	6,362
Sutton	737	5.6%	779	6.8%	831	293	5.7%	309	4.2%	322	5,145	5.4%	5,424	6.5%	5,777
Tower Hamlets	659	5.8%	697	7.0%	745	269	5.6%	283	4.0%	295	4,940	5.7%	5,224	6.9%	5,585
Waltham Forest	397	6.1%	422	6.9%	451	151	5.9%	160	3.9%	167	2,726	5.9%	2,888	7.2%	3,095
Wandsworth	773	5.6%	817	6.7%	872	309	5.3%	325	4.0%	338	5,664	5.5%	5,975	6.7%	6,376
Westminster City	2,943	-1.0%	2,912	7.2%	3,121	1,406	5.1%	1,478	4.3%	1,541	28,680	6.0%	30,412	7.6%	32,730

* Growth between one year and the next is shown in red

Figure 32 shows the different profiles of London's Local Authorities when sales are split at Level 1. The City of London is the most extreme case due to Carbon Finance, but across Local Authorities there are significant ranges in proportions for Environmental 8-31% (8-33% in 2020/21), Low Carbon 18-57% (18-56% in 2020/21) and Renewable Energy 28-62% (27-61% in 2020/21). This highlights that London's Local Authorities are not a homogeneous market, and show subtle regional variations in activity within the LCEGS sector. This is highlighted by Figure 33 below.

Figure 32: London's Local Authorities LCEGS Sales 2022/23 (Level 1)

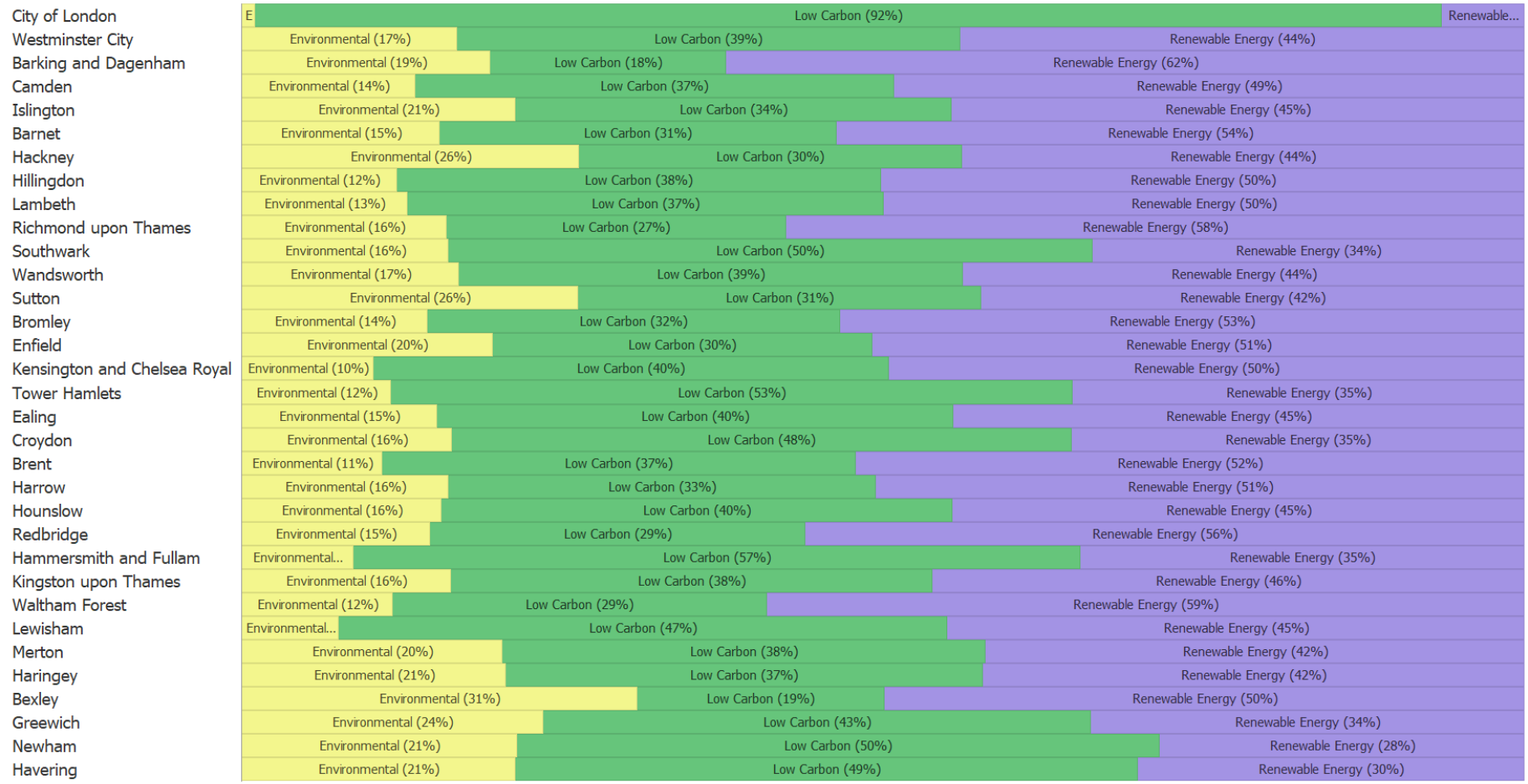
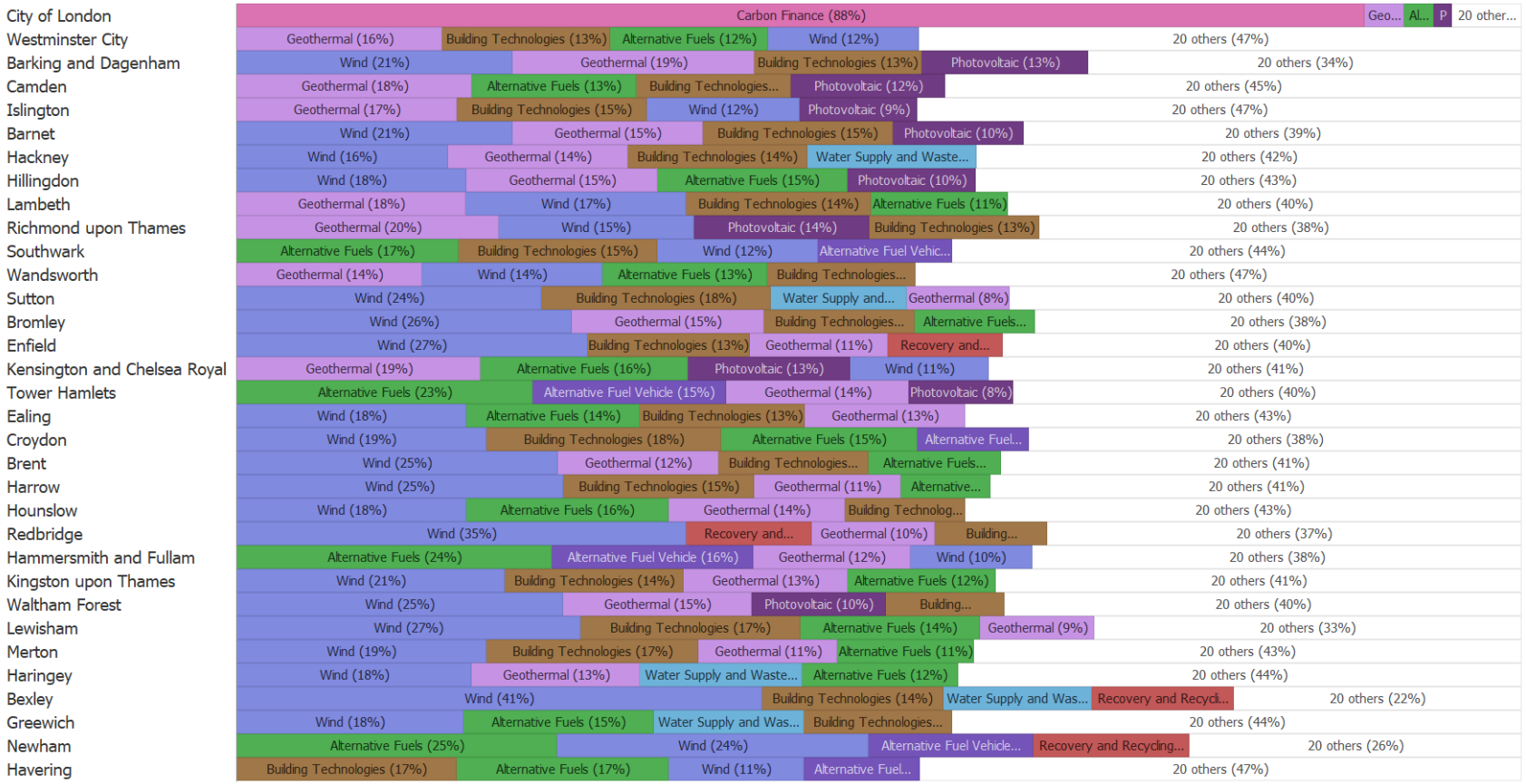


