London's Low Carbon Market Snapshot

Low Carbon Environmental Goods and Services (LCEGS)

Disclaimer

kMatrix

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Executive Summary

London's Low Carbon and Environmental Goods and Services (LCEGS) sector was worth around £50.0bn to London's economy in 2019/20, as indicated by the value of sales in the sector. These sales were generated by over 17,000 businesses that employed over 300,000 people in the sector in 2019/20.

The report looks to contextualize the size and value of the LCEGS sector within London's wider economy by using the same kMatrix methodology to quantify the size of London's economy and some of its sectors. In 2019/20 London's economy was worth £550.8bn in sales and this shows that the LCEGS sector makes up around 9.1% of London's overall economy when measured by the value of sales. In 2019/20 the LCEGS sector was worth around £50bn and the following sectors have been quantified to give additional context: the Manufacturing sector (excluding assembly) was worth £11.7bn in sales, Construction sector £29.3bn in sales, ICT £32.7bn in sales and Retail £100.4bn in sales.

London's Impact on Regional Chains and Networks of Supply

The report also looked at the impact that London's LCEGS sector had on regional chains and networks of supply across the country, to understand the economic benefit that activity in London has on regional economies. This supports the premise that investing in London supports the levelling-up agenda by providing opportunities for regional chains and networks of supply. It was estimated that London's £50.0bn of sales in 2019/20 generated a further £14.5bn in sales, or an additional 29% in terms of sales, within the chains and networks of supply in the regions outside of London.

Growing London's green economy

In 2020 the Mayor set a target for his Green New Deal mission to double the size of London's green economy by 2030 as part of London's green and fair recovery. It was decided that sales in the LCEGS sector should be used as a proxy for the green economy in London, due to the length of the time series that is held on London's LCEGS sector along with the quality and replicability of the dataset. There are numerous other datasets and approaches that differ from LCEGS in the way they collect data, their methodologies, and in terms of their sector definitions that can also provide useful insights into the green economy. For example, the Office of National Statistics (ONS) Environmental Goods and Services Sector (EGSS) data is produced primarily for the purpose of national accounting and is sector-specific, using Standard Industry Codes (SIC) that are narrow sector definitions that take no account of the value or supply chains in a sector. For more information on the differences please see Appendix 3. Analysis into net zero pathways[1] to support the Mayor's 2030 net zero target and 'Green Jobs and Skills in London' illustrate that the total number of green jobs could grow by hundreds of thousands in the sector by 2030[2].

The LCEGS sector doubled in size from around £23bn to around £50bn between 2009/10 and 2019/20 and saw annual growth rates ranging between 4% and 10% during the decade. Based on growing climate commitments internationally, nationally and within London along with historical growth trends in the sector, a target was set as part of London's green recovery from the pandemic to double the value of the green economy by 2030 (measured by the value of LCEGS sales). The

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[1] [Pathways to Net Zero Carbon by 2030 | London City Hall](#)

[2] [Green-Jobs-and-Skills-in-London-Final-Report-1.pdf (wpieconomics.com)](#)

Green New Deal[3] and Helping Londoners into Good Work[4] missions are both focused on supporting this goal.

At the beginning of the pandemic, 2019/20, London's LCEGS sector was worth just under £50bn. The size of the LCEGS sector will be measured each year during the 2020s and presented in periodic updates to the London Low Carbon Market Snapshot report to show progress towards this 2030 target. The impact of the pandemic meant that the value of the sector fell from around £50bn in 2019/20 to around £43bn in 2020/21. Forecast growth post-pandemic (2021/22 onwards) is expected to build from nearly 4% in 2021/22 to over 8% in 2025/26, which will be back to an annual rate of growth similar to that seen in the sector pre-pandemic.

Impact of Covid-19 in 2020/21

The most recent financial year for this 3-year sector update is 2020/21. This year was the beginning of the Covid-19 pandemic which had a considerable impact on the economy as a whole, as well as this sector, with decreased sales and a proportion of the workforce on furlough across the economy.

The sector was impacted by sales falling from £50.0bn in 2019/20 to £42.9bn in 2020/21, the number of businesses falling from over 17,000 in 2019/20 to 16,376 in 2020/21 and employment also falling from over 300,000 in 2019/20 to approximately 246,000 in 2020/21.

Forecasts for the sector are favorable with the impact expected to only last years and not decades, so whilst 2020/21 figures are reported throughout this report, the forecasts within the report have been made on the basis of the sector data time-series from 2007/08 through to 2019/20, with 2020/21 being treated as an outlier. Further detail on this rationale can be found in the introduction.

Sales and growth

The Low Carbon and Environmental Goods and Services sector in London continued to grow year on year between 2007/08 and 2019/20. In 2007/08 total sales in the sector were worth £20.9bn, in 2019/20 they were worth £50.0bn before falling to £42.9bn in 2020/21, the first year of the pandemic. This meant that the sector had shrunk to just below the £44bn of sales seen in 2018/19.

The sector in London grew by over 11.0% a year in the two years prior to the pandemic, 2017/18 to 2019/20, and even when Carbon Finance was excluded the rest of the sector grew by over 8%. Then London's sales contracted for the first time since the time series began in 2007/08 as a consequence of the pandemic, meaning that growth was negative at -14.1% in London and -9.0% for the UK as a whole.

The sector showed resilience during the economic downturn and although impacted heavily by the Covid-19 pandemic, it is expected to demonstrate a strong recovery. This reflects the increasing market opportunities that are being created by regulation, policy and customer demand, in response to the climate and ecological emergencies for businesses operating in the Low Carbon and Environmental Goods and Services sector.

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[3] A Green New Deal | London City Hall

[4] Helping Londoners into Good Work | London City Hall

Employment

Employment in London's Low Carbon and Environmental Goods and Services sector in 2019/20 was 302,021, up from 246,073 in 2017/18 (see previous report). Employment then fell to 269,714 in 2020/21.

Companies

The number of companies in London's Low Carbon and Environmental Goods and Services sector in 2017/18 was 13,906, and grew to 17,054 in 2019/20, before falling to 16,376 in 2020/21.

London's sub-sectors

In both 2019/20 and 2020/21 London's Low Carbon and Environmental Goods and Services sector was made up by the following proportions: Low Carbon 58%, Renewable Energy 31% and Environmental 11%; and this was similar to the make up in 2017/18 too.

London's sub-sector strengths

For both 2019/20 and 2020/21 the five largest sub-sectors in the Low Carbon and Environmental Goods and Services sector by sales accounted for 71% of the London total sales and was made up of the same five sub-sectors as in the previous report covering 2015/16 to 2017/18:

- **Carbon Finance** - this includes Carbon finance trading houses and consultancies
- **Wind** – this includes control systems development and manufacture, drive train development, manufacture and systems integration and consulting houses
- **Geothermal** – this includes head office functions, systems and design and international consultancy
- **Building Technologies** – this includes head office functions, building systems design and consultancy and building systems providers and installers
- **Alternative Fuels** – this includes R&D functions, alternative fuel providers and process implementation accounting.

The next six largest sub-sectors by sales account for a further 26% of London's total sales in 2019/20 and 24% of sales in 2020/21 and are made up of: Photovoltaic; Alternative Fuel Vehicles; Biomass; Water Supply and Waste-Water Treatment; Waste Management; Recovery and Recycling.

The Low Carbon and Environmental Goods and Services sector in London is slightly different to that in the rest of the UK due to the fact that the Carbon Finance sub-sector, which is by far the largest sub-sector in London, had 93% of its activity in 2019/20 based within London and much of that is in the City of London. This fell to 92% in 2020/21, and with the percentage being 97% in 2017/18, this indicates that the Carbon Finance sector is also growing outside of London too.

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 2017/18 and 2019/20, followed by negative growth between 2019/20 and 2020/21. The high level of growth enjoyed in these sub-sectors before the pandemic created a level of resilience that meant that even after the impact of the pandemic the size of these sub-sectors remained above their 2017/18 levels:

- **Carbon Finance** – sales grew from £12.77bn to £17.79bn (39% increase) between 2017/18 to 2019/20, then fell to £15.44bn (-13.2%) between 2019/20 and 2020/21

- **Wind** – sales grew from £4.14bn to £5.27bn (27% increase), between 2017/18 to 2019/20, then fell to £4.48bn (-15.1%) between 2019/20 and 2020/21

- **Geothermal** – sales grew from £4.06bn to £4.91bn (21% increase) between 2017/18 to 2019/20, then fell to £4.25bn (-13.3%) between 2019/20 and 2020/21

- **Building Technologies** – sales grew from £3.28bn to £3.92bn (19% increase) between 2017/18 to 2019/20, then fell to £3.27bn (-16.6%) between 2019/20 and 2020/21

- **Alternative Fuels** – sales grew from £3.07bn to £3.70bn (21% increase) between 2017/18 to 2019/20, then fell to £3.13bn (-15.5%) between 2019/20 and 2020/21

Scalability of sub-sectors

Scalability, which is another way of assessing opportunities for growth, within London is variable across the sub-sectors but when combined with sales, London's strengths include: Geothermal, Building Technologies, Water and Waste-Water Treatment, and Waste Management. These correspond with some of London's sub-sector strengths by value of sales and could represent some of the sub-sectors with greatest potential for growth.

Regional Comparison

The regional comparison is performed using 2019/20 data rather than 2020/21, because regions were impacted differently by the Covid-19 pandemic. The Low Carbon and Environmental Goods and Services sector in London accounts for 22% of sales, 19% of companies and 19% of employees in the UK, with the next largest regions being the South-East, North West and East of England. For comparison the South-East accounts for 9% of sales, 12% of companies and 16% of employees in the UK.

London's share of the UK LCEGS market varies between sub-sectors, from 92% of the Carbon Finance sub-sector, to 10% for Air Pollution, Carbon Capture and Storage, and Contaminated Land.

London has the highest share of the market in 12 sub-sectors but only Carbon Finance (92%), Geothermal (24%) and Photovoltaic (23%) sub-sectors have a share that is greater than London's 22% share of the overall UK LCEGS market.

The larger the percentage share of a sub-sector in a region, the higher the degree of supply chain localisation within the region for that sub-sector. Highly localised supply chains mean that there is a greater percentage of the sub-sector's supply chain based within the region. This in turn offers a stronger opportunity for the development of the sub-sector through closer partnerships and regional cooperation that will ultimately help generate greater local economic opportunity and associated growth.

London's Impact on Regional Chains and Networks of Supply

London's LCEGS market was worth £50.0bn in 2019/20 and generated a further £14.5bn in sales, or an additional 29% in terms of sales within the chains and networks of supply in the regions outside of London.

The greatest beneficiary of London's LCEGS sector, in terms of sales generated within the chains and networks of supply within a region is the North-West, with £2.4bn, representing 4.7% of London's total sales. This is followed by the West Midlands with £2.2bn (4.4%), Wales, and the rest of the South-East, both with £1.7bn (3.3%).

Examples of London sub-sectors which generate large sales through the chains and networks of supply outside of London include: Photovoltaics which generates £224.7m in the North West; Carbon Finance which generates £1,149.3m in the West Midlands, £1,014.5m in the North West,

and £963.1m in Wales; Building Technologies which generates £246.6m in the West Midlands; and Alternative Fuels which generate £205m in the North West and £167.4m in the East of England.

London's Exports

The value of exports in London's Low Carbon and Environmental Goods and Services sector in 2019/20 was £3.4bn, an increase from £2.7bn in 2017/18. This fell to £2.8bn in 2020/21. This accounted for 22% of the UK's LCEGS exports in 2019/20 and was in line with London's 22% share of the overall UK LCEGS market.

London's LCEGS exports grew by 16.8% the year before the pandemic (2018/19 to 2019/20) and then saw negative growth of -15.6% during the pandemic (2019/20 to 2020/21).

London's top Export sub-sectors are similar to its UK market strengths and they are Carbon Finance, Wind, Geothermal, Building Technologies, Alternative Fuels, and Photovoltaic.

London's LCEGS analysed by Standard Occupational Classification categories

In Appendices 4, 5, 6 and 7 we present some initial data on the LCEGS sector broken down by Standard Occupational Classification (SOC) categories to help understand the types of occupations that exist within the LCEGS sector, how these are represented across its sub-sectors and the link to skills development to support growth in the sector.

London's LCEGS sector in the context of London's wider economy and selected sectors

Using the same kMatrix methodology used for estimating the size of economies and sectors including LCEGS, we have estimated the size of London's economy and other selected sub-sectors to provide greater context for the important role of the LCEGS sector in London's wider economy, this is presented in Appendix 8.

In 2019/20 London's economy was worth £550.8bn in sales and London's Manufacturing sector (excluding assembly) was worth £11.7bn in sales, Construction sector £29.3bn in sales, ICT £32.7bn in sales and Retail £100.4bn in sales. Each of these sector measurements is a 'standalone' definition, with some overlap due to the cross sectoral nature of the LCEGS sector, e.g., Manufacturing elements of LCEGS account for approximately 3% of London's LCEGS sales, while LCEGS accounts for approximately 12% of the Manufacturing sector.

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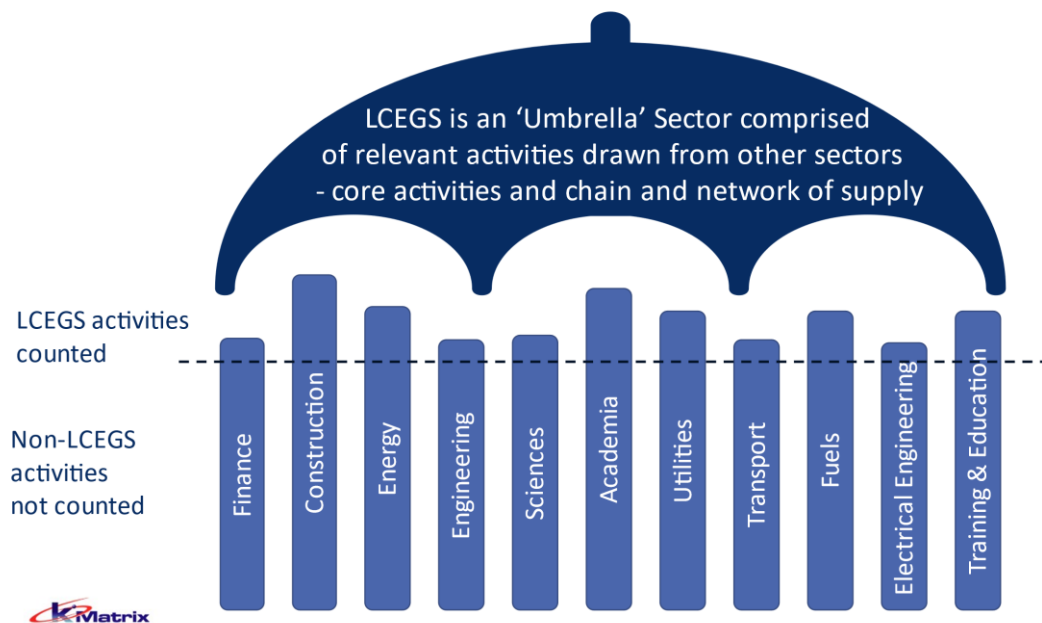
The sector is comprised of both core elements and those in the chain and network of supply, without whom the sector could not function.

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
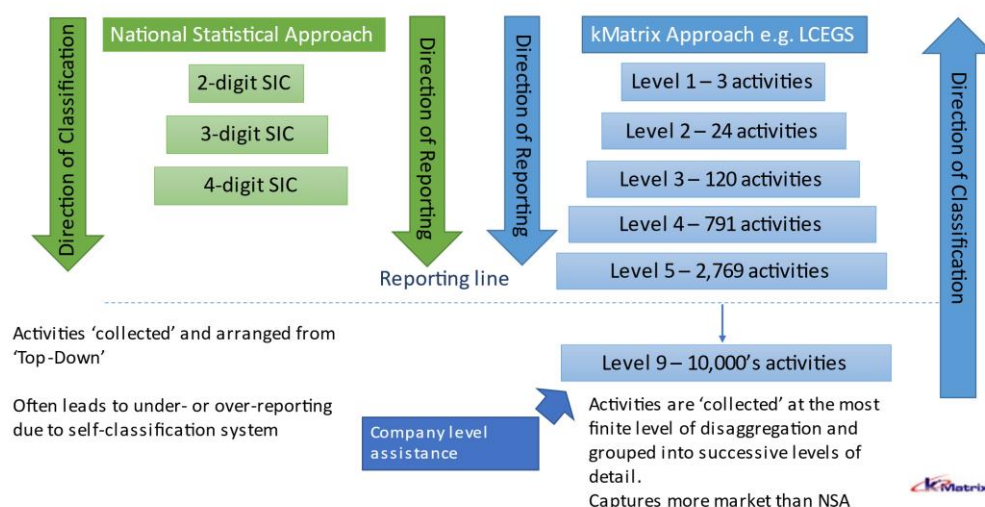
This is quite different to the National Statistical Approach, which classifies from the 'top down', with a company choosing their 2-digit code, then successive codes down through the classification system. The SIC system is very good as a national accounting system, but it struggles with hard to measure 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: https://www.eunity-project.eu/m/filer_public/4b/62/4b6262dc-3bca-4145-a84b-b514049156ce/1_lsec_japan_eunity_ecso_wg2_cima_seldeslachts_ulrich_20190124881.pdf
- Low carbon environmental goods and services sector: https://www.london.gov.uk/sites/default/files/london_low_carbon_market_snapshot_-_2019.pdf and https://www.enterprisem3.org.uk/sites/default/files/2020-02/Hampshire-LCEGS-Market-Report-2015-16-to-2017-18-2nd-Draft_0.pdf
- The Green Economy: https://rgs-ibg.onlinelibrary.wiley.com/doi/pdf/10.1002/geo2.36 and https://www.nature.com/articles/s41599-019-0329-3
- Adaptation Economy: https://www.nature.com/articles/nclimate2944
- Carbon Finance: https://www.nature.com/articles/nclimate1492?draft=marketing
- Weather and Climate: https://advances.sciencemag.org/content/3/5/e1602632.full
- Climate Services: https://www.sciencedirect.com/science/article/pii/S2405880719300494?via%3Dihub

The LCEGS Dataset

This report presents data for the fiscal years 2018/19, 2019/20 and 2020/21. 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 2017/18. 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 11 years of sales, companies and employment data and 10 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:

| Sector | **Low Carbon and Environmental Goods and Services** |

Level 1 sub-sectors: Low Carbon · Environmental · Renewable Energy

Level 2 sub-sectors

Low Carbon:
- Additional Energy Sources
- Alternative Fuel Vehicle
- Alternative Fuels
- Building Technologies
- Carbon Capture & Storage
- Carbon Finance
- Energy Management
- Nuclear Power

Environmental:
- Air Pollution
- Contaminated Land Reclamation & Remediation
- Environmental Consultancy & Related Services
- Environmental Monitoring Instrumentation & Analysis
- Marine Pollution Control
- Noise & Vibration Control
- Recovery & Recycling
- Waste Management
- Water & Waste Water Treatment

Renewable Energy:
- Wind
- Geothermal
- Photovoltaic
- Biomass
- Hydro (Hydroelectric)
- Renewable consultancy
- Wave & Tidal

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 standardized 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.

Total LCEGS Market	=	Core LCEGS Market	+	Non-Core Enabling LCEGS Market

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.

Core LCEGS Activities (example activities)

- Wind Turbine & Tower Manufacture & Supply
- Design and Installation of Large Geothermal Systems
- Manufacture of Building Insulation Materials
- Production & Supply of Methane
- Production & Supply of Auto Gas (aka LPG, LP Gas, Propane)
- All Other Core Activities

Total LCEGS Market = Core + Non-Core or Enabling Activities

Non-Core/Enabling LCEGS Activities (example activities)

- Manufacture and Supply of Non-Sector Specific Components (e.g., Standard Valves, Drive Chains etc)
- Financial, Legal and Administration Services
- Training Services
- Design and Supply of Precision Engineering Machine Control Software
- Production and Supply of Operations Journals, Information Packs etc
- All Other
- Non-Core/Enabling Activities

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.

The complexity of determining the potential contribution to net zero

Understanding the potential contribution of each sub-sector to net zero targets (2030 and 2050) is important in identifying where priority markets lie for reaching those goals. Although the LCEGS sector entails low carbon and renewable energy technologies, they are not all equal in terms of their own carbon footprints or their ability to contribute to net zero targets.

When assessing the potential for each Level 2 sub-sector to contribute to net zero, there are a number of factors to consider, including:
- The embodied carbon of the product is the carbon footprint to make the product, increasing throughout the supply chain and across geographies
- The carbon emissions during transportation, installation and commissioning of a product
- The emissions produced during operational lifetime of a product
- The emissions produced during decommissioning, dismantling and recovery of materials
- The localisation and format of the chain and network of supply

Academia varies with regards to estimating the carbon footprint of products, for example, photovoltaic systems produce almost zero carbon emissions when in operation, however carbon

emissions are produced during the manufacturing process. Life cycle analysis of renewable energy systems, quantifying the carbon emissions of photovoltaic systems, report a wide range of carbon emissions factors. This is partly due to different methodologies and associated assumptions or design considerations.[5]

There are also variations in carbon emissions within industries, for example, the life cycle carbon emissions from both on- and off-shore wind are very low at 15 and 12 gCO_2eq/kWh[6]. The carbon emissions reduction of wind power cannot be solely estimated as being the value of carbon emissions displaced from coal- or gas-fired generation. Wind power is not carbon-zero, because greenhouse gases are emitted during installation, maintenance and decommissioning and wind power will not replace all forms of conventional generation equally and will depend on the operation of the whole grid. Variations in cost and carbon emissions estimates are affected by assumptions made in the calculation itself and the differences in wind turbine designs, manufacturing and installations locations, maintenance and disposal.

When the embodied emissions for each material involved in manufacture, transport to site and installation are quantified, higher rated turbines had greater embodied carbon emissions, with a 3 MW turbine incorporating 1046 tCO2eq, compared with only 58 tCO2eq for an 80 kW turbine. However, the greater electricity output from the larger turbines offset these emissions more quickly, with a recovery of 6 days for a 3.4 MW turbine, compared with 354 days for a 100 kW one.[7] Renewable energy generation is clean when compared with conventional energy generation methods, however the cost, payback time, size of power generation, construction time, resource capacity, characteristics of resource, external funding and other factors have affected how quickly different technologies have been adopted and the subsequent relative sizes of each market. The size of each market, corresponding to the carbon emissions displaced from conventional energy generation methods differs, as does the lifecycle carbon footprint of each renewable energy sub-sector.

Building Technologies are hugely important in terms of decarbonisation potential. An estimated 37% of UK emissions are attributable to heat,[8] so building technologies such as roof and wall insulation, insulative glazing and other technologies designed to prevent the loss of heat can indirectly lead to reduction in energy usage and carbon emissions. As for the renewable energy sub-sector, the reductions in carbon emissions through a decrease in energy consumption, must offset any embodied carbon and those emissions associated with transportation, installation, those produced during usage, maintenance and 'end-of-life' recovery of materials.

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[5] Nian, V (2016) Impacts of changing design considerations on the life cycle carbon emissions of solar photovoltaic systems. J. Applied Energy 183 (2016) 1471-1487
https://doi.org/10.1016/j.apenergy.2016.08.176

[6] https://www.climatexchange.org.uk/media/1459/life_cycle_wind_-_executive_summary_.pdf

[7] Smoucha EA, Fitzpatrick K, Buckingham S, Knox OGG (2016) Life Cycle Analysis of the Embodied Carbon Emissions from 14 Wind Turbines with Rated Powers between 50 Kw and 3.4 Mw. J Fundam Renewable Energy Appl 6: 211. doi:10.4172/20904541.1000211

[8] Clean Growth – Transforming Heating, Overview of Current Evidence, Department for Business, Energy and Industrial Strategy, December 2018
https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/766109/decarbonising-heating.pdf

In terms of sub-sectors within the Environmental Level 1 sub-sector, the carbon footprint of Water and Waste Water Treatment may be decreased dramatically by the usage of forward osmosis membrane-technology during the next generation of waste water treatment[9].

Within Waste Management, the collection, re-use and recycling of the 2 Mt of waste electrical and electronic equipment (WEEE) produced in the UK each year has become a foremost environmental issue in the UK,[10] where efforts are undergoing to increase the levels and efficiency of recycling. Each sub-sector within the LCEGS sector has the potential to play their part in the move towards net zero, but as indicated above, the relative impact they may have varies both between sub-sectors and between academics attempting to quantify current levels.

For this study, the level 2 sub-sectors have been allocated a relative impact score of "Low", "Medium" and "High", based upon estimates including the activities present in the area being studied, the localization of chains and networks of supply and the technologies both being used and produced.

Reporting on Financial Years within this report

This report provides data for the financial years 2018/19, 2019/20 and 2020/21. Reports providing 3-year updates for a sector would ordinarily use the latest year's data for reporting and forecasting, with the previous year's data used for growth analysis and monitoring of sub-sector performance.

The most recent financial year for this 3-year sector update is 2020/21. This year was the beginning of the Covid-19 pandemic which had a considerable impact on the economy as a whole, as well as this sector, with decreased sales and a proportion of the workforce on furlough across the economy. This sector, as with many other sectors, has been impacted by the pandemic, both at a geographical and at a sub-sector level, however the consensus around recovery forecasts is favorable and suggest that this will be a relatively short-term impact, likely to be measured in years not decades. The 2020/21 data has been reported throughout this update as that was the size of the sector in 2020/21 and whilst it has been used to draw comparisons with 2019/20 data to demonstrate the impact that the pandemic had on the sector it is also being treated as an outlier when it comes to making forecasts for future growth.

Consequently, some analysis in this report, especially where there are forecasts being made of future performance or growth, has been performed using 2019/20 sector data. This is because for these metrics, 2020/21 has been considered as an 'outlier' financial year, with 2019/20 data being more pertinent for analysis and making growth forecasts. This was based on the nature of the impact of the pandemic and the extensive evidence base established through the time series starting in 2007/08 that chronicles the actual growth in the sector.

Figures 1 to 6 provide a timeseries of the Sales, Number of Companies and Number of Employees for London and the UK between 2007/08 to 2020/21, and highlights 2020/21 as an outlier.

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[9] Environ. Sci.: Water Res. Technol., 2020, 6, 153

[10] Clarke C, Williams I, Turner D, (2019) Evaluating the carbon footprint of WEE management in the UK. J Resources, Conservation & Recycling 141 (2019) 465-473

Figure 1: LCEGS London – Total Sales (£m)
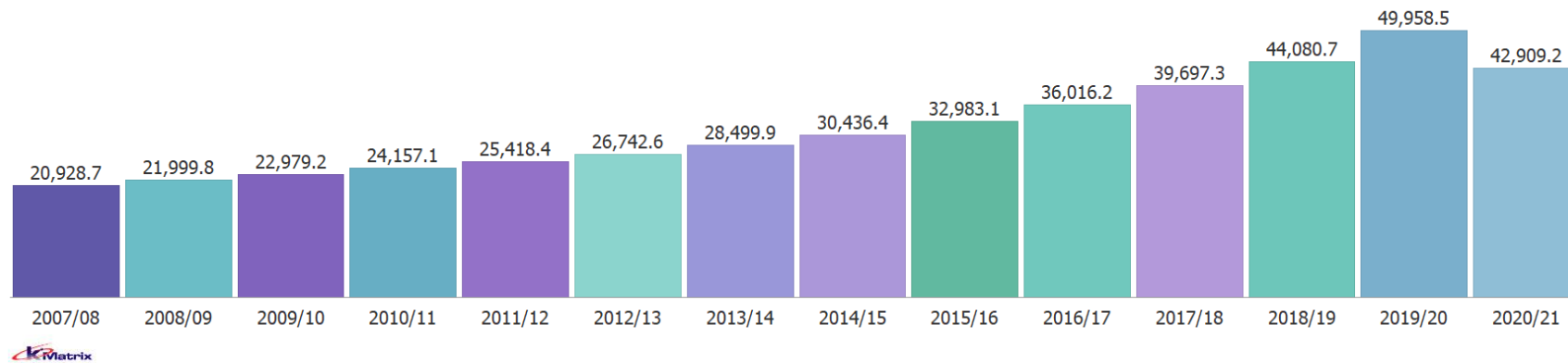
Figure 2: LCEGS UK – Total Sales (£m)
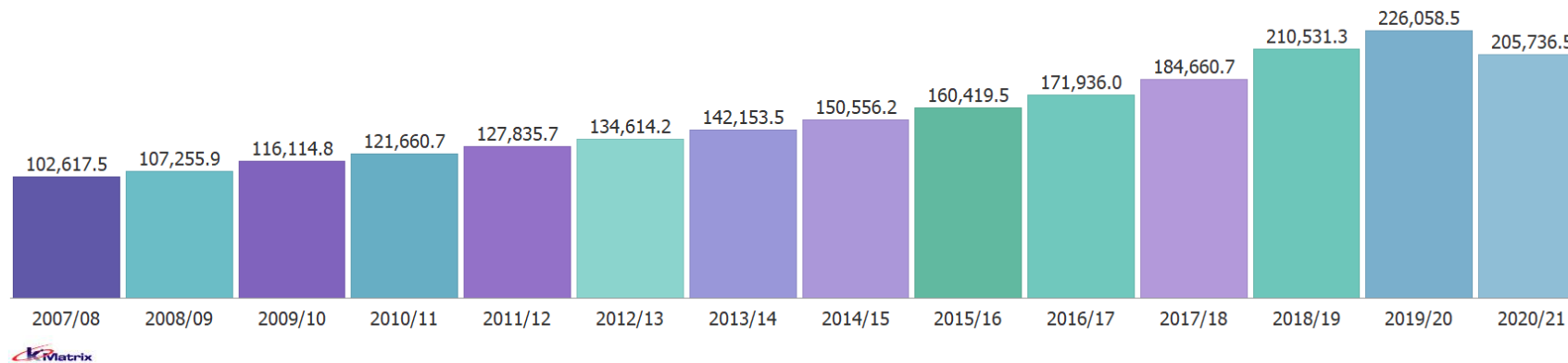
Figures 1 and 2 illustrate the year on year growth of sales for the LCEGS sector in both the UK and London, with the London market growing by 138% and the UK market growing by 120% between 2007/08 and 2019/20. If Carbon Finance is removed, growth was 123% in London and 108% in the UK between 2007/08 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.

Figure 3: LCEGS London – Total Number of Companies

Figure 3 bar chart data:
- 2007/08: 9,977
- 2008/09: 10,008
- 2009/10: 9,213
- 2010/11: 9,246
- 2011/12: 9,242
- 2012/13: 9,672
- 2013/14: 10,314
- 2014/15: 10,909
- 2015/16: 11,733
- 2016/17: 12,712
- 2017/18: 13,906
- 2018/19: 15,364
- 2019/20: 17,054
- 2020/21: 16,376
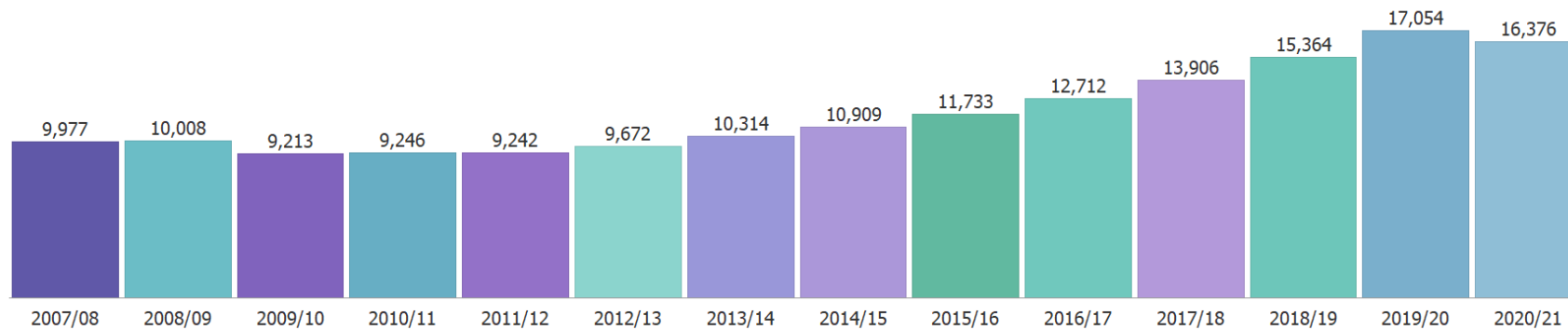
Figure 4: LCEGS UK – Total Number of Companies

Figure 4 bar chart data:
- 2007/08: 41,496
- 2008/09: 43,267
- 2009/10: 46,950
- 2010/11: 49,060
- 2011/12: 51,392
- 2012/13: 53,942
- 2013/14: 56,770
- 2014/15: 59,916
- 2015/16: 63,571
- 2016/17: 67,807
- 2017/18: 72,478
- 2018/19: 79,232
- 2019/20: 87,399
- 2020/21: 75,715
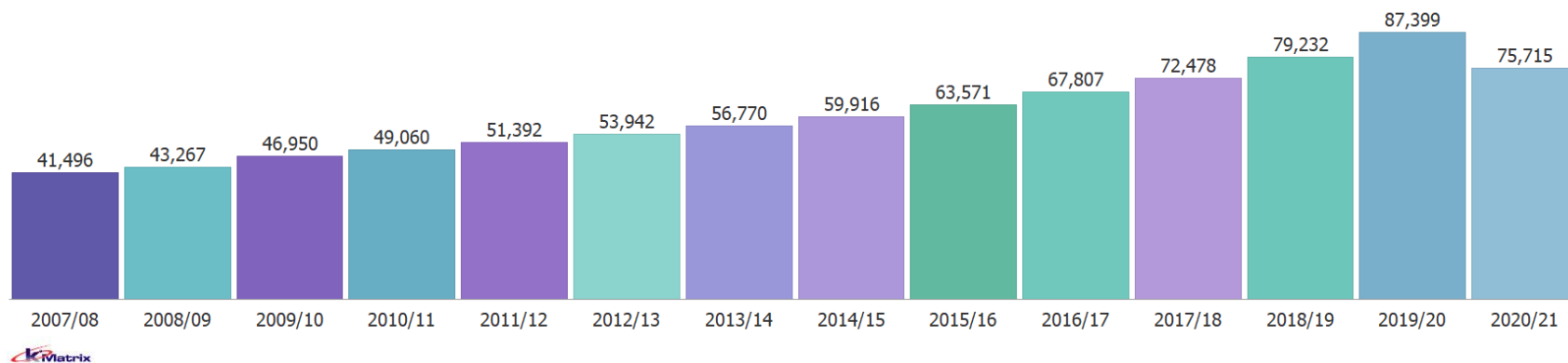
Figures 3 and 4 illustrates the year-on-year growth in the number of companies in the LCEGS sector for the UK and generally for London too, apart from the dip in number of companies located in London in 2009/10 and the reduction in numbers in 2021. The number of companies in London grew by 71% and in the UK by 111% between 2007/08 and 2019/20. 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.

Figure 5: LCEGS London – Total Number of Employees
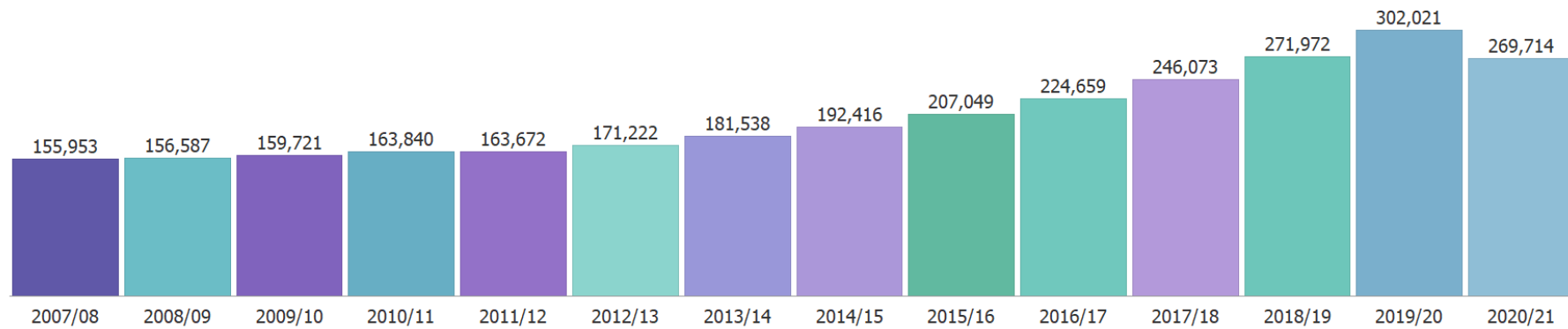
Figure 6: LCEGS UK – Total Number of Employees
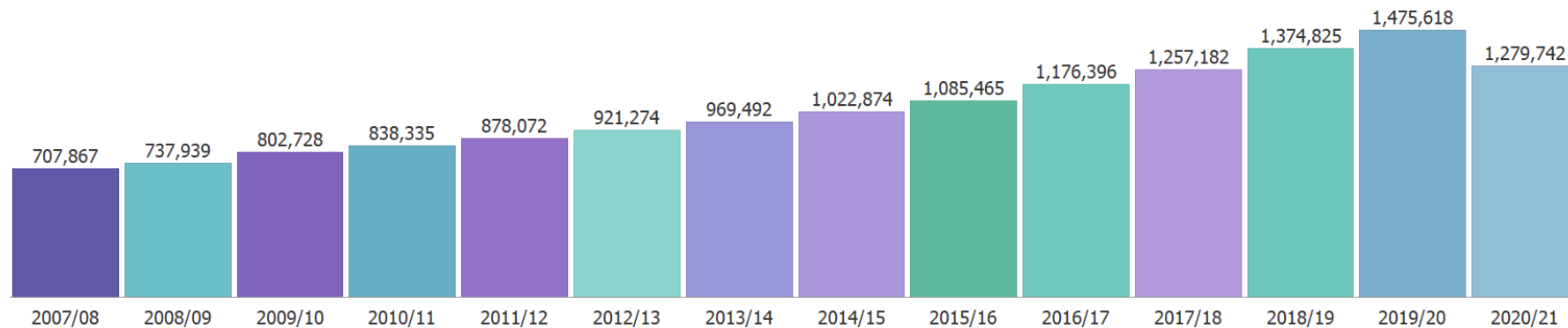
Figures 5 and 6 illustrate the year-on-year growth in the number of employees within the LCEGS sector for both the UK and London. The number of employees in the London market grew by 94% and in the UK market grew by 108% between 2007/08 and 2019/20. The UK saw a consistent increase in the number of employees 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%.