Figure 33 extends the analysis to include the Top 4 sub-sectors for each of London's Local Authorities. Typically, four sub-sectors account for over 50% of the total value, but the sub-sectors and their rankings do differ significantly across the 33 Local Authorities. But there are some consistent sub-sectors running through many of London's Local Authorities and these include Alternative Fuels, Geothermal, Wind, and Building Technologies, they are represented in most of London's Local Authorities and are consistent with London's top five sub-sectors.

Figure 33: London's Local Authorities LCEGS Sales 2022/23 at Level 2



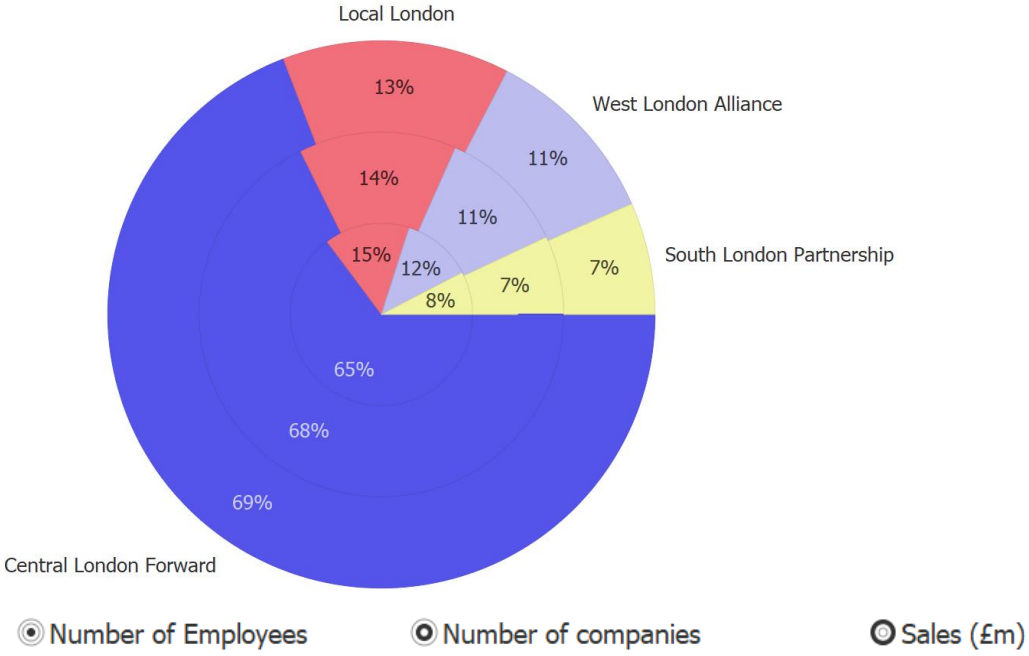
4. London's LCEGS by Sub-Region

4.1 LCEGS by London's Sub-Region

This section of the report analyses London's Local Authorities by sub-region.

Figure 34 shows LCEGS for 2022/23 split by sub-region for sales (outer circle), companies (middle circle) and employment (inner circle). Central London Forward accounts for 69% of London's LCEGS sales (68% in 2020/21), 68% of companies (67% in 2020/21) and 65% of employment (64% in 2020/21). If Carbon Finance is excluded from the analysis, then the percentage of London's LCEGS sales associated with Central London Forward reduces to 51% of the total sales, 51% of companies and 52% of employment (51% of sales, 52% of employment and 52% of companies in 2020/21). This highlights that even though Carbon Finance is having a lower impact on the overall LCEGS growth rates for London than in previous years, the size of this sub-sector means it has a significant impact on the size of LCEGS within the Central London Forward sub-region and consequently, its ranking with other sub-regions in London.

Figure 34: London's LCEGS 2022/23 by Sub-Region for Sales, Companies and Employment



London's sub-regions are analysed in more detail, by year, by economic measure and by LCEGS activity in the following section.

4.2 London's Sub-regional Analysis by Year and Sub-Sector

Table 8 shows the two years of growth data for London's sub-regions for sales, companies and employment. Growth between 2020/21 and 2022/23 across metrics are generally similar at between 4-9% for the sub-regions, with the exception of Central London Forward at 4-10%.

Table 8: London's Sub-regions Sales, Companies and Employment from 2020/21 to 2022/23

	Sales £m					# Companies					# Employees				
London Sub-region	**2020/21**	***Growth %**	**2021/22**	***Growth %**	**2022/23**	**2020/21**	***Growth %**	**2021/22**	***Growth %**	**2022/23**	**2020/21**	***Growth %**	**2021/22**	***Growth %**	**2022/23**
Central London Forward	29,325	7.0%	31,388	10.1%	34,567	11,007	7.5%	11,836	4.4%	12,352	173,447	7.2%	185,924	9.0%	202,576
Local London	5,913	5.8%	6,259	7.2%	6,708	2,325	5.7%	2,458	4.1%	2,559	41,455	5.7%	43,823	6.9%	46,847
South London Partnership	2,924	5.8%	3,093	6.9%	3,306	1,158	5.9%	1,226	3.9%	1,274	20,809	5.6%	21,974	6.8%	23,467
West London alliance	4,747	6.0%	5,030	7.2%	5,392	1,885	6.1%	2,000	4.0%	2,080	34,002	5.8%	35,987	7.1%	38,531

* Growth between one year and the next is shown in red

Figure 35 shows the different profiles of London's sub-regions when sales are split at Level 1. Central London Forward is the most extreme case due to Carbon Finance, but across the sub-regions there are significant ranges in proportions for Environmental 14-19% (15-20% in 2020/21), Low Carbon 27-38% (27-38% in 2020/21) and Renewable Energy 46-54% (45-53% in 2020/21). This highlights that London's sub-regions are not a homogeneous market, but they actually show subtle regional variations in activity within the LCEGS sector. This is further confirmed by Figure 36 below.

Figure 35: London's Sub-regions LCEGS Sales 2022/23 (Level 1)

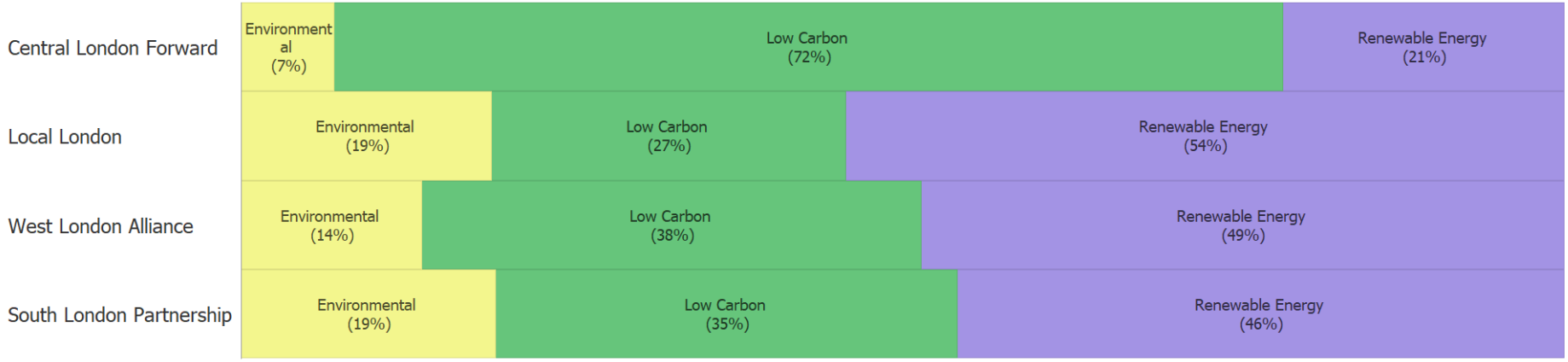
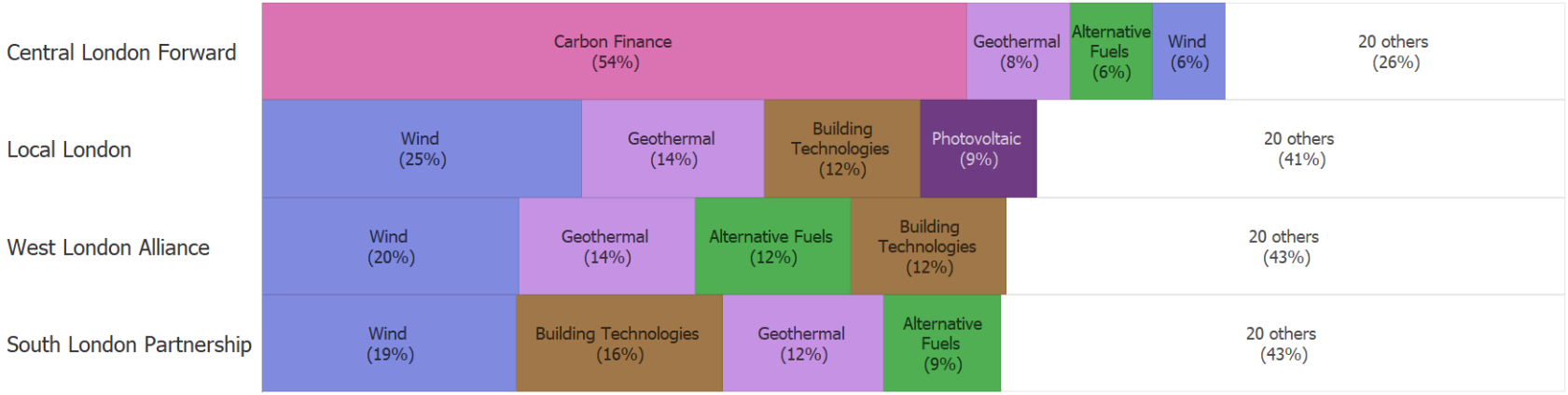


Figure 36 extends the analysis to include the Top 4 sub-sectors for each of London's sub-regions. Typically, four sub-sectors account for over 55% of the total value, whilst the sub-sectors are similar, their rankings do differ across the 4 sub-regions. As would be expected these are consistent with the sub-sectors running through many of London's Local Authorities, these being Alternative Fuels, Geothermal, Wind and Building Technologies; and are consistent with London's top five sub-sectors.