Throughout the report, each section, graph and table explicitly state which financial year's data has been used for each analysis.

1.   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. It also provides information at Level 3 and Level 4 to show the type of activities included in these sub-sectors.

1.1   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 2018/19 to 2020/21 in £m
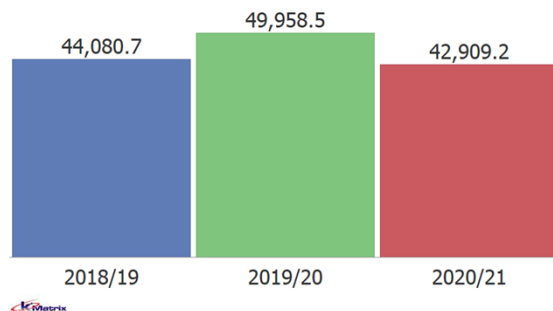
London's LCEGS sales in 2020/21 were £42.9bn, down from ~ £50.0bn in 2019/20, which was up from £44.1bn in 2018/19 and £39.7bn in 2017/18 (see previous report).

Annual sales growth in London's LCEGS was 11.0% from 2017/18 to 2018/19, 13.3% from 2018/19 to 2019/20 and -14.1% from 2019/20 to 2020/21. In comparison UK sales growth in LCEGS was 10.0%, 8.1% and -9.0% respectively.

Figure 8: Employment 2018/19 to 2020/21
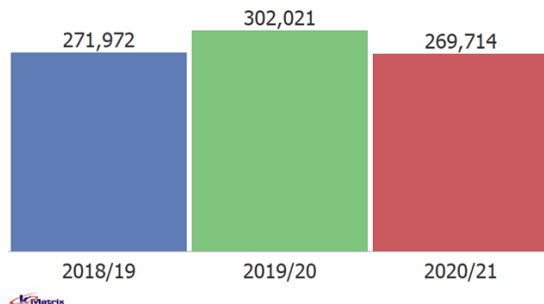
London's LCEGS employment in 2020/21 was 269,714, down from 302,201 in 2019/20, which was up from 271,972 in 2018/19 and 246,073 in 2017/18 (see previous report).

Annual employment growth in London's LCEGS was 10.5% from 2017/18 to 2018/19, 11.5% from 2018/19 to 2019/20 and -10.7% from 2019/20 to 2020/21. In comparison UK employment growth in LCEGS was 9.4%, 7.3% and -13.1% respectively.

Figure 9: Companies 2018/19 to 2020/21
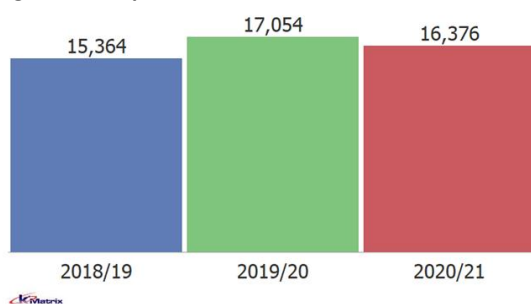
London's LCEGS company count in 2020/21 was 16,376, down from 17,054 in 2019/20, which was up from 15,364 in 2018/19 and 13,906 in 2017/18 (see previous report).

Annual company growth in London's LCEGS was 10.5% from 2017/18 to 2018/19, 11.0% from 2018/19 to 2019/20 and -4.0% from 2019/20 to 2020/21. In comparison UK company growth in LCEGS was 9.3%, 10.3% and -13.3% respectively. Head offices in London have provided resilience.

1.2   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 2018/19 to 2020/21in £m (Level 1)
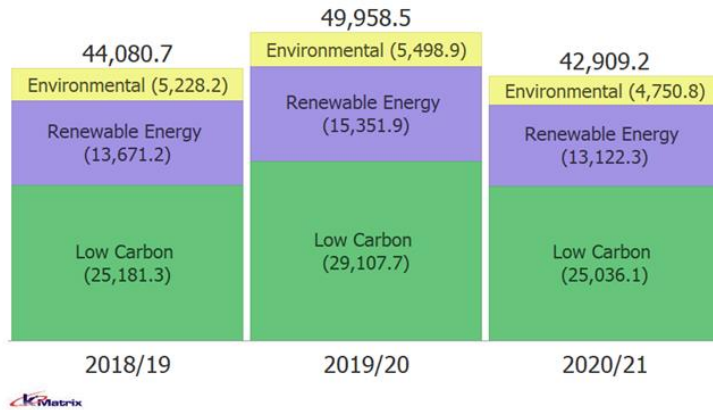
Figure 10 shows the three-year LCEGS sales split by Level 1.

In 2018/19 the split was 57% Low Carbon, 31% Renewable Energy and 12% Environmental. This remained similar and in 2020/21 it was 58%, 31% and 11% respectively.

Figure 11: Employment 2018/19 to 2020/21 (Level 1)
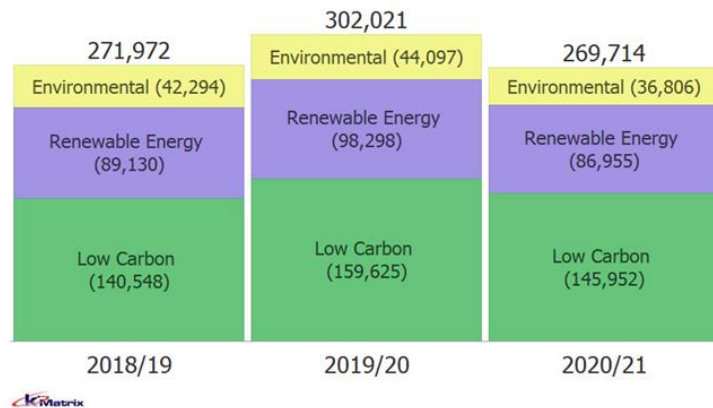
Figure 11 shows the three-year employment split by Level 1.

In 2018/19 the split was 52% Low Carbon, 33% Renewable Energy and 16% Environmental. This remained similar and in 2020/21 it was 54%, 32% and 14% respectively.

Figure 12: Companies 2018/19 to 2020/21 (Level 1)
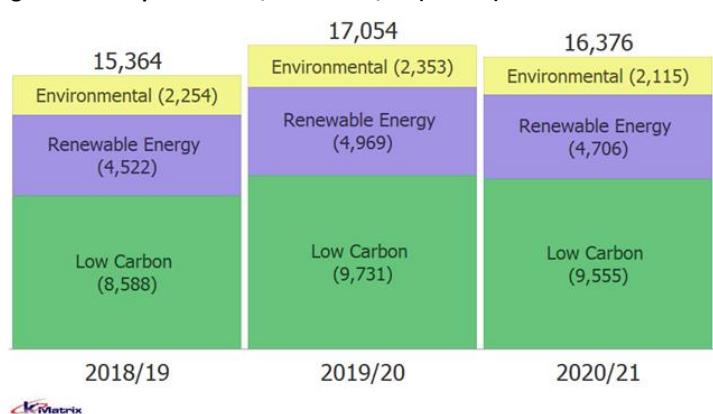
Figure 12 shows the three-year company split by Level 1.

In 2018/19 the split was 56% Low Carbon, 29% Renewable Energy and 15% Environmental. This remained similar and in 2020/21 it was 58%, 29% and 13% respectively.

In 2020/21 UK LCEGS sales was split - Low Carbon 49%, Renewable Energy 36% and Environmental 15%.

1.3   London's LCEGS Level 1 - Low Carbon Market

In this section we look at the Low Carbon market in greater detail. Initially we split the market into eight further sub-sectors (Level 2) and then look at the highest performing Level 2 sub-sectors in more detail by highlighting activity happening within them at Level 3 and Level 4.

1.3.1   Low Carbon Market (Level 2)

Figure 13: Sales 2020/21 in £m (Level 2)
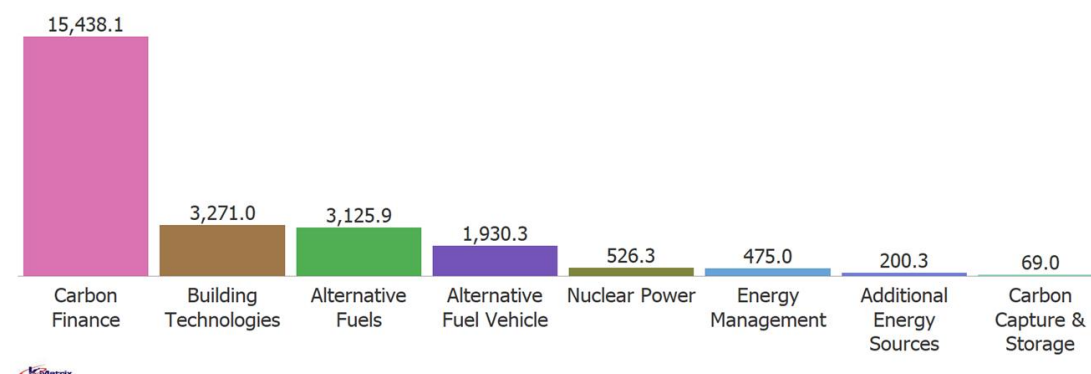
Low Carbon is further sub-divided into eight sub-sectors, of which four account for 95% of sales (Figure 13). These four are made up of Carbon Finance 62% (61% in 2019/20), Building Technologies 13% (13% in 2019/20), Alternative Fuels 12% (13% in 2019/20) and Alternative Fuel Vehicle 8% (8% in 2019/20).

Carbon Finance was the only sub-sector to grow overall between 2018/19 and 2020/21, from £14.88bn to £17.79bn in 2019/20 and then down to £15.44bn in 2020/21. The other three sub-sectors all grew between 2018/19 and 2019/20, then had negative growth between 2019/20 and 2020/21: Building Technologies from £3.56bn to £3.92bn, then £3.27bn; Alternative Fuels from £3.34bn to £3.70bn, then £3.13 and Alternative Fuel Vehicles from £2.03bn to £2.22bn, then £1.93bn.

Figure 14: Employment 2020/21 (Level 2)
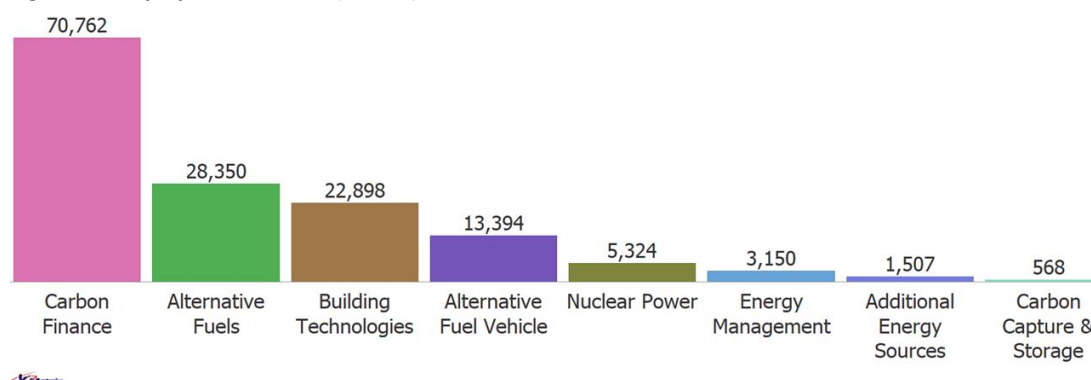
The same four sub-sectors account for 93% of employment (Figure 14). They are Carbon Finance 48% (46% in 2019/20), Alternative Fuels 19% (20% in 2019/20), Building Technologies 16% (17% in 2019/20) and Alternative Fuel Vehicles 9% (10% in 2019/20).

Carbon Finance was again the only sub-sector to grow overall between 2018/19 and 2020/21, from 60,372 to 72,920 in 2019/20 and then down to 70,762 in 2020/21. The other three sub-sectors all

grew between 2018/19 and 2019/20, then had negative growth between 2019/20 and 2020/21: Alternative Fuels from 30,032 to 32,589, then 28,350; Building Technologies from 24,376 to 26,389, then 22,898 and Alternative Fuel Vehicles from 14,069 to 15,313, then 13,394.

Figure 15: Companies 2020/21 (Level 2)
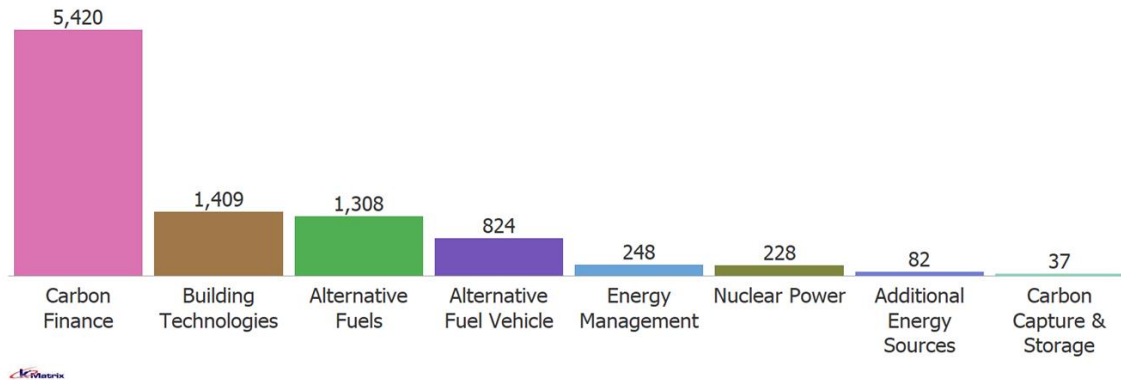
The same four sub-sectors again account for 94% of companies (Figure 15). They are Carbon Finance 57% (54% in 2019/20), Building Technologies 15% (16% in 2019/20), Alternative Fuels 14% (14% in 2019/20) and Alternative Fuel Vehicles 9% (9% in 2019/20).

Carbon Finance was the only sub-sector to grow consistently between 2018/19 and 2020/21, from 4,471 to 5,286 in 2019/20 and then to 5,421 in 2020/21. Building Technologies grew from 1,401 to 1,514, then went down to 1,409 in 2020/21; Alternative Fuels grew from 1,279 to 1,393, then went down to 1,308 in 2020/21 and Alternative Fuel Vehicles grew from 826 to 888 and then contracted to 824 in 2020/21.

1.3.2 Low Carbon Market at Level 3

Figure 16: Summary of selected metrics for 2020/21 for selected Low Carbon Level 2 sub-sectors at Level 3
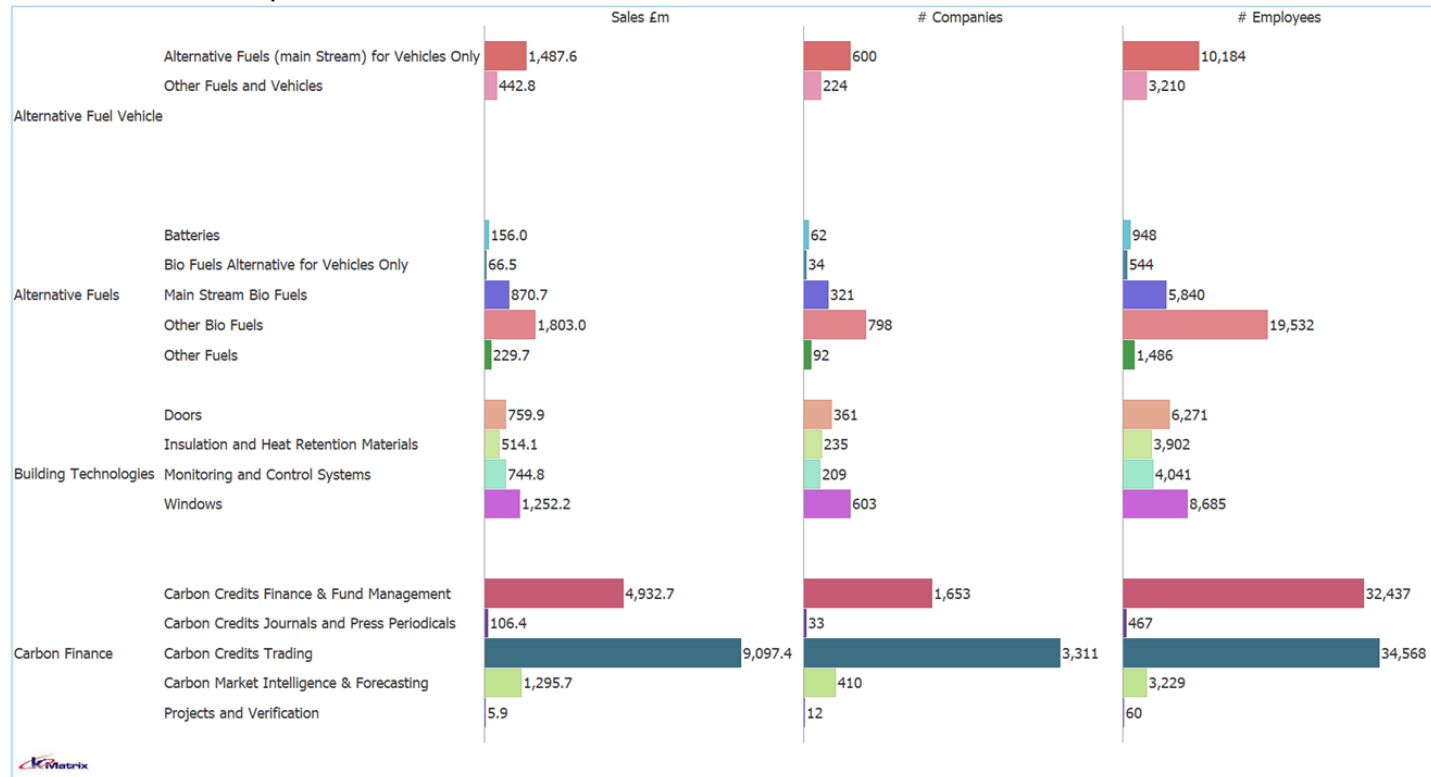
The top four Level 2 sub-sectors for Low Carbon are Alternative Fuel Vehicle, Alternative Fuels, Building Technologies and Carbon Finance, making up 95% of the Low Carbon market in London. Figure 16 shows a summary of the Sales, Companies and Employees for these Level 2 sub-sectors, broken out into their Level 3 sub-sectors.

Carbon Finance is the largest Level 2 sub-sector and Carbon Credits Trading is the largest of the five Level 3 sub-sectors. Example companies in this sub-sector include carbon credits trading houses.

Building Technologies has four sub-sectors at Level 3, with the largest being Windows, making up 38% of the market (40% in 2019/20). Example companies in this sub-sector would include window manufacturers, agents and installers.

Alternative Fuels has five sub-sectors at level 3, of which, Other Biofuels accounts for 58% of Sales (62% in 2019/21). Example companies of this sub-sector would include process designers and consultancy, process implementation and sales and application development specialists.

Alternative Fuel Vehicles has only two sub-sectors at level 3, with Alternative Fuels (main stream) for Vehicles Only holding 77% of the market share (75% in 2019/20). Example companies in this sub-sector would include selling agencies, alternative fuel development companies and consulting and applications development for vehicle conversion specialists.