Figure 36: London's Local Authorities LCEGS Sales 2022/23 at Level 2



5. London Sub-regions LCEGS Timeseries

Figure 37 LCEGS London Sub-regions – Total Sales (£m)

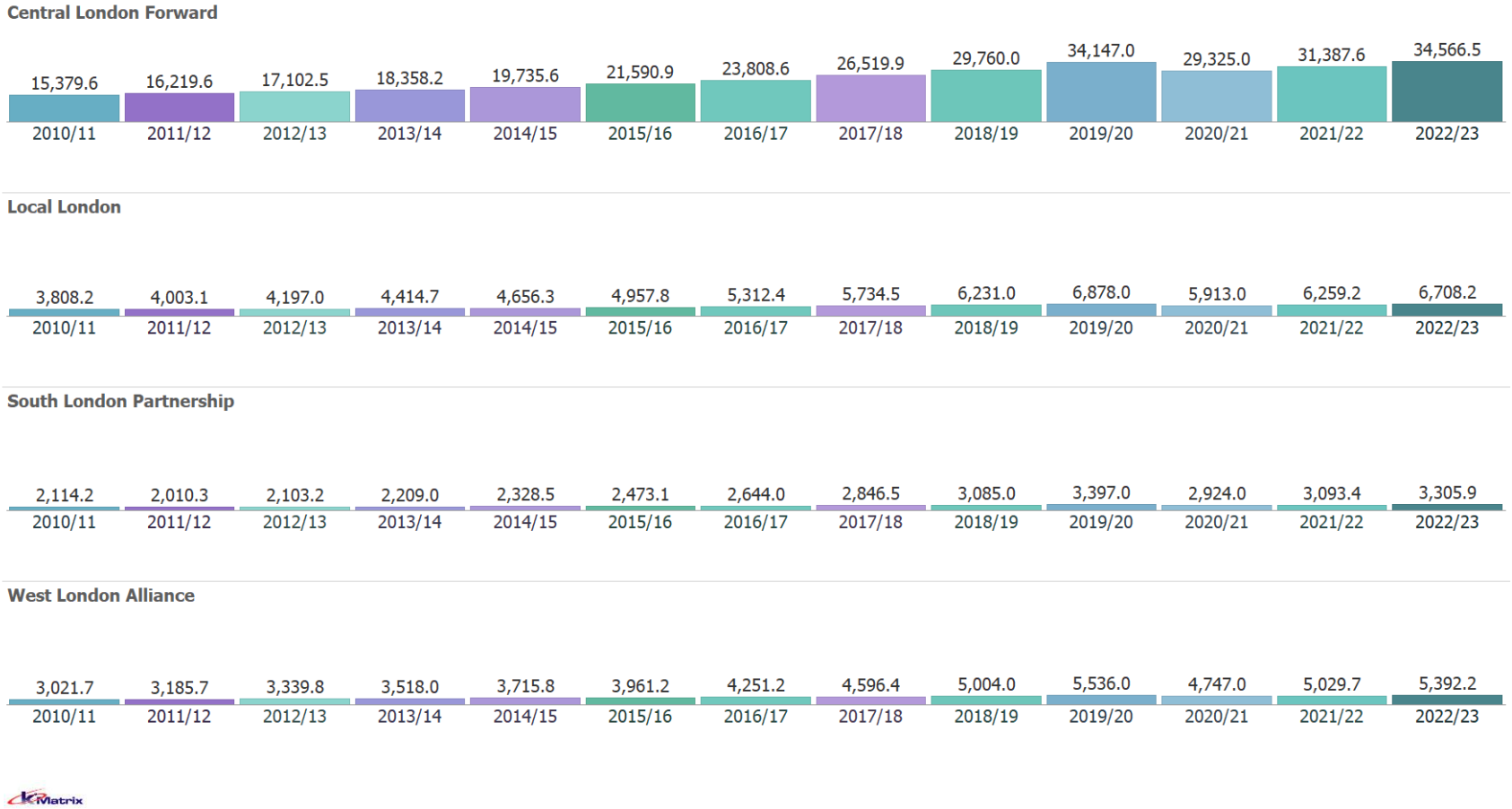


Figure 37 illustrates the year-on-year growth of sales for the LCEGS sector in the four London Sub-regions. Central London Forward grew 125%, Local London grew by 76%, South London Partnership by 56% and West London Alliance by 78% between 2010/11 and 2022/23. This compares with London growth of 107% and UK growth of 94% 2010/11 and 2022/23.

Figure 38: LCEGS London Sub-regions – Total Number of Companies

Figure 38 illustrates the year-on-year growth of companies for the LCEGS sector in the four London Sub-regions. Central London Forward grew 117%, Local London grew by 67%, South London Partnership by 47% and West London Alliance by 69% between 2010/11 and 2022/23. This compares with London growth of 98% and UK growth of 78% 2010/11 and 2022/23.

Figure 39: LCEGS London Sub-regions – Total Number of Employees

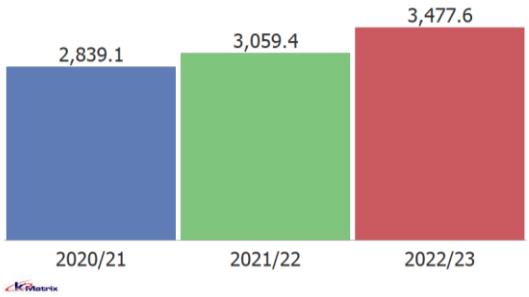
Figure 39 illustrates the year-on-year growth of employment for the LCEGS sector in the four London Sub-regions. Central London Forward grew 110%, Local London grew by 61%, South London Partnership by 44% and West London Alliance by 65% between 2010/11 and 2022/23. This compares with London growth of 90% and UK growth of 77% 2010/11 and 2022/23.

6. London's LCEGS and International Trade

6.1 London's LCEGS Exports

This section of the report addresses London's LCEGS Exports over the past two years when compared with UK totals and then identifies leading LCEGS export products and services.

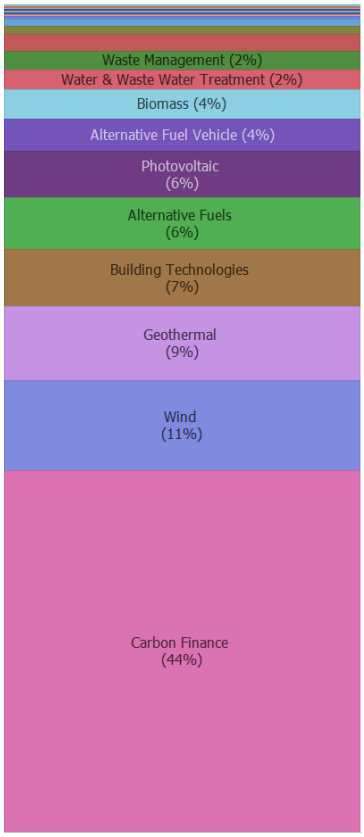
Figure 40: London's Exports (£m) 2020/21 to 2022/23



The value of London's LCEGS Exports was £3.5bn in 2022/23, up from £2.8bn in 2020/21, which had contracted from £3.4bn in 2019/20 due to the Covid-19 pandemic (see previous report).