1.3.3 Low Carbon Market at Level 4

Figure 17: Summary of selected metrics for 2020/21 for selected Low Carbon Level 3 sub-Sectors at Level 4
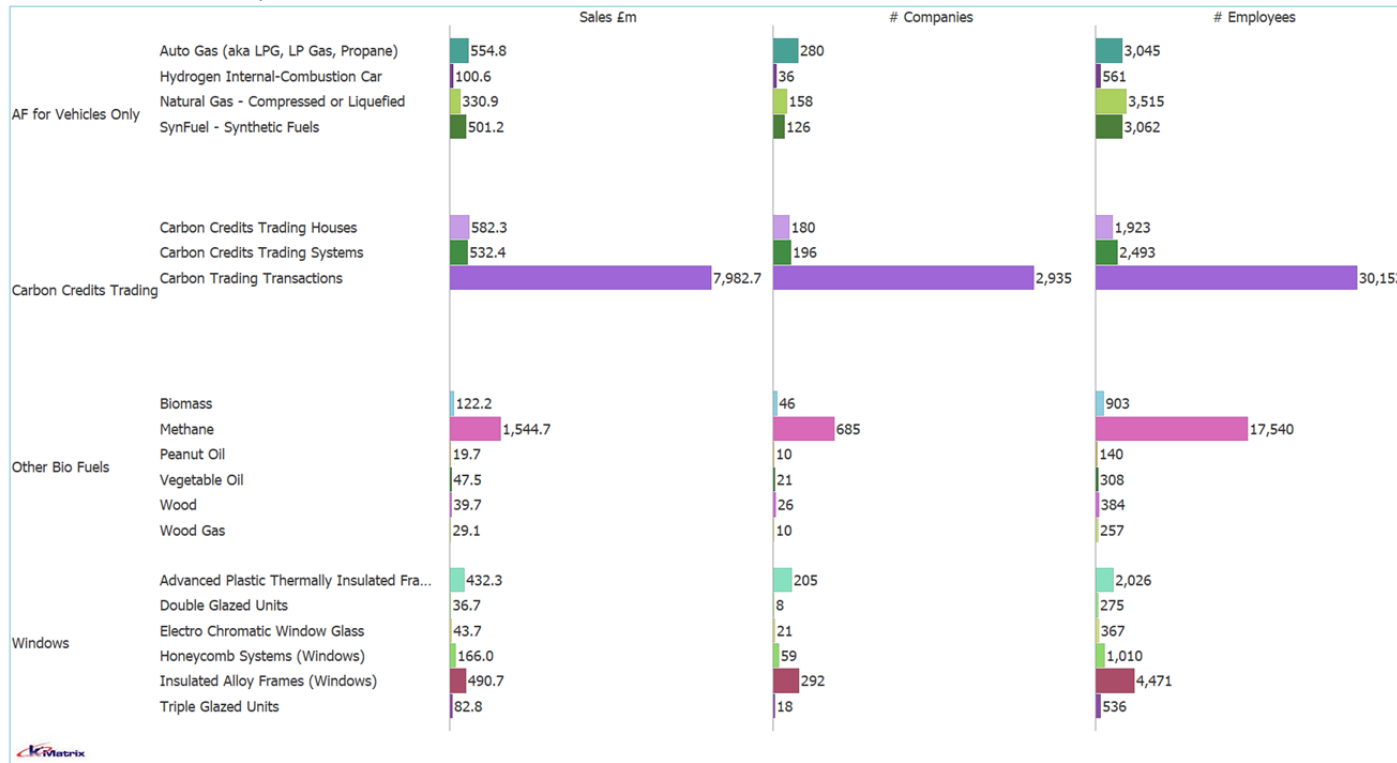
The top Level 3 sub-sectors for each Level 2 category within Low Carbon have been sub-divided into their component Level 4 sub-sectors in Figure 17.

Carbon Finance - Within the three Level 4 sub-sectors in Carbon Credits Trading, Carbon Trading Transactions is the dominant sub-sector holding 88% of the market at Level 3 (90% in 2019/20) and these relate to the carbon credit trading transactions performed by the carbon credits trading houses.

Building Technologies - Within the six Level 4 sub-sectors in Windows, the Insulated Alloy Frames (Windows) make up 39% of the sales (43% in 2019/20) and these companies design, manufacture and supply insulated alloy framed windows.

Alternative Fuels - Within the six Level 4 sub-sectors in Other Biofuels, Methane is clearly the most significant market making up 86% of the sales (86% in 2019/20) and these companies are involved in the production and supply of methane and the management of methane supply chains.

Alternative Fuel Vehicles – Within the four Level 4 sub-sectors in Alternative Fuels (main stream) for Vehicles Only, there is less obvious dominance with Auto Gas making up 37% of sales (43% in 2019/20) and Natural Gas making up 22% of sales (26% in 2019/20), examples of these types of companies include supply chain management in particular and also include sales agencies and distributors.

1.4   London's LCEGS Level 1 - Renewable Energy Market

In this section we look at the Renewable Energy market in greater detail. Initially we split the market into eight further sub-sectors, Level 2, and then look at the highest performing Level 2 sub-sectors in more detail by highlighting activity happening within them at Level 3 and Level 4.

1.4.1   Renewable Energy Market at Level 2

Figure 18: Sales 2020/21 in £m (Level 2)
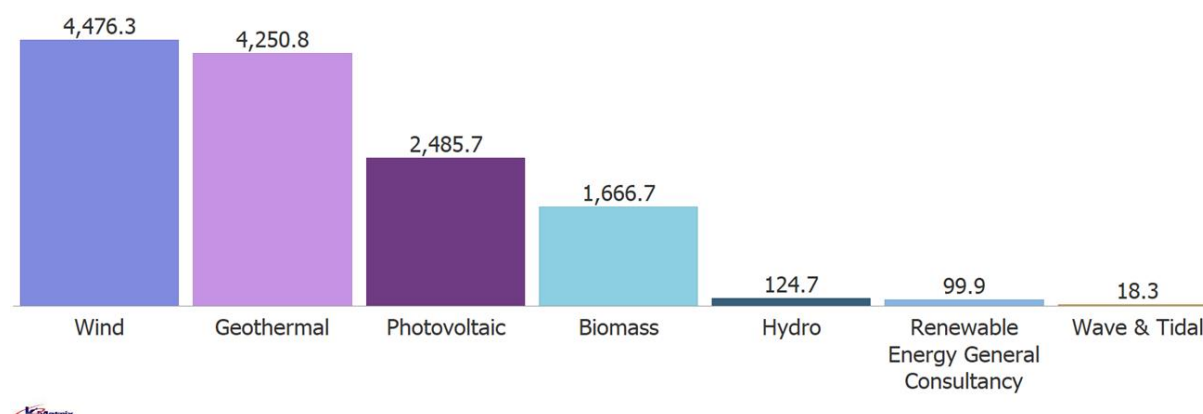
Renewable Energy is split into seven sub-sectors, of which four account for 98% of sales (Figure 18). These four are made up of Wind 34% (34% in 2019/20), Geothermal 32% (32% in 2019/20), Photovoltaic 19% (19% in 2019/20) and Biomass 13% (13% in 2019/20).

All four sub-sectors grew between 2018/19 and 2019/20, then had negative growth between 2019/20 and 2020/21: Wind from £4.63bn to £5.27bn, then £4.48bn in 2020/21, Geothermal from £4.42bn to £4.91bn, then £4.25bn; Photovoltaic from £2.58bn to £2.92bn, then £2.49bn and Biomass from £1.76bn to £1.97bn, then £1.67bn.

Figure 19: Employment 2020/21 (Level 2)
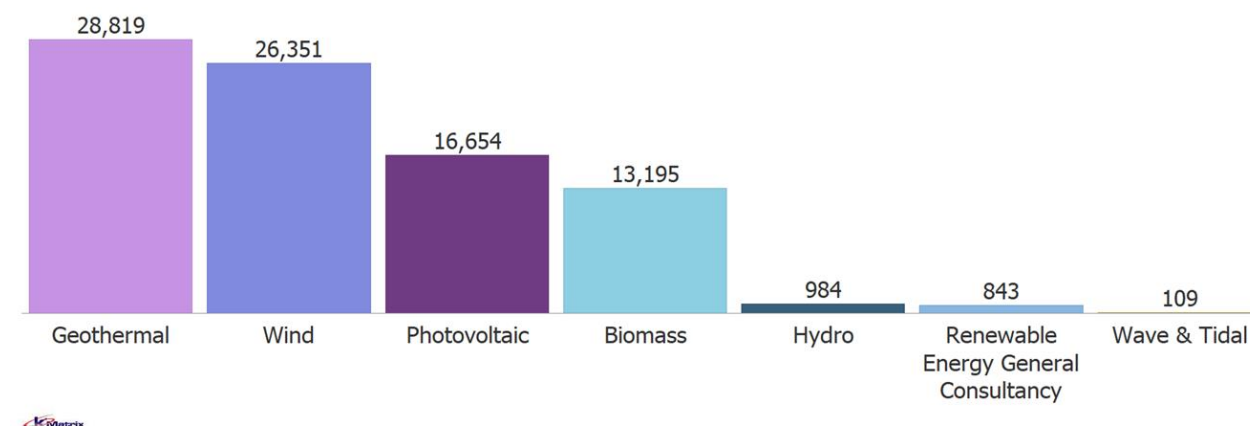
The same four sub-sectors account for 98% of employment (Figure 19). They are made up of Geothermal 33%, Wind 30%, Photovoltaic 19% and Biomass 15%, these are the same ratios as for 2019/20.

All four sub-sectors grew between 2018/19 and 2019/20, then had negative growth between 2019/20 and 2020/21: Geothermal from 30,056 to 32,869, then 28,819; Wind from 26,114 to

29,276, then 26,351; Photovoltaic from 17,059 to 18,831, then 16,654 and Biomass from 13,696 to 15,012, then 13,195.

Figure 20: Companies 2020/21 (Level 2)
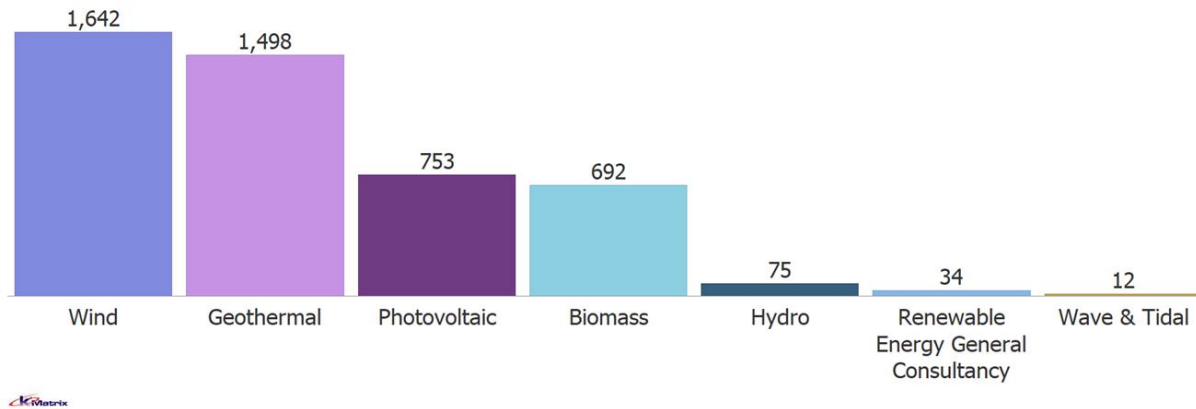
And the same four sub-sectors also account for 97% of companies (Figure 20). They are made up of Wind 35%, Geothermal 32%, Photovoltaic 16% and Biomass 15%.

Each of these four sub-sectors grew overall between 2018/19 and 2019/20 and then had negative growth between 2019/20 and 2020/21: Wind from 1,540 to 1,713, then 1,642; Geothermal from 1,463 to 1,596, then 1,498; Photovoltaic from 716 to 791, then 753 and Biomass from 675 to 736, then 692.

1.4.2 Renewable Energy Market at Level 3

Figure 21: Summary of selected metrics for 2020/21 for selected Renewable Energy Level 2 sub-sectors at Level 3
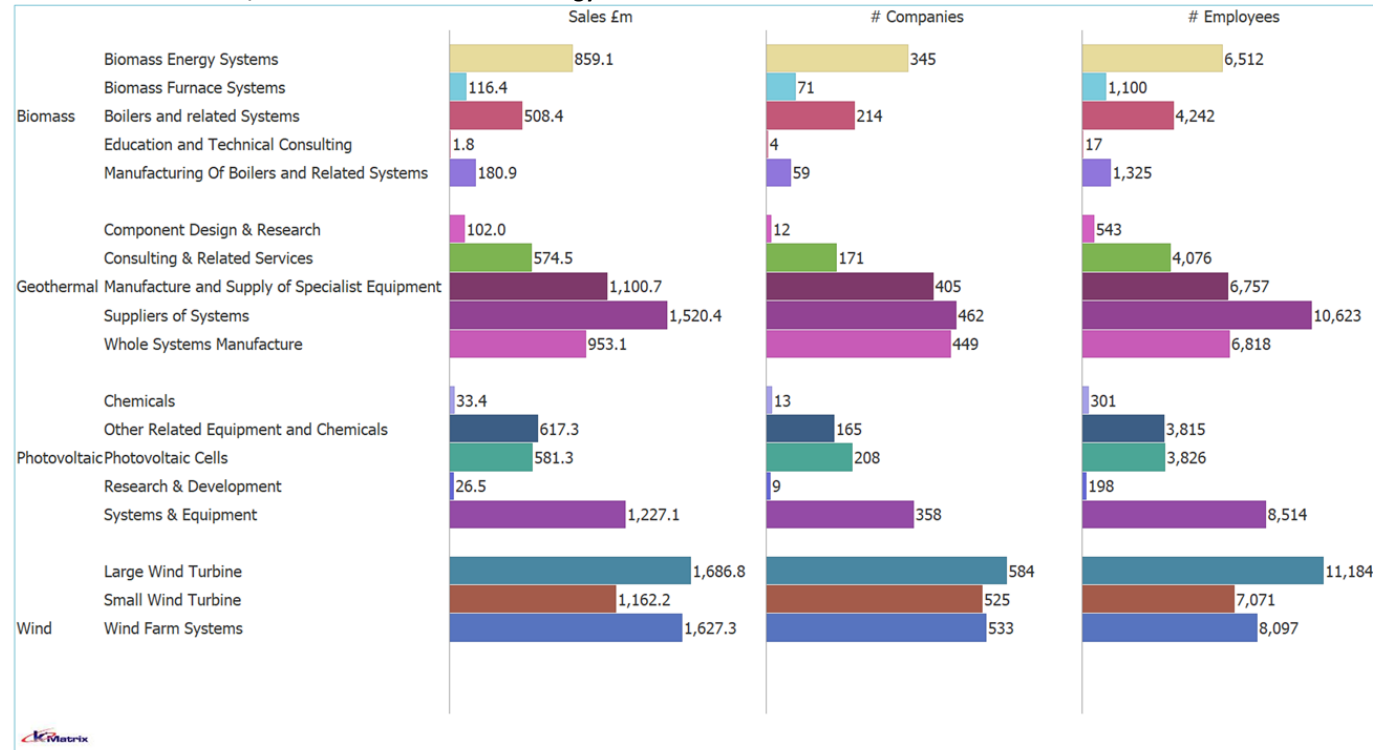
The top four Level 2 sub-sectors for Low Carbon are Wind, Geothermal, Photovoltaic and Biomass, making up 98% of the Renewable Energy market in London. Figure 21 shows a summary of the Sales, Companies and Employees for these Level 2 sub-sectors, broken out into their Level 3 sub-sectors.

Wind is the largest Level 2 sub-sector with 34% of sales and has three sub-sectors at Level 3, the largest being Large Wind Turbine which makes up 38% of sales in this market (37% in 2019/20). Example companies include drive chain suppliers and maintenance services, systems integration services and power firming services.

Geothermal has five sub-sectors at Level 3, the largest being Suppliers of Systems which makes up 36% of the sales in this market (33% in 2019/20).

Example companies include lateral geothermal systems providers and installers at the domestic and small commercial level, and vertical control systems developers and suppliers.

Photovoltaic has five sub-sectors at level 3, the largest being Systems & Equipment which makes up 49% of sales in this market (51% in 2019/20). Example companies include systems developers, suppliers and installers.

Biomass has five sub-sectors at level 3, the largest being Biomass Energy Systems which makes up 52% of the sales in this market (48% in 2019/20), example companies include developers, installers and consultancies.

1.4.3   Renewable Energy Market at Level 4

Figure 22: Summary of selected metrics for 2020/21 for the Low Carbon Level 3 sub-sector Large Wind Turbine (Wind) at Level 4
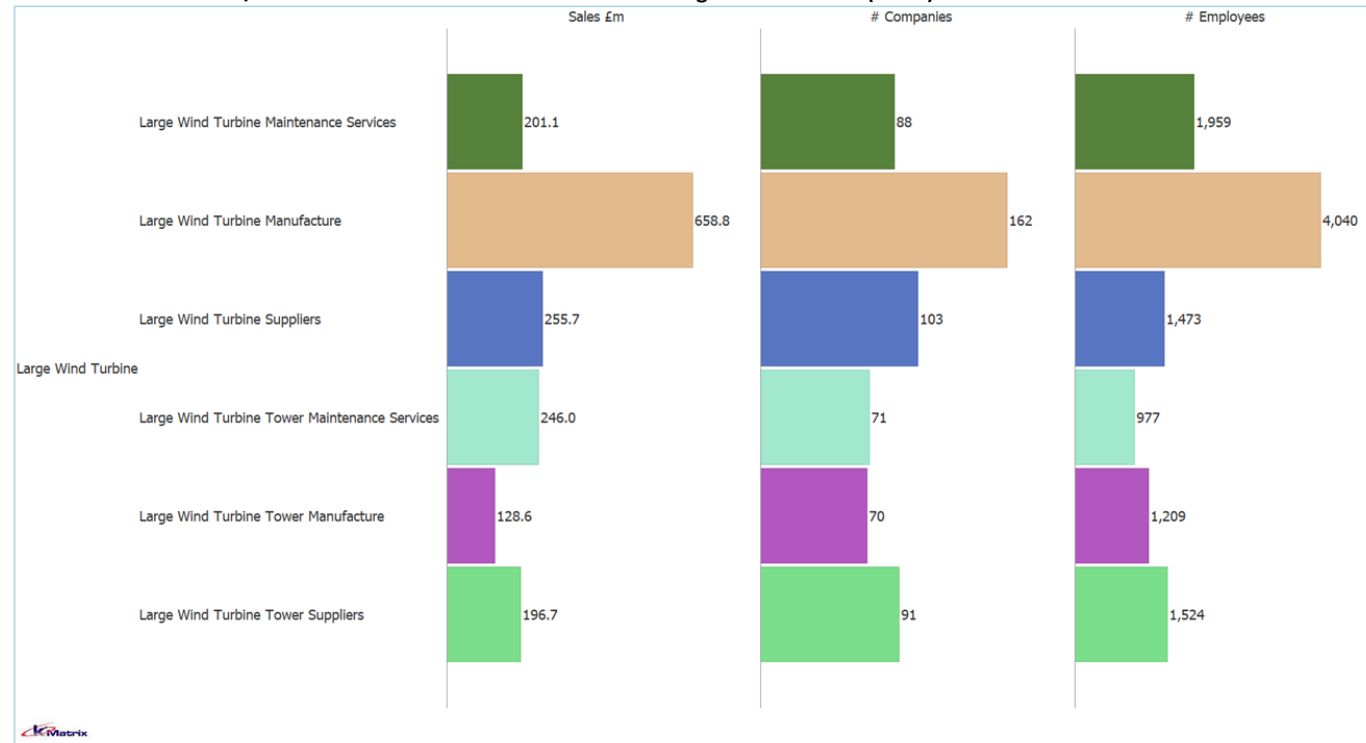
Wind – Within the six Level 4 sub-sectors in Large Wind Turbine sales are relatively evenly distributed across this Level 3 market but the top three sub-sectors account for 69% of sales (62% in 2019/20) and are made up of:

- Large Wind Turbine Manufacture making up 39% of the Level 3 market (31% in 2019/20), example companies include drive chain and power firming systems manufacture, development and supply
- Large Wind Turbine Suppliers, 15% (17% in 2019/20), with example companies including head office functions, suppliers and supply chain.
- Large Wind Turbine Tower Maintenance Services, 15% (14% in 2019/20), which includes maintenance services.

The third largest sub-sector in 2019/20 was Large Wind Turbine Tower Suppliers, 14% (12% in 2020/21), which includes importers and installers of towers.

Figure 23: Summary of selected metrics for 2020/21 for the Low Carbon Level 3 sub-sector Suppliers of Systems (Geothermal) at Level 4
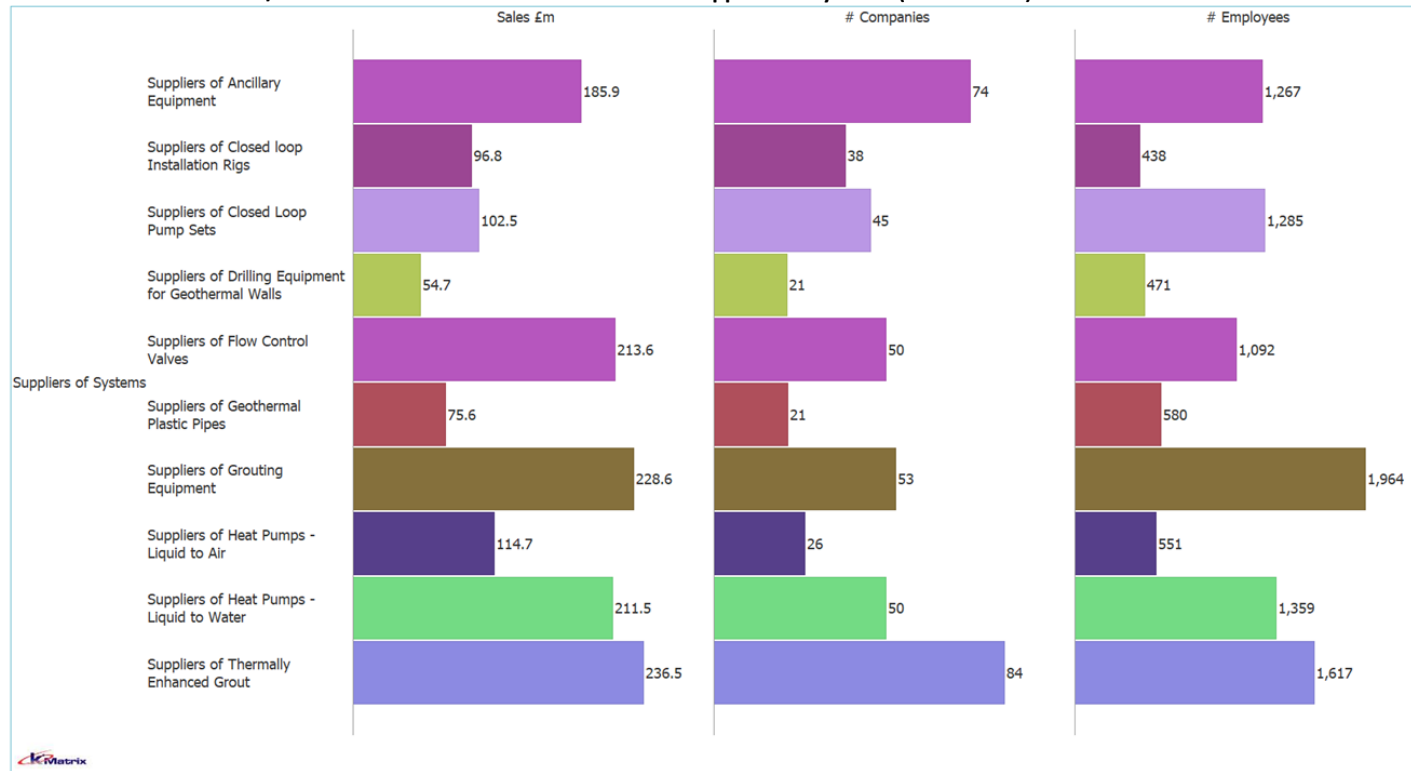
Geothermal – Within the ten Level 4 sub-sectors in Suppliers of Systems the top four sub-sectors account for 59% of sales (55% in 2019/20) and are made up of:

- Thermally Enhanced Grout makes up 16% of the market (14% in 2019/20) and includes distribution and supply companies
- Grouting Equipment makes up 15% of the market (15% in 2019/20) and includes distribution and installation companies
- Flow Control Valves makes up 14% of the market (13% in 2019/20) and includes importers, manufacturers and suppliers
- Suppliers of Heat Pumps – Liquid to Water makes up 14% of the market (13% in 2019/20) and includes importers, distribution and suppliers

The fourth largest sub-sector in 2019/20 was Suppliers of Ancillary Equipment, 14% (12% in 2020/21), example companies include the suppliers and installers of system integration equipment

Figure 24: Summary of selected metrics for 2020/21 for the Low Carbon Level 3 sub-sector Systems and Equipment (Photovoltaic) at Level 4
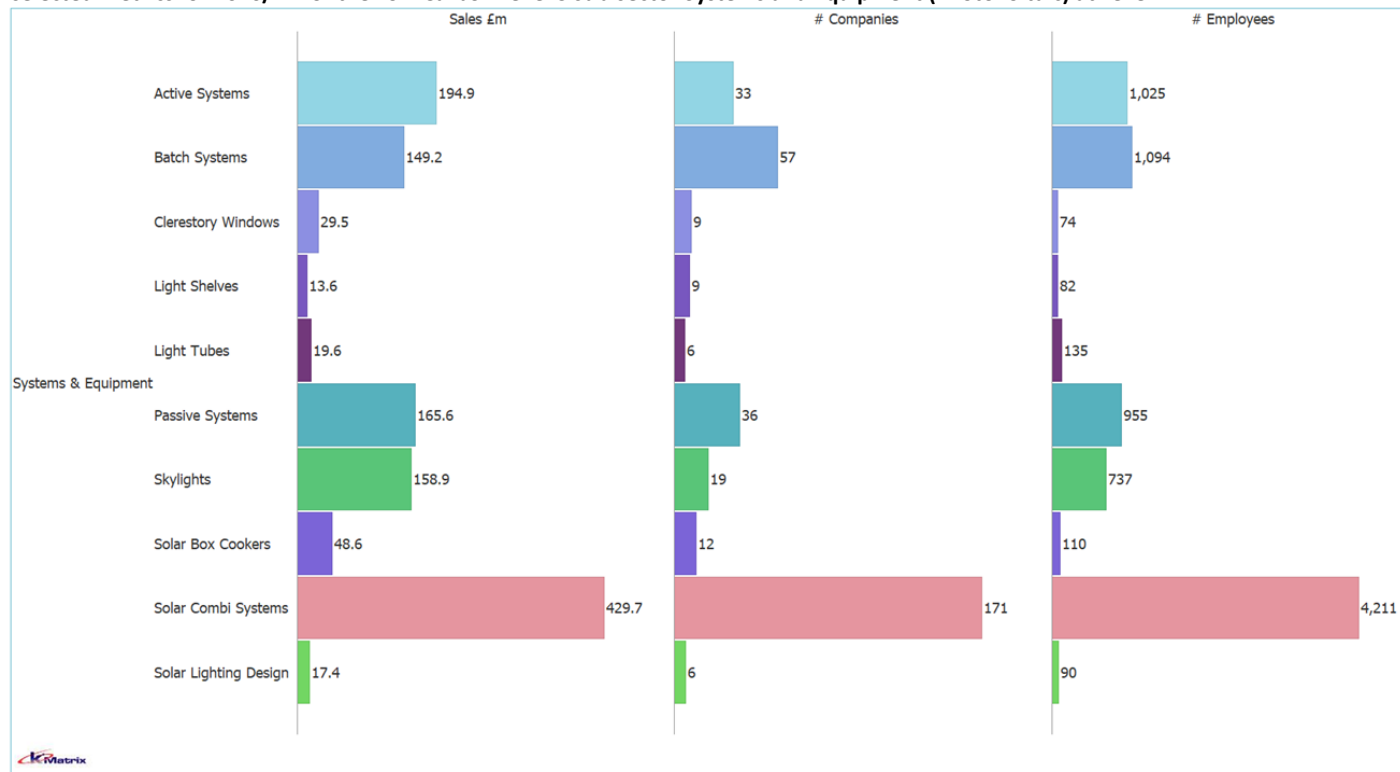
Photovoltaic – Within the ten Level 4 sub-sectors in Systems and Equipment, the largest Level 3 sub-sector for this market, the Solar Combi Systems sub-sector is the dominant sub-sector and it accounts for 35% of sales in this Level 3 market (36% in 2019/20). Example companies include the developers, suppliers and installers of solar combi systems.

Figure 25: Summary of selected metrics for 2020/21 for Biomass Energy Systems at Level 4
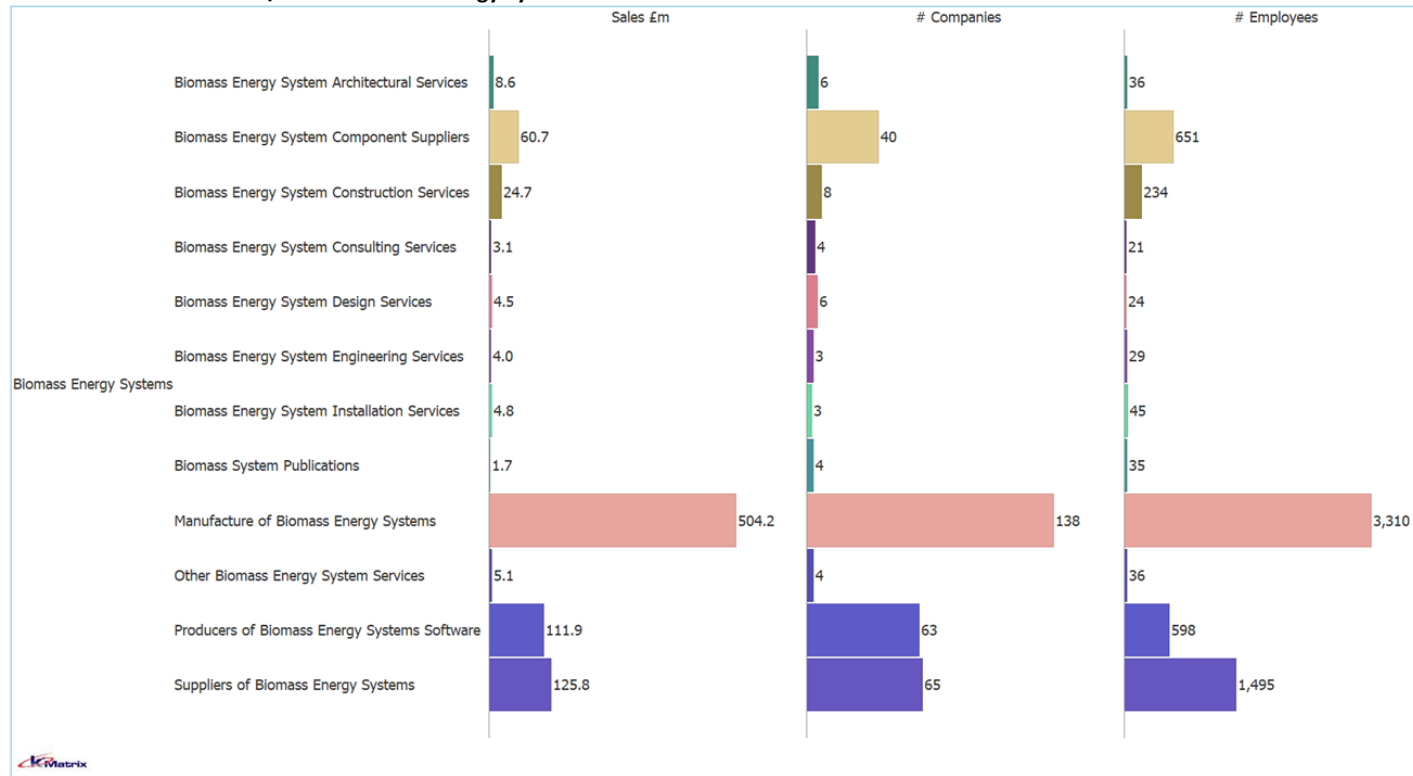
Biomass – Within the twelve Level 4 sub-sectors in Biomass Energy Systems the top three sub-sectors account for 86% of the market (82% in 2019/20) and these are made up of:
- Manufacture of Biomass Energy Systems which accounts for 59% of sales (49% in 2019/20) and is made up of manufacturing companies
- Suppliers of Biomass Energy Systems which accounts for 15% of sales (18% in 2019/20) and includes suppliers and applications consultants
- Producers of Biomass Energy Systems Software which accounts for 13% of the market (15% in 2019/20) and includes specialist software houses

1.5   London's LCEGS Level 1 - Environmental Market

In this section we look at the Environmental market in greater detail. Initially we split the market into eight further sub-sectors, Level 2, and then look at the highest performing Level 2 sub-sectors in more detail by highlighting the activity happening within them at Level 3 and Level 4.

### 1.5.1   Environmental Market at Level 2

Figure 26: Sales 2020/21 in £m (Level 2)
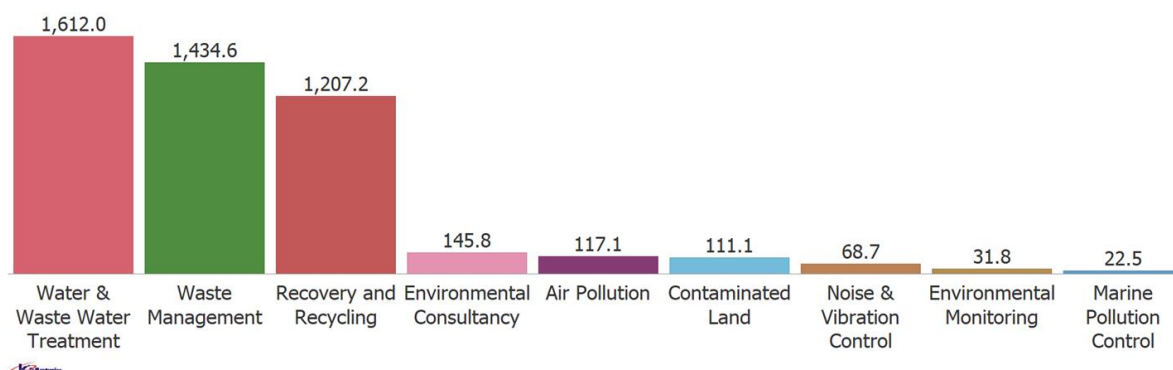
Environmental is split into nine sub-sectors, of which three account for 90% of sales (89% in 2019/20) (Figure 26). These three are made up of Water Supply & Waste Water Treatment 34% (34% in 2019/20), Waste Management 30% (31% in 2019.20) and Recovery & Recycling 25% (25% in 2019/20).

Each of these three sub-sectors grew between 2018/19 and 2019/20, then had negative growth between 2019/20 and 2020/21: Water Supply and Waste Water Treatment from £1.79bn to £1.85bn, then £1.61bn; Waste Management from £1.60bn to £1.68bn, then £1.43bn and Recovery and Recycling from £1.29bn to £1.39bn, then £1.20bn.

Figure 27: Employment 2020/21 (Level 2)
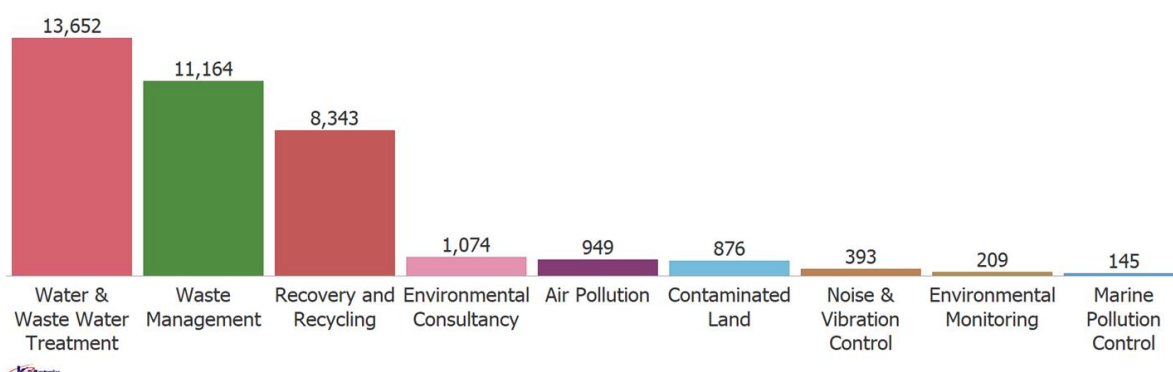
The same three sub-sectors account for 90% of employment (Figure 27). They are made up of Water Supply & Waste Water Treatment 37% (38% in 2019/20), Waste Management 30% (30% in 2019/20) and Recovery & Recycling 23% (22% in 2019/20).

Each of these three sub-sectors grew between 2018/19 and 2019/20, then had negative growth between 2019/20 and 2020/21: Water & Waste Water Treatment from 16,132 to 16,591, then 13,652; Waste Management from 12,806 to 13,367, then 11,164 and Recovery and Recycling from 9,238 to 8,809, then 8,343.

Figure 28: Companies 2020/21 (Level 2)
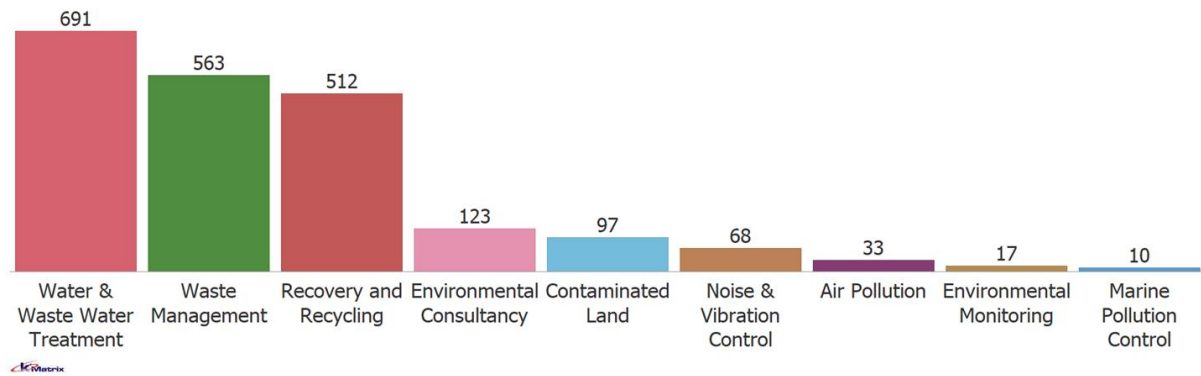
The same three sub-sectors also account for 83% of companies (84% in 2019/20) (Figure 28). They are made up of Water Supply & Waste Water Treatment 33% (33% in 2019/20), Waste Management 27% (27% in 2019/20) and Recovery & Recycling 24% (24% in 2019/20).