Growth was -15.6% from 2019/20 to 2020/21, 7.8% from 2020/21 to 2021/22 and 13.7% from 2021/22 to 2022/23. This is compared to UK growth of approximately -6.4%, 5.8% and 8.0% respectively.

Figure 41: London's Exports (%) by Sub-Sector 2022/23



London represented 22% of all UK LCEGS exports in 2022/23 (22% in 2019/20, up from 18% in 2011/12). It is slightly higher than London's 21% of overall UK Sales for that year. This means that although historically London's companies have had a slightly smaller share of the export market than the UK market, they now hold a slightly higher share of the export market.

Figure 41 shows the proportion of London LCEGS exports by Level 2 sub-sector for 2022/23, with Carbon Finance 44% (42% in 2020/21); Wind 11%; Geothermal 9%; Building Technologies 7%; and Alternative Fuels 6% being the leading sub-sectors and accounting for 77% of all London LCEGS exports (75% in 2020/21).

Figure 41 illustrates how Carbon Finance exports continue to grow, when compared with previous reports. In 2015/16 Carbon Finance was not in the top 5 sub-sectors but by 2017/18 it held 35% of the export market, in 2019/20 it held 40%, in 2020/21 it held 42%.

The large increase in exports in Carbon Finance is due to a significant increase in the number of financial institutions that are dealing with Carbon Finance in export markets, with further increases in the consulting arena.

In Table 9 London's LCEGS exports are shown by sub-sector for each of the three years of the report and have been expressed as a percentage of that sub-sector's overall Sales.

Table 9: London's LCEGS Exports as a % of Sales 2020/21 to 2022/23

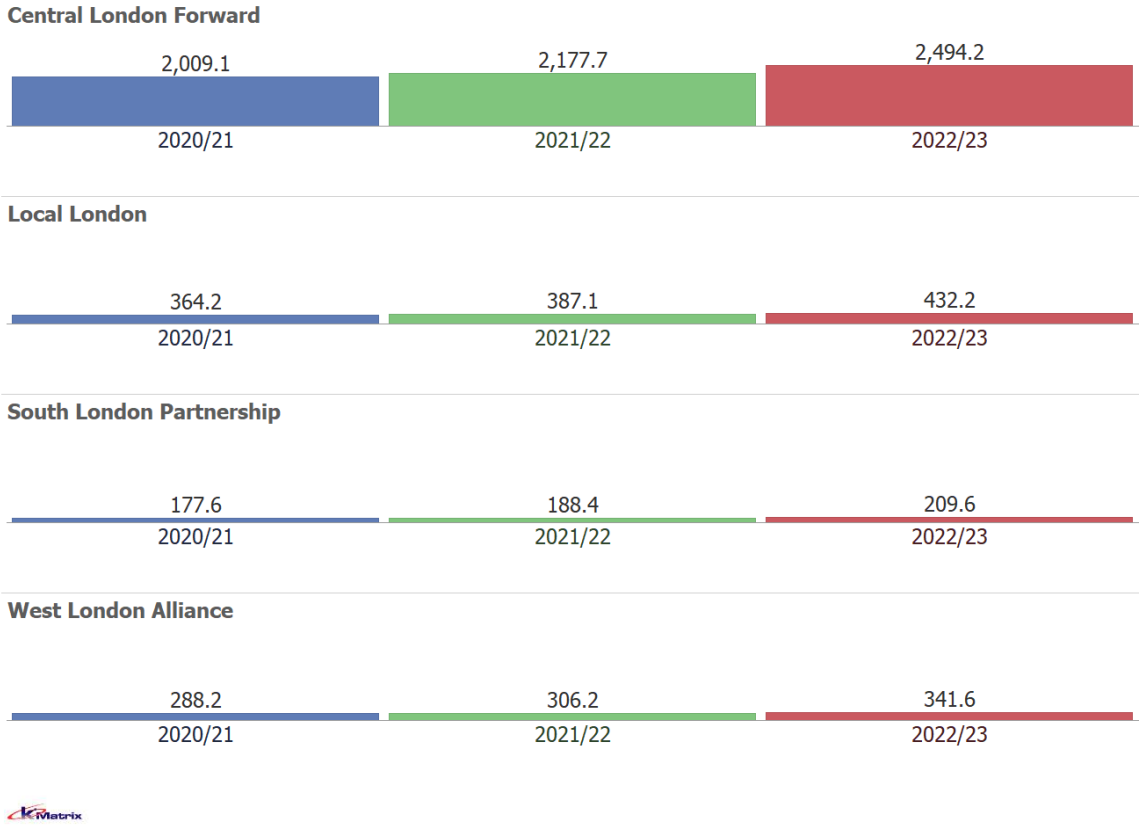
		2020/21			2021/22			2022/23		
Level 1	**Level 2**	**Sales £m**	**Exports £m**	**Exports as a % of Sales**	**Sales £m**	**Exports £m**	**Exports as a % of Sales**	**Sales £m**	**Exports £m**	**Exports as a % of Sales**
Environmental	Air Pollution	117.1	5.8	5.0%	120.2	6.0	5.0%	124.2	6.3	5.1%
	Contaminated Land	111.1	6.0	5.4%	114.9	6.2	5.4%	119.7	6.6	5.5%
	Environmental Consultancy	145.8	7.9	5.4%	151.1	8.2	5.4%	157.2	8.8	5.6%
	Environmental Monitoring	31.8	1.7	5.3%	32.9	1.8	5.4%	34.3	1.9	5.5%
	Marine Pollution Control	22.5	1.2	5.4%	23.4	1.3	5.4%	24.4	1.3	5.5%
	Noise & Vibration Control	68.7	4.1	5.9%	71.3	4.2	5.9%	74.2	4.5	6.1%
	Recovery and Recycling	1,207.2	65.5	5.4%	1,252.0	68.1	5.4%	1,309.8	72.7	5.6%
	Waste Management	1,434.6	73.0	5.1%	1,479.4	75.4	5.1%	1,535.2	79.4	5.2%
	Water & Waste Water Treatment	1,612.0	78.0	4.8%	1,642.5	79.5	4.8%	1,677.1	82.5	4.9%
Low Carbon	Additional Energy Sources	200.3	10.8	5.4%	209.4	11.3	5.4%	220.9	12.2	5.5%
	Alternative Fuel Vehicle	1,930.3	115.0	6.0%	2,037.6	122.1	6.0%	2,176.5	135.9	6.2%
	Alternative Fuels	3,125.9	184.5	5.9%	3,314.4	195.9	5.9%	3,553.1	217.9	6.1%
	Building Technologies	3,271.0	200.6	6.1%	3,487.2	213.9	6.1%	3,774.4	240.6	6.4%
	Carbon Capture & Storage	69.0	3.9	5.6%	71.6	4.0	5.6%	74.7	4.3	5.7%
	Carbon Finance	15,438.2	1,178.3	7.6%	16,715.4	1,299.3	7.8%	18,892.8	1,520.6	8.0%
	Energy Management	475.0	25.6	5.4%	493.6	26.6	5.4%	516.4	28.5	5.5%
	Nuclear Power	526.3	29.5	5.6%	546.7	30.6	5.6%	572.6	32.8	5.7%
Renewable Energy	Biomass	1,666.7	106.5	6.4%	1,758.8	112.3	6.4%	1,876.8	124.3	6.6%
	Geothermal	4,250.8	264.7	6.2%	4,506.0	279.9	6.2%	4,826.5	311.4	6.5%
	Hydro	124.7	6.6	5.3%	129.5	6.9	5.3%	135.3	7.4	5.5%
	Photovoltaic	2,485.7	158.3	6.4%	2,663.5	169.4	6.4%	2,882.7	192.2	6.7%
	Renewable Consultancy	99.9	5.4	5.5%	102.9	5.6	5.5%	107.0	5.9	5.5%
	Wave & Tidal	18.3	1.2	6.5%	19.5	1.3	6.5%	20.9	1.4	6.8%
	Wind	4,476.3	305.0	6.8%	4,826.2	329.8	6.8%	5,286.2	378.0	7.2%
Total		**42,909.2**	**2,839.1**	**6.6%**	**45,770.0**	**3,059.4**	**6.7%**	**49,972.8**	**3,477.6**	**7.0%**