Each of these three sub-sectors grew between 2018/19 and 2019/20, then had negative growth between 2019/20 and 2020/21: Water & Waste Water Treatment from 759 to 781, then 691; Waste Management from 601 to 628, then 563 and Recovery and Recycling from 530 to 561, then 512.

1.5.2 Environmental Market at Level 3

Figure 29: Summary of selected metrics for 2020/21 for Waste Management and Water & Waste Water Treatment sub-sectors at Level 3
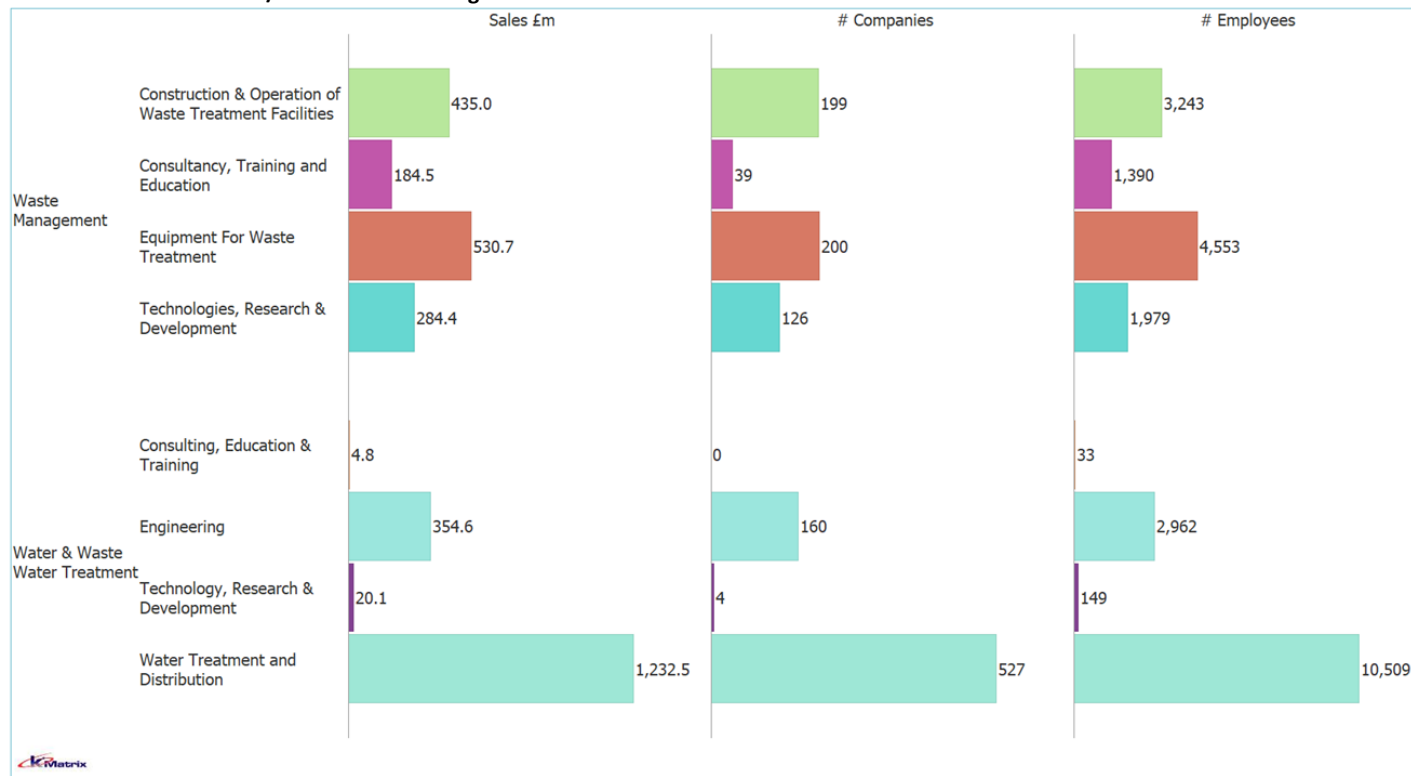
Figure 29 shows the Sales, Companies and Employees for the Waste Management and Water & Waste Water Treatment Level 2 sub-sectors broken down into their Level 3 sub-sectors.

Water & Waste Water Treatment is made up of four Level 3 sub-sectors, the largest being Water Treatment and Distribution which makes up 76% of sales (77% in 2019/20). Example activities include development and implementation by utilities along with supply, consultancy and implementation by independent consulting engineers.

Waste Management is made up of four Level 3 sub-sectors with sales more evenly distributed across them than for the Water and Waste Water Treatment market. The largest Level 3 sub-sector is Equipment for Waste Treatment which makes up 37% of sales in the market (36% in 2019/20). Example companies are those involved in development, manufacture and supply. The next largest sub-sector is Construction & Operation of Waste Treatment Facilities which makes up 30% of sales (32% in 2019/20). Example companies are those involved in both public and private operations management and supply and installation of operational equipment.

Figure 30: Summary of selected metrics for 2020/21 for Recovery and Recycling at Level 3

Figure 30 shows the Sales, Companies and Employees for the Level 2 Recovery & Recycling sub-sector broken down into its Level 3 sub-sectors. There are eighteen Level 3 sub-sectors and Waste Collection, including the collection of all waste, both municipal and commercial (landfill and recyclates), is clearly the largest sub-sector making up 43% of all sales in the Recovery and Recycling sub-sector (43% in 2019/20). There are then a number of waste stream stock processing sub-sectors with the largest ones being Glass, Rubber Products, Textiles, Paper and Composting.

1.5.3 Environmental Market at Level 4

Figure 31: Summary of selected metrics for 2020/21 for the Environmental Level 3 sub-sector Water Treatment & Distribution at Level 4
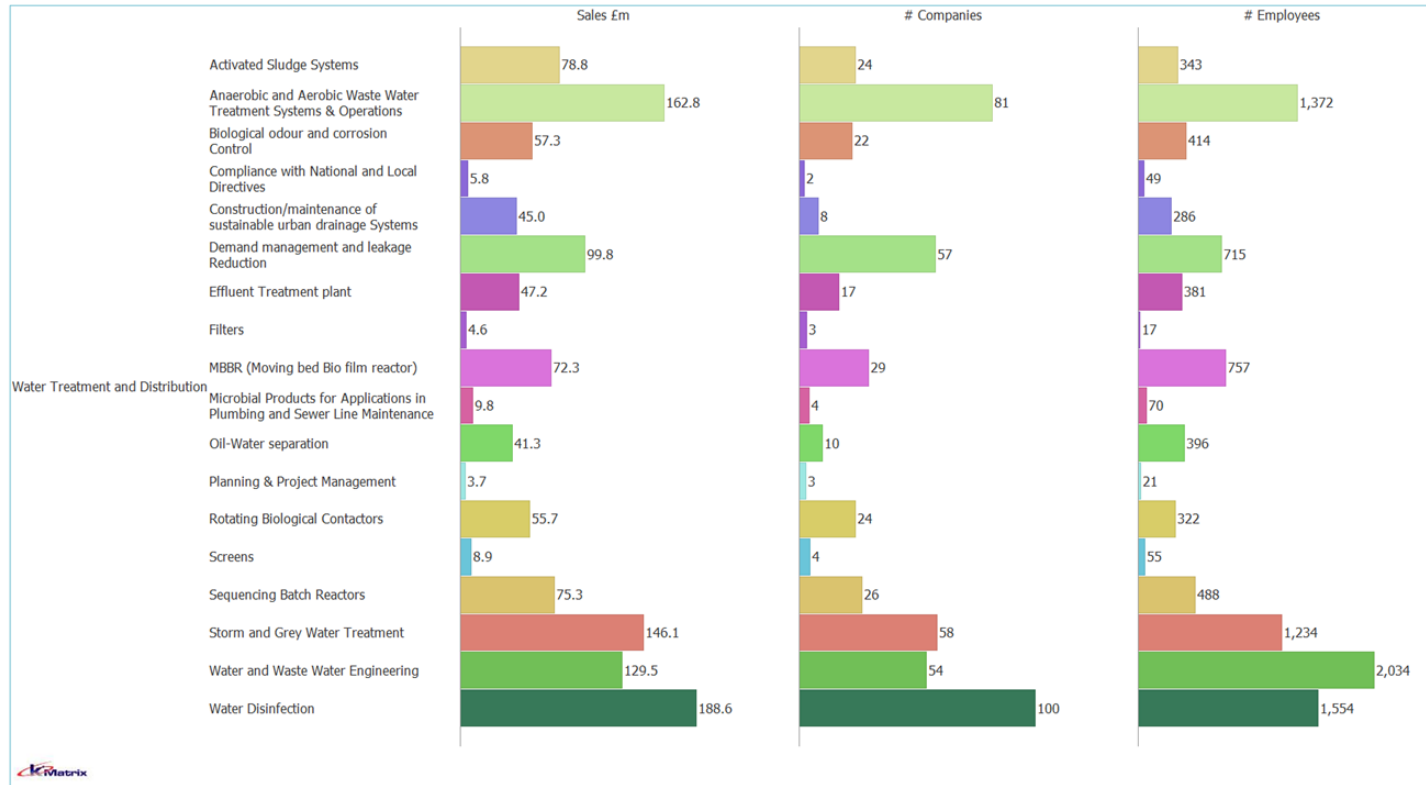
Water and Waste Water Treatment – Within the eighteen Level 4 sub-sectors in Water Treatment and Distribution the relative sizes of the sub-sectors vary considerably and the top four sub-sectors account for 51% of the market (50% in 2019/20). These are made up of:

- Water Disinfection which accounts for 15% of sales (14% in 2019/20) and includes companies involved in the development and supply of disinfection systems
- Anaerobic and Aerobic Waste Water Treatment Systems & Operations which accounts for 13% of sales (13% in 2019/20) and includes companies involved in development, supply and consultation services
- Storm and Grey Water Treatment which accounts for 12% of sales (12% in 2019/20) and includes companies involved in the manufacture of fixtures and fittings and heavy systems

- Water and Waste Water Engineering which accounts for 11% of sales (11% in 2019/20) and includes predominantly consulting engineering companies

Figure 32: Summary of selected metrics for 2020/21 for the Environmental Level 3 sub-sector Equipment for Waste Treatment (Waste Management) at Level 4
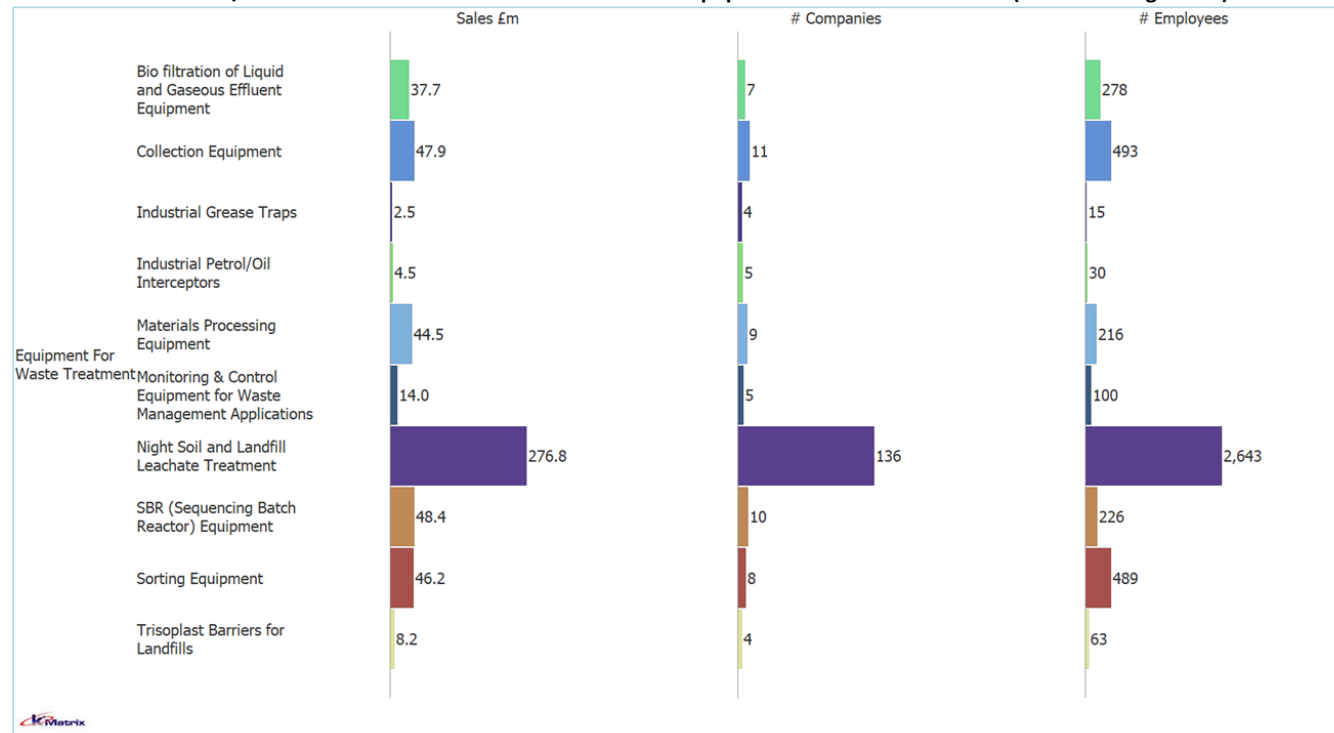
Waste Management – Within the ten Level 4 sub-sectors in Equipment for Waste Treatment the Night Soil and Landfill Leachate Treatment sub-sector is the dominant sub-sector and accounts for 52% of the sales in this Level 3 market (52% in 2019/20). Example companies in this sub-sector include equipment manufacturers, installers and consultancies.

Figure 33: Summary of selected metrics for 2020/21 for the Environmental Level 3 sub-sector Waste Collection (Recovery & Recycling) at Level 4
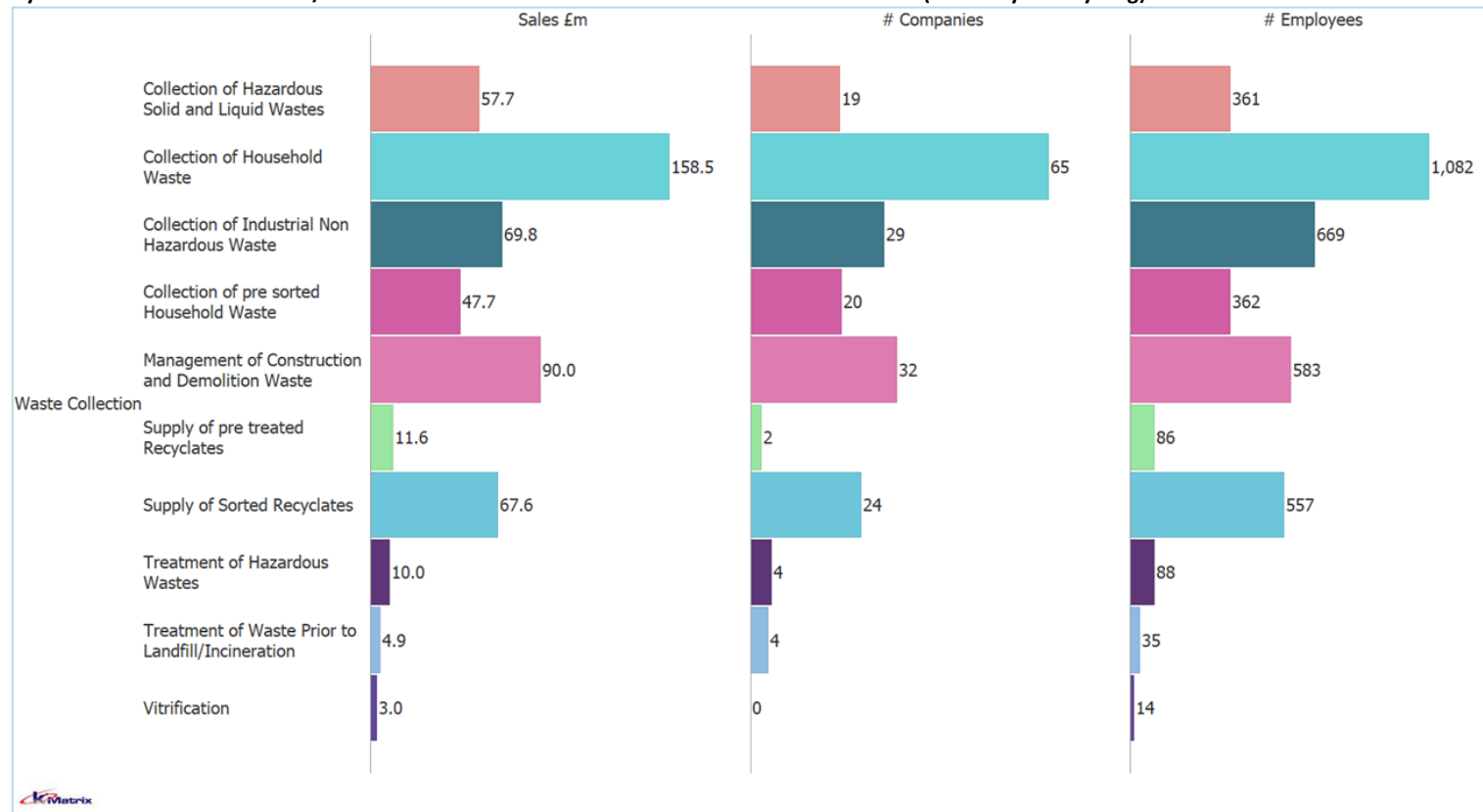
Recovery & Recycling – Within the ten Level 4 sub-sectors in Waste Collection the Collection of Household Waste is the dominant sub-sector and accounts for 30% of the sales in this Level 3 market (31% in 2019/20). Example companies in this sub-sector include those involved in the supply of household waste compacting equipment and waste collection vehicles.

1.6   London's LCEGS Level 2 Summary

Figure 34 compares all 24 sub-sectors of LCEGS and shows that the five leading sub-sectors: Carbon Finance (36%), Wind (10%), Geothermal (10%), Building Technologies (8%) and Alternative Fuels (7%) have the largest share in terms of sales, company numbers and employment and accounted for 71% of London's LCEGS sector activity in 2020/21 (71% in 2019/20).

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 24% of the LCEGS sector sales in 2020/21 (24% in 2019/20).

These 11 sub-sectors dominate the LCEGS sector sales and together made up 95% of its overall sales in 2020/21 (95% in 2019/20).

Figure 34: LCEGS Summary 2020/21 for Sales, Number of Companies and Number of Employees

1.7   London and the UK's LCEGS compared

Figure 35: London Measures 2020/21 by Level 1
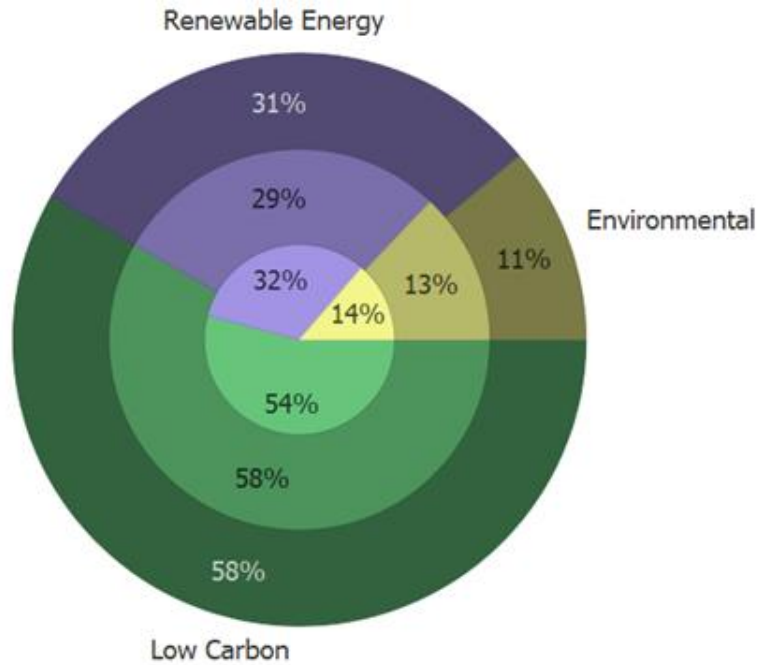
Figure 36: UK Measures 2020/21 by Level 1
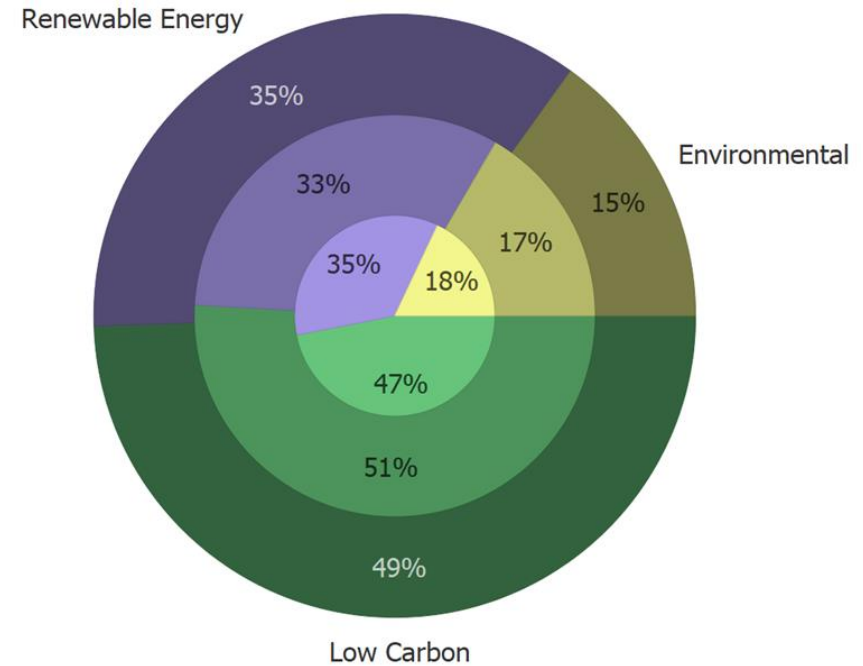
Figures 35 and 36 compare the profile of London and UK's LCEGS activities at Level 1 for sales (outer circle), companies (middle circle) and employment (inner circle). London is stronger in Low Carbon for sales and number of companies. Low Carbon number of employees are also stronger, but not as strong as the other metrics, despite a higher level of sales and this is due to the higher than average value-added created by employment in Carbon Finance.

Figure 37: London's LCEGS sub-sectors for 2020/21 at Level 2
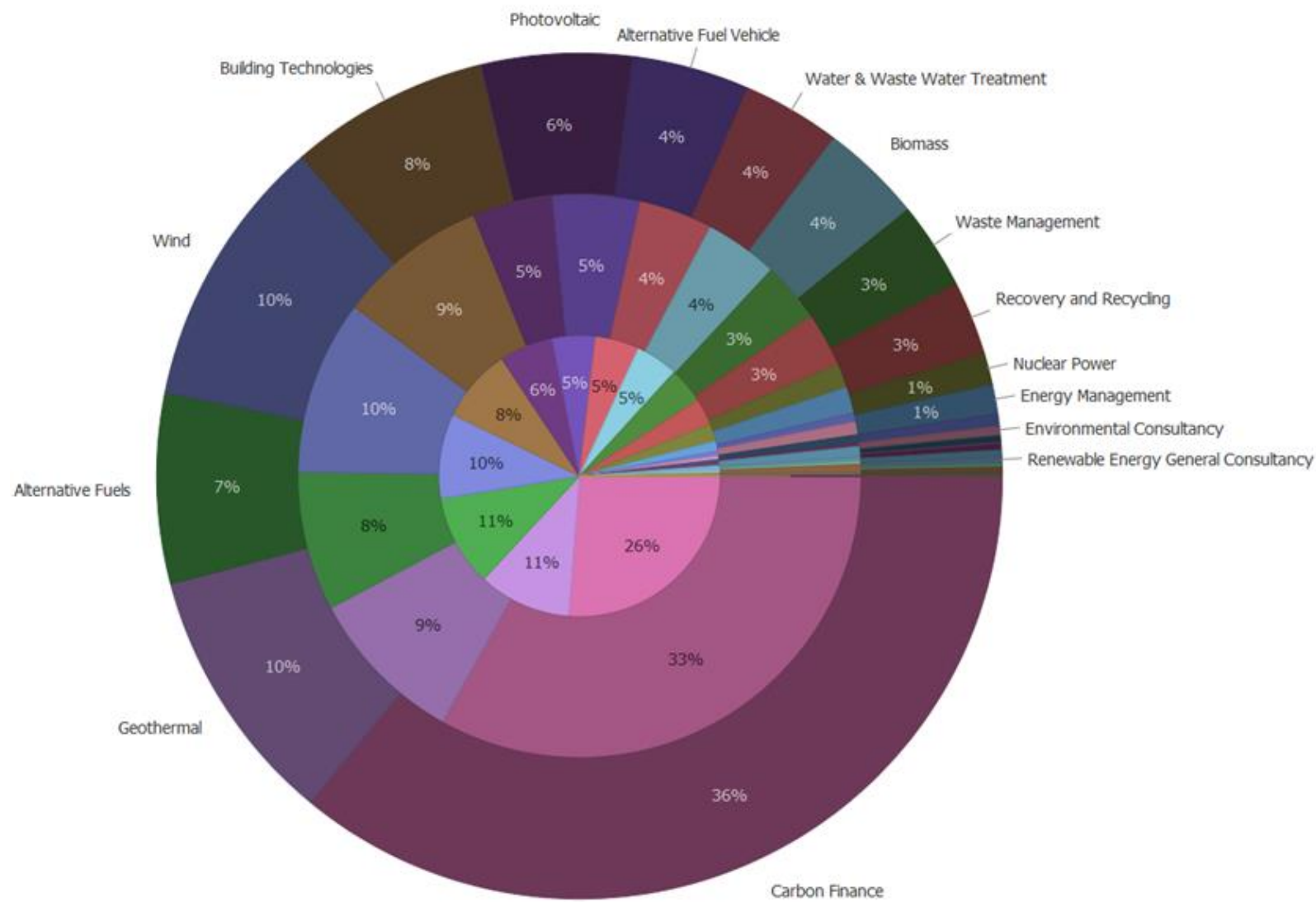
Figure 38: UK's LCEGS sub-sectors for 2020/21 at Level 2
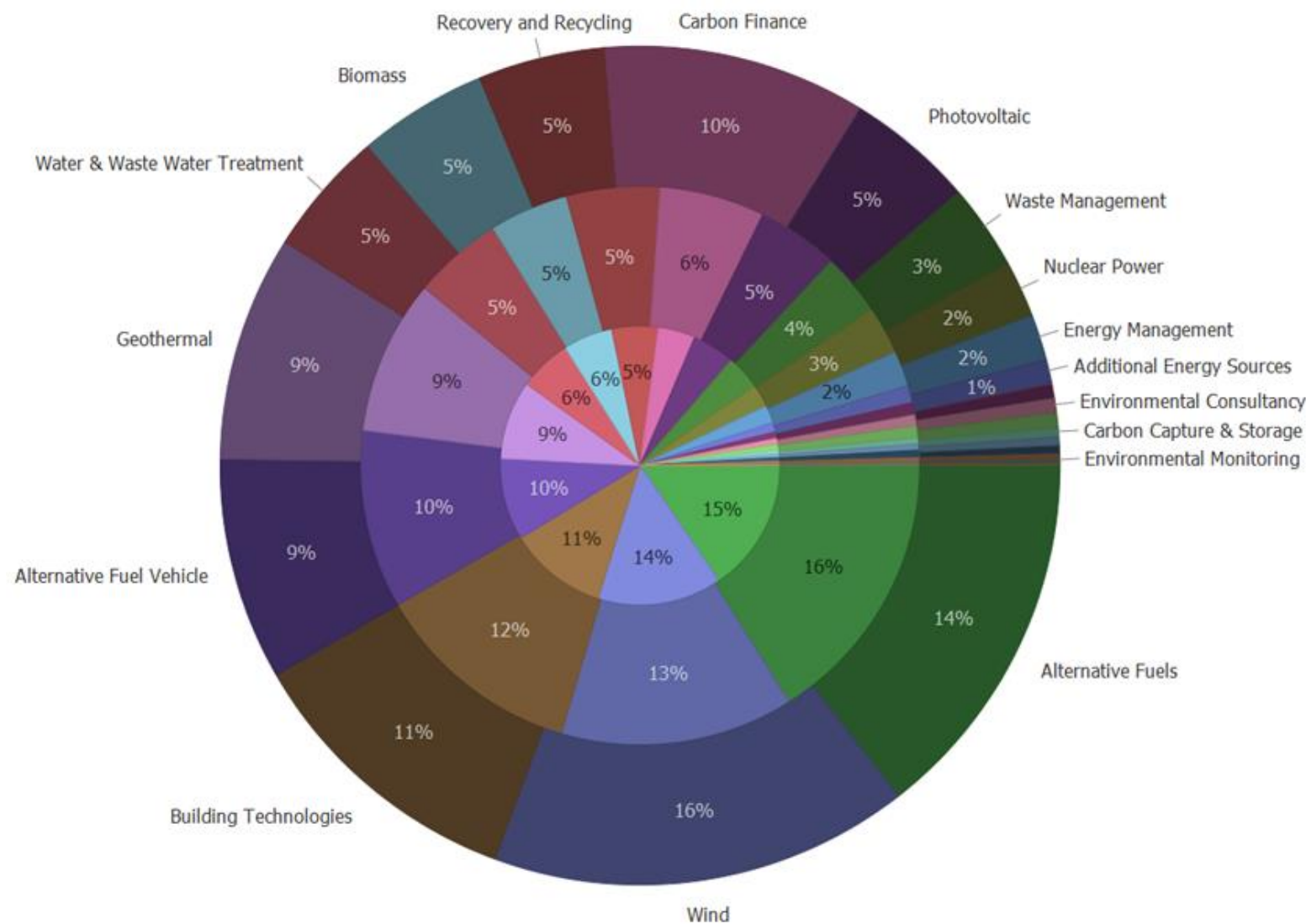
Figures 37 and 38 extends the analysis by comparing the profile of London and UK's LCEGS activities at Level 2 for sales (outer circle), companies (middle circle) and employment (inner circle). There are significant differences between the two that gives London a distinctive LCEGS profile compared to 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.

Figure 39: Sales, Employment and Companies 2019/20 as % of UK
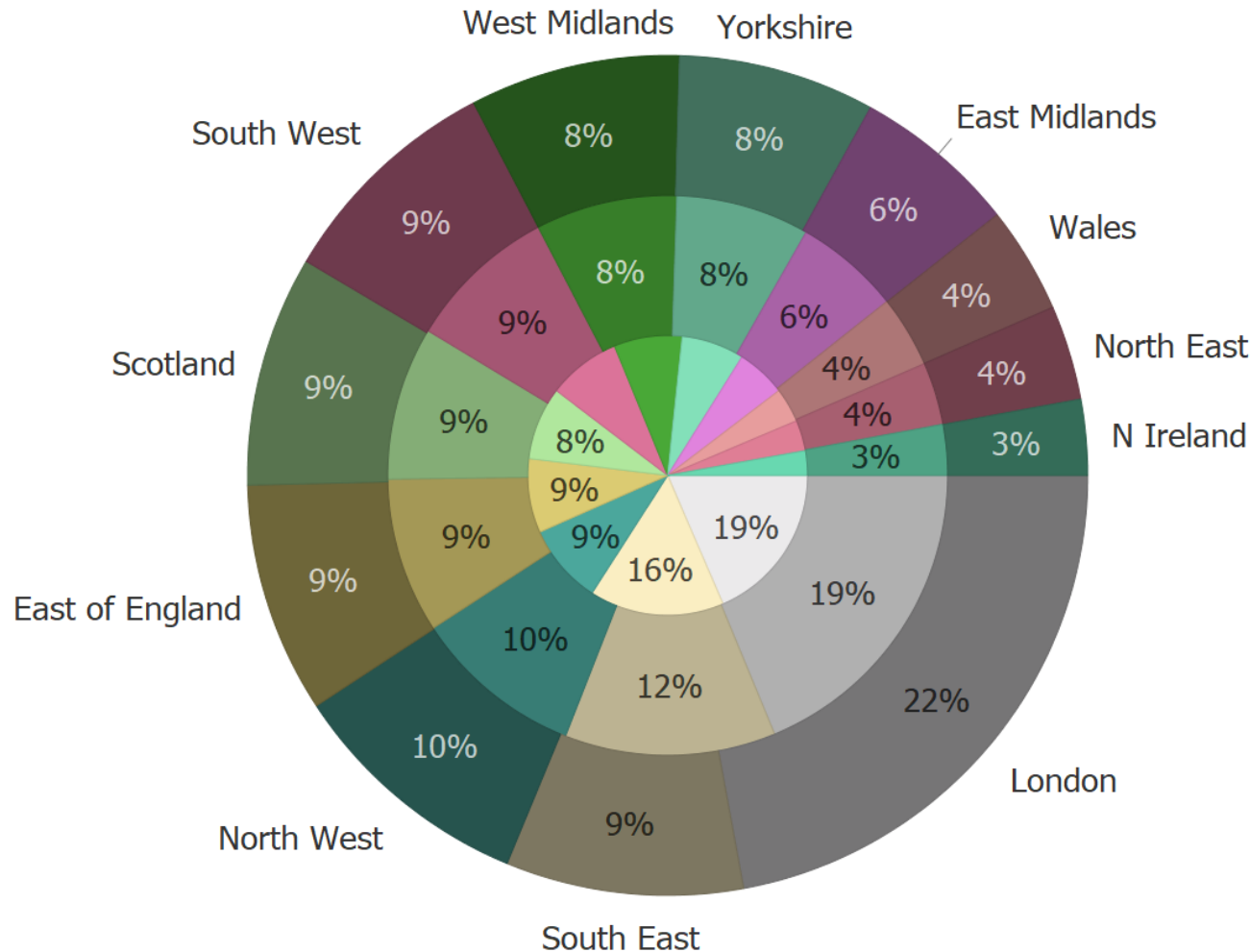
Figure 39 compares the "old" UK regions and the Devolved Administrations for sales, companies and employment.

2019/20 data has been used for this analysis because the impact of Covid-19 across the regions has varied considerably. The data for 2020/21 would provide regional comparisons that were skewed to reflect the impact of covid.

London accounts for 22% of sales, 19% of companies and 19% of employment. If Carbon Finance is removed, this changes to 16% of sales, 14% of companies and 15% of employment.

The next largest regions for LCEGS are the South East, North West and East of England, these rankings are unchanged since 2014/15.

Note: Regions have been used for comparison because London is so much bigger than the next largest LEP (London is 22% of England's LEP total whereas the South East LEP accounts for 5%) and this also maintains consistency with previous reports.

Figure 40 then compares the same regions again for 2019/20, but this time by all the Level 2 sub-sectors. This graphic shows how London's 22% of UK Sales is made up from a range of contributions, from Carbon Finance at 92% to Air Pollution, Carbon Capture and Storage and Contaminated Land down at 10%.

The larger the percentage share of a sub-sector in a region, the higher the degree of supply chain localization in that sub-sector, in that region. The higher the degree of localization, the bigger the opportunity for the development of partnerships and regional cooperation.

Figure 40: Sales 2019/20 London as % of UK at Level 2
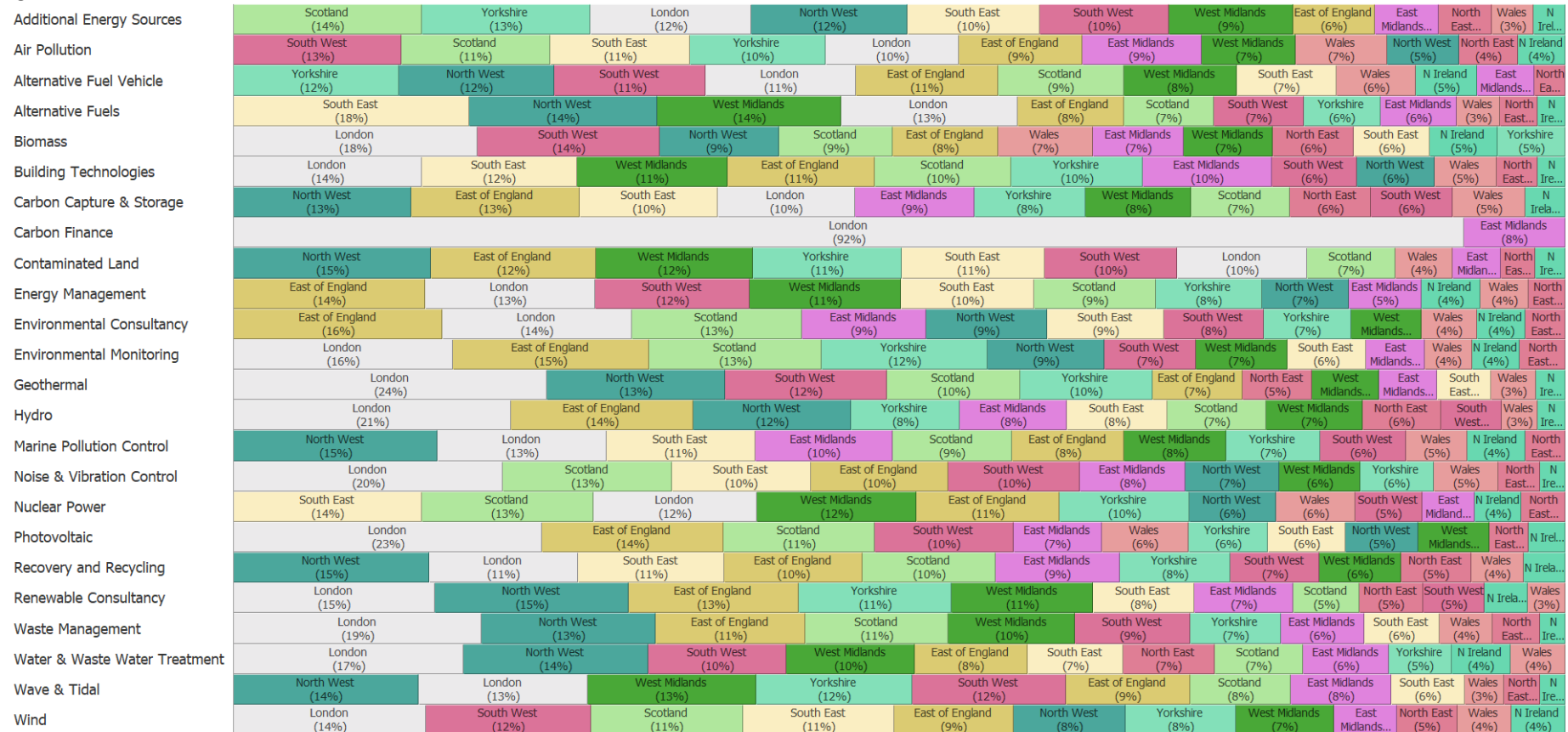
London has the highest share of the market in 12 of the 24 sub-sectors: Carbon Finance (92%), Geothermal (24%), Photovoltaic (23%), Hydro (21%), Noise and Vibration Control (20%), Waste Management (19%), Biomass (18%), Water Supply and Waste Water Treatment (17%), Environmental Monitoring (16%), Renewable Consultancy (15%), Building Technologies (14%) and Wind (14%).