Table 9 shows the average for 2022/23 is 7.0%, with generally less than 1.5 percentage point variation between sub-sectors, which is consistent with 2018/19 and indicates a stable and established export market.

6.2 London Sub-regions' LCEGS Exports

This section of the report addresses London sub-regions' LCEGS Exports over the past two years and then identifies leading LCEGS export products and services.

Figure 42: London Sub-regions' Exports (£m) 2020/21 to 2022/23



The value of Central London Forward Exports was £2.5bn in 2022/23, up from £2.0bn in 2020/21. They grew 8.4% from 2020/21 to 2021/22 and 14.5% from 2021/22 to 2022/23.

The value of Local London Exports was £432m in 2022/23, up from £364m in 2020/21. They grew 6.3% from 2020/21 to 2021/22 and 11.7% from 2021/22 to 2022/23.

The value of South London Partnership Exports was £210m in 2022/23, up from £178m in 2020/21. They grew 6.1% from 2020/21 to 2021/22 and 11.4% from 2021/22 to 2022/23.

The value of West London Alliance Exports was £342m in 2022/23, up from £288m in 2020/21. They grew 6.2% from 2020/21 to 2021/22 and 11.6% from 2021/22 to 2022/23.

This is compared to London growth of 7.8% and 13.7% respectively.

Figure 43: London Sub-regions' Exports (%) by Sub-Sector 2022/23

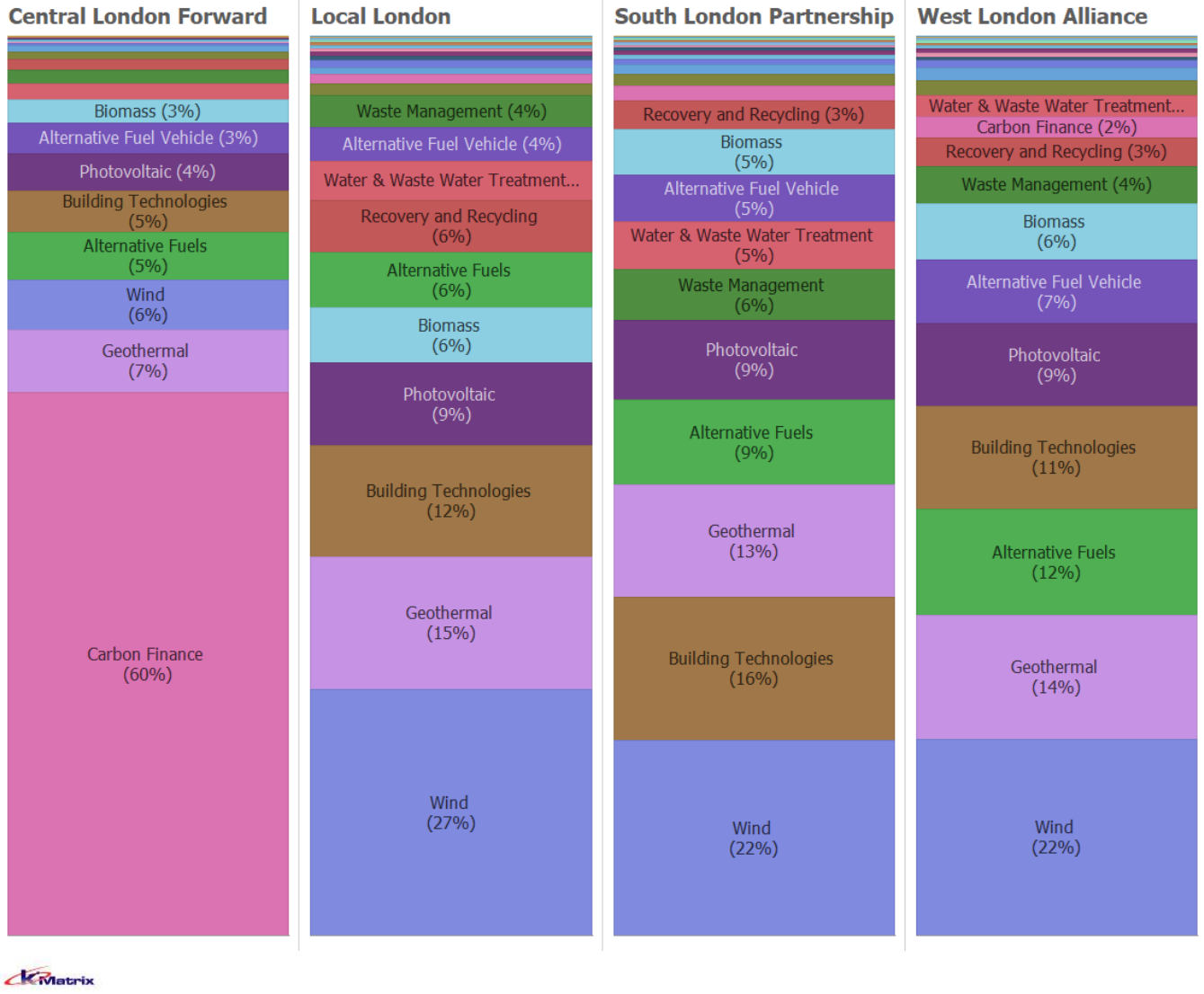


Figure 43 illustrates the proportion of LCEGS exports varies significantly by sub-regions, in line with sales.

Central London Forward is dominated by Carbon Finance 60%; with Geothermal 7%; Wind 6%; Alternative Fuels 5%; and Photovoltaic 4% the leading sub-sectors, accounting for 92% of exports.

The top five exporting sub-sectors in Local London are: Wind 27%; Geothermal 15%; Building Technologies 12%; Photovoltaic 9%; and Biomass 6%, accounting for 69% of exports.

The top five exporting sub-sectors in South London Partnership are: Wind 22%; Building Technologies 16%; Geothermal 13%; Alternative Fuels 9%; and Photovoltaic 9%, accounting for 69% of exports.

The top five exporting sub-sectors in Local London are: Wind 22%; Geothermal 14%; Alternative Fuels 12%; Building Technologies 11%; and Photovoltaic 9%, accounting for 68% of exports.

Appendix 1 - LCEGS Sector Definition

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

- The Environmental sub-sector is made up of the following: Air Pollution Control, Contaminated Land Reclamation & Remediation, Environmental Consultancy, Environmental Monitoring, Marine Pollution Control, Noise & Vibration Control, Recovery & Recycling, Waste Management and Water Supply & Waste Water Treatment
- The Renewable Energy sub-sector is made up of the following: Biomass, Geothermal, Hydro, Photovoltaic, Renewable Energy Consultancy, Wave & Tidal and Wind
- The Low Carbon sub-sector is made up of the following: Additional Energy Sources, Alternative Fuels & Vehicles, Alternative Fuels, Building Technologies, Carbon Capture & Storage, Carbon Finance, Energy Management and Nuclear Power

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

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

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

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

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

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

Further detail on the Level 2 sub-sectors are provided below in their Level 1 groupings:

Environmental

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

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

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

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

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

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

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

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

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

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

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

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

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

- Consulting and training - consulting, publications, training and noise monitoring services

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

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

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

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

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

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

- Consulting and training - engineering and water management training, publishing and specialist consulting for water systems treatment, management and engineering

Renewable Energy

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

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

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

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

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

- Turbines - manufacture, supply, installation and maintenance of turbine generators, control systems, spares and structural supports and fittings
- Dams & structures - manufacture, supply, installation and maintenance of dam operational systems, control systems, maintenance services and sluice gates and actuators
- Pumping & lubrication - manufacture, supply, installation and maintenance of pumps, spares, storage and lubrication systems and spares
- Electricity supply - manufacture, supply, installation and maintenance of power factor, power distribution and grid connections and supporting structures

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

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

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

- Chemicals - production and supply of solar chemicals and solar pond salt
- Systems & equipment - manufacture, supply, installation and maintenance of active and batch systems, clerestory windows, light shelves and tubes, solar box cookers, solar combi-systems and solar lighting design
- R&D - solar power and solar car research
- Photovoltaic cells - manufacture, supply, installation and maintenance of photovoltaic modules, mounting systems, ancillary components, cells and cell materials
- Other equipment & chemicals - manufacture, supply, installation and maintenance of glass houses, convection towers, heliostats, parabolic collectors, turbines, trough collectors, towers and solar trackers

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

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

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

- Turbines & generators - the manufacture, supply, installation and maintenance of tidal turbines, structural supports and fittings, spares and turbine control systems
- Pumps & equipment - the manufacture, supply, installation and maintenance of pumps and pump spares

- Two basin schemes - provision of structural engineering and field maintenance services
- Ebb & flow systems - manufacture, supply, installation and maintenance of ebb and flood generation systems
- Assessment & Measurement - waves, water levels, turbidity, tidal energy, sediment, salinity pollutants, fish stocks monitoring and local/ global environmental impact assessment
- Other general services - financial planning, operational and maintenance services

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

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

Low Carbon

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

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

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

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

- Alternative Fuels includes the production, supply and distribution of Natural Gas (Compressed or Liquefied), Synthetic Fuel and Auto Gas (LPG, LP Gas or Propane)
- Other Fuels and Vehicles includes vehicle technologies and fuel sources that are still at an early stage
- Research, Design, Development and Prototyping activities are included for: Hydrogen fuel cells and hydrogen internal combustion, Electric, Hybrid Electric, Steam powered, Organic waste fuel, Wood gas, Solar powered and Air, Spring & Wind powered vehicles

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

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

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

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

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

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

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

- Carbon credits finance and fund management - land, project or general trading services from finance houses and investment funds
- Carbon credits trading - development and supply of trading systems, land/project/general trading houses and transactions
- Carbon market intelligence - carbon markets analysis & reporting and carbon trading by forecasting and reporting from journals, online, data providers or other publishing sources

- Projects and verification - data collection, verification, legal, project development, capacity development and carbon declaration services
- Press and journalism - financial press and periodicals, other journals, data providers and online services

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

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

Appendix 2 - The kMatrix Methodology

2.1 Introduction

This sector (until 2015) has not been well documented by government statistics, so the methodology works beyond standard industrial and market classifications and looks for multiple sources of industrial-based evidence to quantify market values. kMatrix is unique in how it identifies, assembles, evaluates, monitors and develops rules for the use of those sources to quantify 'difficult-to-measure' markets.

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

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

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

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

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

2.2 Measures

Throughout this dataset the focus is on a small number of key measures. To summarise, these are:

Sales – This is the estimate (in £m) of economic activity by identified companies in a defined region within the supply/value chain for market products and services. The estimate is based upon where sales activity takes place rather than where it is reported.

Companies – This is a measure of the total number of companies in a defined region that match, or fit within, the market activity headings.

Employment – This is a measure of the estimated employment numbers across all aspects of the supply/value chain. National, regional and other economic data sources have been used to estimate current employment levels for each area of market activity.

Growth – This is a multi-year measure that includes historical AND forecast growth. The growth measure is derived from live, rapidly changing and multi-sourced data links and is specifically based upon growth in Sales. Growth is generally a measure of increased market opportunity and can be used for trend analysis, comparison across different markets or as a moving indicator of market confidence (growth time series).

Exports – This is a measure of products and services sold overseas and is calculated using in-country/out-of-country data and additional data from the logistics and freight forwarding industry.

2.3 kMatrix's Methodology

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

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

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

This is an iterative process that continues until they arrive at robust values and comparisons for all activities within the sector (comparative values of Wind vs. Photovoltaic vs. Biomass) that can then be meaningfully compared across global economies (UK vs. US vs. China etc.) and across different sectors (environmental consultancy vs. other specialist consulting activities). It is important that the methodology triangulates economic values in this way so that they:

a) Can exclude the research bias that often occurs from focusing on a single sector in a single country and
b) Ensure that they are effectively monitoring a sector that is still evolving by absorbing activities often included in other sectors.

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

As they derive the financial value for the sector they also assemble and assess the UK company base that is contributing to this value. In the first case they identify all "significant" or "specialist" companies, these are companies where LCEGS account for over 80% of company sales, and then the supply/value chain companies where LCEGS sales is an

important and measurable component of their overall sales - (over 20%). These percentages are indicative and vary for different LCEGS activities.

Companies

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

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

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

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

Employment

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

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

Growth

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

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

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

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

Geography

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

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

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

Appendix 3 – LCEGS and Office of National Statistics Environmental Goods and Services Sector Comparison

The purpose of this appendix is to provide a brief description of some of the differences between the Office of National Statistics (ONS) Environmental Goods and Services Sector (EGSS) data and the LCEGS data provided by kMatrix. The two methodologies differ in the way data is collected, their methodologies, and in terms of their sector definitions.

kMatrix is a data house that specialises in providing evidential data for business modelling and analysis on a multi-sectoral basis. We provide back room services to the likes of Deloitte and PWC amongst others in the UK, New Zealand, Australia, US and the EU for sectoral analysis and due diligence for sectoral development and investment. We also provide our business and technology profiling services through these channels to market, as well as direct to universities for technology spinouts and individual businesses for development purposes. Further customers include government departments such as BEIS, Home Office and various local and regional government departments.

The ONS EGSS data is produced primarily for the purpose of national accounting. It is sector-specific, using narrow sector definitions and takes no account of the value or supply chains in a sector. In contrast, the kMatrix methodology was originally designed to help companies by measuring technologies or activities using small taxonomies, to assist with investment and developmental planning. This capability was expanded to provide market data for a number of economic sectors, by creating larger taxonomies to capture as much of the market as possible, including the supply and value chains. Each taxonomy for a sector will draw relevant activities from many other sectors, to fully capture all activity. In this way, the LCEGS taxonomy captures activities across multiple sectors and down the value and supply chains. This difference in *what* is being measured is the fundamental reason why the definitions used by ONS and LCEGS do not align.

The kMatrix methodology uses a unique process of 'triangulation' to measure metrics such as employment and other characteristics of a sector at varying levels of detail. This process has been developed over 30 years and has been adopted by various governments, universities and major corporates to provide economic industry data for hard to measure sectors. It is similar in concept to the triangulation of satellites to work GPS satellite navigation systems. The methodology uses multiple data points which can be economic or non-economic in origin, from a number of different sources to 'triangulate' the value of a product or service in question.

This process is different to the methodology used by the ONS to produce the EGSS data, predominantly because the ONS data relies on self-certification of companies into SIC codes, whereas the kMatrix methodology calculates values based on multiple sources of data. The ONS data is based on where companies choose to classify themselves. kMatrix data looks at the activities of companies and attributes those activities to different sub-sectors. In effect, the ONS system is limited to the ability or willingness of companies to list which sectors their products or services are used in, this method is likely to produce both over and underestimates of market size as companies will attribute more or less of their activities to relevant SIC codes. The kMatrix methodology does not rely on company cooperation but looks at their activities and breaks them down into the levels or sub-sectors they are relevant to.

The kMatrix process operates on a 'bottom up' basis, meaning we look at products and services delivered, rather than company classifications and turnover, which is classed as 'top down' (SIC system). The bottom up process was developed to assist individual companies based on sectoral

analysis findings and provide evidential data and advice. By looking at the sector from the bottom up (by each activity, product or service), the sector can be determined in accordance with the relevant sector definition, whilst allowing the flexibility to 'add in' or 'opt out' of various activities depending on the purpose of the reporting. ONS data itself is not used to produce kMatrix figures, but the kMatrix values can be reported out through the ONS classification system if required.

Table 1 shows a comparison between employment analysis for the London region using the SIC classification methodology and the kMatrix methodology for the Manufacturing sector and the Construction sector.

Table 1: Comparison of 2011 - 2016 Employment Data for SIC and kMatrix in London

Methodology	Sector	2011 Jobs	2012 Jobs	2013 Jobs	2014 Jobs	2015 Jobs	2016 Jobs
SIC based	Manufacturing	106,750	108,250	106,750	112,000	108,000	105,250
SIC based	Construction	133,250	150,500	146,500	146,250	145,250	155,750
kMatrix	Manufacturing	137,351	135,943	138,951	141,873	140,308	131,230
kMatrix	Construction	166,629	195,334	177,915	184,022	184,317	199,038
Indexed numbers for the rows above show that growth in the manufacturing and construction sectors is similar for both the SIC and kMatrix definitions		100	101.4	100.0	104.9	101.2	98.6
		100	112.9	109.9	109.8	109.0	116.9
		100	99.0	101.2	103.3	102.2	95.5
		100	117.2	106.8	110.4	110.6	119.4

Sector - LCEGS is made up of elements from many different traditional sectors (including manufacturing, finance, construction, consulting and energy) therefore as a grouping it includes products and services from those sectors that together amount to the total value of the LCEGS grouping.
Scale - The ONS system only produces estimates of the sector size at the country level, whereas the LCEGS data can be provided by Country, Region, City, Local Authority etc.

Table 2 shows a summary of the main differences between the kMatrix data and the ONS EGSS data.

Table 2: kMatrix and ONS – EGSS Comparison Summary Table

	kMatrix - LCEGS	ONS - EGSS
Sector definition	The LCEGS sector includes the EGSS definition but expands it to include all activities that contribute and enable growth in the sector. Those elements which are excluded from EGSS which are produced for purposes that, while beneficial	The environmental goods and services sector is made up of areas of the economy engaged in producing goods and services for environmental protection purposes, as well as those engaged in conserving and maintaining natural resources.

	to the environment, primarily satisfy technical, human and economic needs or that are requirements for health and safety are included in LCEGS if they contribute to the sector. For more information please see Appendix 3 and Appendix 4 of this report.	Excluded from the scope of EGSS are goods and services produced for purposes that, while beneficial to the environment, primarily satisfy technical, human and economic needs or that are requirements for health and safety.
Sector size measurement	Triangulation of data from multiple sources	Company surveys via company self-certification
Sector sales coverage	Full value of sales for the sector, including supply and value chain	Only sector sales, not including supply or value chains
Geographic range of coverage	Global, Country, Regional, City & Local Authority	Country
Available data includes	Sales, number of employees, number of companies, exports, growth rates (historical and forecast) & 60+ more metrics	Output, GVA, employee count and exports
For further information and detail on the ONS – EGSS definition: https://www.ons.gov.uk/economy/environmentalaccounts/bulletins/ukenvironmentalaccounts/2010to2015		