London has the second highest share of the market in 5 sub-sectors: Environmental Consultancy (14%), Energy Management (13%), Marine Pollution Control (13%), Wave & Tidal (13%) and Recovery and Recycling (11%).

1.8   London's LCEGS Company Size

In this section we look at the number of companies within London in 2019/20, split by size of company, using the standard classification of company size.

Company size classifications:
- Start-up = any company formed during the previous 12 months, for 2019/20 that would include companies formed during 2018/19
- Micro = companies with 2-9 employees
- SME = Small and Medium-sized companies, with 10-249 employees
- Large = companies with 250-1,500 employees
- Corporations = any company with 1,501 or more employees

Start-up companies are a discrete category, not dependent on number of employees and are not double counted in the other categories.

Figure 41: Companies 2019/20 split by size
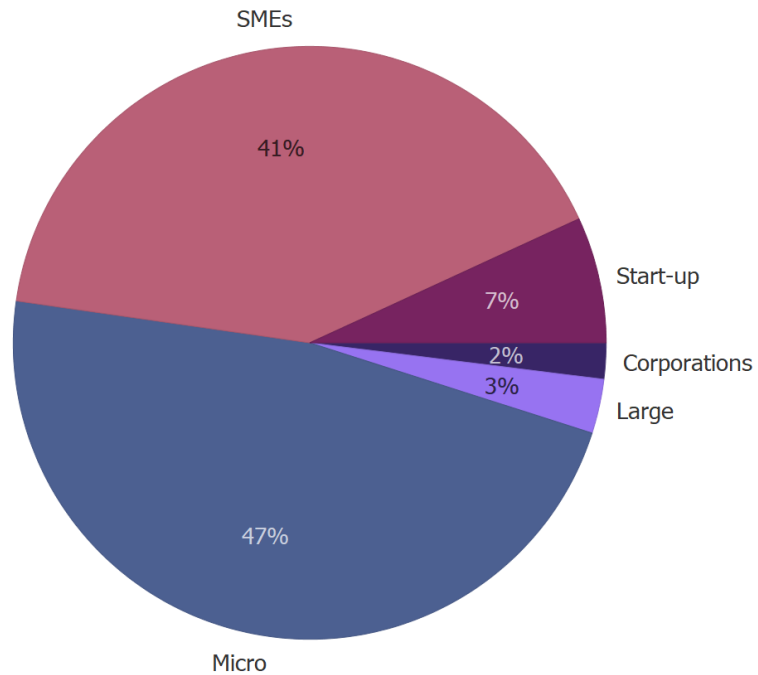
Figure 41 splits the 17,054 LCEGS sector companies in 2019/20 by company size. The LCEGS sector in London is characterized by:

- Micro, 47% of companies, but 24% of employment
- SMEs, 41% of companies, but 44% of employment
- Start-up, 7% of companies, but 7% of employment
- Large companies, 3% of companies, but 7% of employment
- Corporations, 2% of companies, but 19% of employment

Figure 42 splits the 17,054 LCEGS sector companies in 2019/20 by company size and by Level 1 sub-sector.

Figure 42: Companies 2019/20 split by size and Level 1
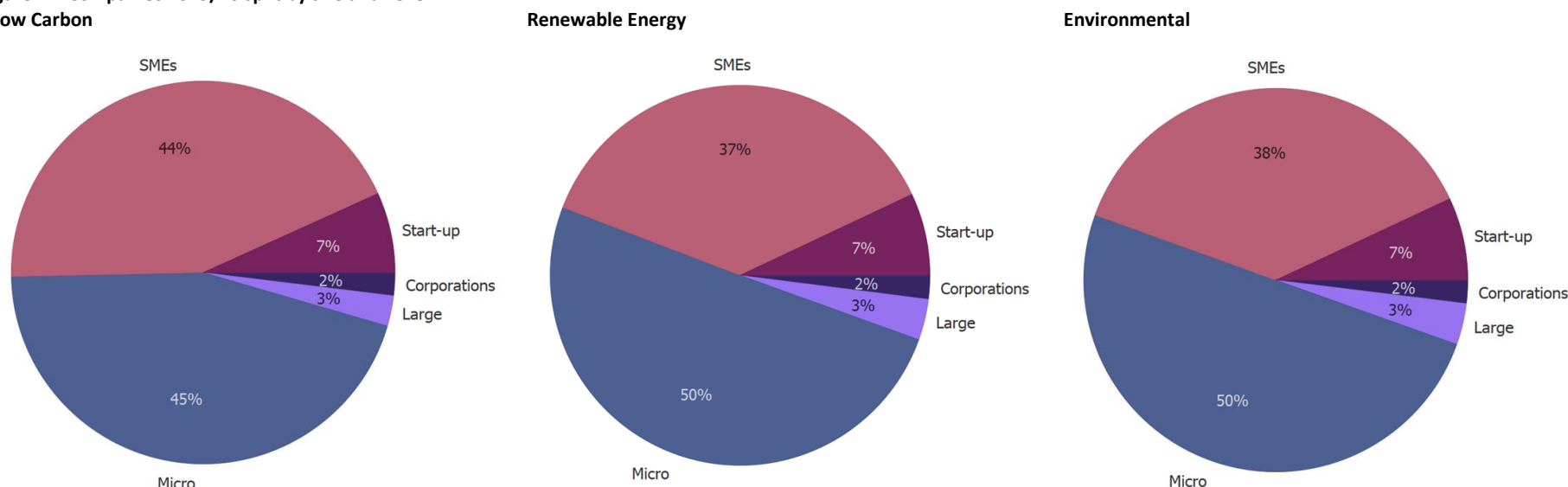
The 9,731 Low Carbon companies in 2019/20 consisted of 45% Micro (25% of employment), 44% SMEs (44% of employment), 7% Start-up (6% of employment), 3% Large (6% of employment) and 2% Corporations (19% of employment).

The 4,969 Renewable Energy companies in 2019/20 consisted of 50% Micro (24% of employment), 37% SMEs (43% of employment), 7% Start-up (7% of employment), 3% Large (7% of employment) and 2% Corporations (20% of employment).

The 2,353 Environmental companies in 2019/20 consisted of 50% Micro (22% of employment), 38% SMEs (45% of employment), 7% Start-up (7% of employment), 3% Large (8% of employment) and 2% Corporations (19% of employment).

The top Level 2 sub-sectors for Low Carbon consisted of:
- Carbon Finance: 41% Micro, 49% SMEs, 7% Start-up, 2% Large and 2% Corporations
- Building Technologies: 50% Micro, 37% SMEs, 7% Start-up, 4% Large and 2% Corporations
- Alternative Fuel: 51% Micro, 36% SMEs, 7% Start-up, 4% Large and 2% Corporations

- Alternative Fuel Vehicle: 49% Micro, 38% SMEs, 7% Start-up, 4% Large and 2% Corporations

The top Level 2 sub-sectors for Renewable Energy consisted of:
- Wind: 50% Micro, 37% SMEs, 7% Start-up, 4% Large and 2% Corporations
- Geothermal: 49% Micro, 38% SMEs, 7% Start-up, 3% Large and 2% Corporations
- Photovoltaic: 51% Micro, 37% SMEs, 7% Start-up, 4% Large and 2% Corporations
- Biomass: 51% Micro, 36% SMEs, 7% Start-up, 3% Large and 2% Corporations

The top Level 2 sub-sectors for Environmental consisted of:
- Water and Waste Water Treatment: 50% Micro, 38% SMEs, 7% Start-up, 3% Large and 2% Corporations
- Waste Management: 50% Micro, 38% SMEs, 7% Start-up, 3% Large and 2% Corporations
- Recovery & Recycling: 50% Micro, 37% SMEs, 7% Start-up, 4% Large and 2% Corporations

1.9   London's LCEGS Growth

In Section 1.1 annual growth in London's LCEGS sales, companies and employment was compared with growth in the UK's LCEGS sector as a whole for 2018/19 to 2020/21. Table 7 shows London's annual growth in more detail by breaking it down into sub-sectors for those years. Growth between one year and the next is shown in red.

While annual growth in the LCEGS sector as a whole has varied between -14.1 and 13.3% for each of the three parameters, Table 7 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, it also reflects the varying impact of the Covid-19 pandemic on different sub-sectors. For this section, the growth rates between 2018/19 and 2019/20 will be discussed regarding the strengths of the sub-sectors, while the growth rates between 2019/20 and 2020/21 will be looked at in respect to the impact of Covid-19 pandemic on the different sub-sectors.

2018/19 to 2019/20 growth rate comparisons
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 1% of the UK growth rates. The three main exceptions are:
- Carbon Finance, where the London growth rate was 19.6% between 2018/19 and 2019/20 and the UK growth rate was 16.3% between 2018/19 and 2019/20

- Alternative Fuel Vehicle, where the London growth rate was 9.6% between 2018/19 and 2019/20 and the UK growth rate was 7.4% between 2018/19 and 2019/20
- Nuclear Power, where the London growth rate was 7.6% between 2018/19 and 2019/20 and the UK growth rate was 5.5% between 2018/19 and 2019/20
- Biomass, where the London growth rate was 11.7% between 2018/19 and 2019/20 and the UK growth rate was 10.2% between 2018/19 and 2019/20

2019/20 to 2020/21 growth rate comparisons

Sub-sectors in London have been impacted by the pandemic to different degrees, varying from -11.5% for Energy Management to -20.9% for Carbon Capture and Storage. In contrast, the impact across all sub-sectors for the UK varied between -8.3% for Alternative Fuels, to -9.9% to Alternative Fuel Vehicle. In all sub-sectors, the impact of Covid-19 in London has been greater than for the UK, with the most notable impacts being:

- Carbon Capture & Storage, where the London growth rate was -20.9% between 2019/20 and 2020/21 and the UK growth rate was -8.9% between 2019/20 and 2020/21
- Hydro, where the London growth rate was -16.8% between 2019/20 and 2020/21 and the UK growth rate was -9.0% between 2019/20 and 2020/21
- Renewable Consultancy, where the London growth rate was -16.7% between 2019/20 and 2020/21 and the UK growth rate was -9.5% between 2019/20 and 2020/21
- Building Technologies, where the London growth rate was -16.6% between 2019/20 and 2020/21 and the UK growth rate was -8.8% between 2019/20 and 2020/21

Other sub-sectors were more in line with the UK average but still showed a greater impact:

- Air Pollution, where the London growth rate was -13.0% between 2019/20 and 2020/21 and the UK growth rate was -8.9% between 2019/20 and 2020/21
- Recovery & Recycling, where the London growth rate was -12.9% between 2019/20 and 2020/21 and the UK growth rate was -9.1% between 2019/20 and 2020/21
- Environmental Monitoring, where the London growth rate was -12.9% between 2019/20 and 2020/21 and the UK growth rate was -9.0% between 2019/20 and 2020/21
- Energy Management, where the London growth rate was -11.5% between 2019/20 and 2020/21 and the UK growth rate was -8.9% between 2019/20 and 2020/21

Table 7 shows that the highest levels of actual growth in London LCEGS occurred in Carbon Finance (Low Carbon), Wind, Photovoltaics and Wave & Tidal (Renewable Energy) between 2018/19 and 2020/21; while the greatest impact from Covid-19 was seen by the highest contraction in Carbon Capture & Storage (Low Carbon), Hydro and Renewable Consultancy (Renewable Energy), Building Technologies and Alternative Fuels (Low Carbon).

Table 7: London's LCEGS Sales (£m), Company and Employment Growth 2018/19 to 2020/21

Level 1	Level 2	Sales £m					# Companies					# Employees				
		2018/19	Growth %	2019/20	Growth %	2020/21	2018/19	Growth %	2019/20	Growth %	2020/21	2018/19	Growth %	2019/20	Growth %	2020/21
Environmental	Air Pollution	128.8	4.4%	134.5	-13.0%	117.1	36.4	3.0%	37.5	-11.4%	33.2	1,102.7	3.7%	1,143.2	-17.0%	948.8
Environmental	Contaminated Land	121.8	6.5%	129.7	-14.3%	111.1	101.1	5.8%	107.0	-8.9%	97.5	986.1	5.3%	1,038.7	-15.6%	876.2
Environmental	Environmental Consultancy	159.1	6.8%	170.0	-14.2%	145.8	128.8	5.3%	135.7	-9.4%	123.0	1,205.5	5.5%	1,271.6	-15.5%	1,073.9
Environmental	Environmental Monitoring	34.0	7.4%	36.5	-12.9%	31.8	16.9	7.2%	18.1	-7.7%	16.7	232.2	6.1%	246.4	-15.1%	209.3
Environmental	Marine Pollution Control	24.6	7.0%	26.3	-14.4%	22.5	10.2	7.2%	10.9	-7.7%	10.1	162.8	5.6%	171.9	-15.5%	145.3
Environmental	Noise & Vibration Control	72.7	9.0%	79.2	-13.2%	68.7	69.0	6.9%	73.7	-8.0%	67.9	429.2	6.9%	458.9	-14.4%	393.0
Environmental	Recovery and Recycling	1,291.6	7.3%	1,386.0	-12.9%	1,207.2	530.4	5.9%	561.4	-8.9%	511.7	9,237.9	6.2%	9,808.5	-14.9%	8,343.3
Environmental	Waste Management	1,602.4	5.0%	1,683.1	-14.8%	1,434.6	601.5	4.3%	627.6	-10.2%	563.5	12,806.0	4.4%	13,367.5	-16.5%	11,164.5
Environmental	Water & Waste Water Treatment	1,793.3	3.4%	1,853.6	-13.0%	1,612.0	759.3	2.9%	781.3	-11.5%	691.4	16,132.2	2.8%	16,590.7	-17.7%	13,652.2
Low Carbon	Additional Energy Sources	219.7	6.8%	234.5	-14.6%	200.3	85.1	5.9%	90.1	-8.9%	82.1	1,684.5	5.7%	1,780.7	-15.4%	1,506.6
Low Carbon	Alternative Fuel Vehicle	2,028.0	9.6%	2,223.4	-13.2%	1,930.3	825.5	7.6%	888.2	-7.2%	823.9	14,068.6	8.8%	15,313.1	-12.5%	13,393.7
Low Carbon	Alternative Fuels	3,341.5	10.7%	3,698.0	-15.5%	3,125.9	1,278.7	9.0%	1,393.2	-6.1%	1,307.6	30,032.1	8.5%	32,589.3	-13.0%	28,349.9
Low Carbon	Building Technologies	3,560.5	10.1%	3,920.5	-16.6%	3,271.0	1,401.0	8.1%	1,514.0	-6.9%	1,408.8	24,375.9	8.3%	26,388.6	-13.2%	22,898.2
Low Carbon	Carbon Capture & Storage	82.4	5.9%	87.3	-20.9%	69.0	38.5	5.3%	40.5	-9.4%	36.7	646.1	4.8%	677.2	-16.1%	568.2
Low Carbon	Carbon Finance	14,876.8	19.6%	17,790.7	-13.2%	15,438.1	4,471.1	18.2%	5,285.6	2.5%	5,419.5	60,372.3	20.8%	72,919.9	-3.0%	70,761.6
Low Carbon	Energy Management	499.3	7.5%	536.7	-11.5%	475.0	253.6	6.5%	270.2	-8.3%	247.8	3,475.1	6.4%	3,697.1	-14.8%	3,150.3
Low Carbon	Nuclear Power	573.0	7.6%	616.6	-14.6%	526.3	234.7	6.3%	249.5	-8.5%	228.4	5,893.3	6.2%	6,259.5	-15.0%	5,323.6
Renewable Energy	Biomass	1,760.9	11.7%	1,966.8	-15.3%	1,666.7	675.4	9.0%	735.9	-6.0%	691.7	13,695.7	9.6%	15,012.1	-12.1%	13,195.1
Renewable Energy	Geothermal	4,424.0	10.9%	4,905.4	-13.3%	4,250.8	1,463.4	9.0%	1,595.5	-6.1%	1,498.3	30,056.3	9.4%	32,869.1	-12.3%	28,818.6
Renewable Energy	Hydro	142.1	5.5%	149.9	-16.8%	124.7	78.5	5.7%	82.9	-9.0%	75.5	1,129.0	4.3%	1,177.9	-16.5%	983.8
Renewable Energy	Photovoltaic	2,582.2	13.0%	2,916.8	-14.8%	2,485.7	716.4	10.4%	791.1	-4.9%	752.5	17,058.9	10.4%	18,831.5	-11.6%	16,654.3
Renewable Energy	Renewable Consultancy	114.3	5.0%	120.0	-16.7%	99.9	36.2	4.2%	37.7	-10.4%	33.8	964.7	4.5%	1,008.2	-16.4%	843.1
Renewable Energy	Wave & Tidal	19.3	11.7%	21.5	-15.1%	18.3	12.2	8.0%	13.2	-7.1%	12.2	110.9	10.6%	122.6	-11.4%	108.6
Renewable Energy	Wind	4,628.4	13.9%	5,271.5	-15.1%	4,476.3	1,540.1	11.2%	1,712.9	-4.1%	1,642.2	26,114.1	12.1%	29,276.5	-10.0%	26,351.4
Total		**44,080.7**	**13.3%**	**49,958.5**	**-14.1%**	**42,909.2**	**15,363.9**	**11.0%**	**17,053.8**	**-4.0%**	**16,376**	**271,971.9**	**11.0%**	**302,020.6**	**-10.7%**	**269,714**

Some sub-sectors have shown significantly stronger growth between 2017/18 (see previous report) and 2019/20 than the UK average and should be considered strengths of the region and include:

- Contaminated Land Reclamation and Remediation with 12.8% (UK 1.0%)
- Alternative Fuel Vehicle with 18.3% (UK 5.7%)
- Carbon Finance with 39.3% (UK 19.1%)
- Energy Management with 14.2% (UK 5.7%)
- Nuclear with 14.4% (UK 10.8%)
- Hydro with 10.2% (UK 1.8%)

Some sub-sectors have shown significantly weaker growth between 2017/18 (see previous report) and 2019/20 than the UK average and include:
- Noise & Vibration Control with 16.5% (UK 23.3%)
- Water & Waste Water Treatment with 6.3% (UK 12.7%)
- Carbon Capture & Storage with 11.9% (UK 19.0%)
- Wind with 27.3% (UK 42.2%)

London is strong with regards to component parts within the Wind sub-sector, but assembly activities have reduced within the London LCEGS market. Activity within the Wind sub-sector in London is early to mid-chain, resulting in a slower growth than the UK average, which is influenced by strong growth in wind by assembly and installation.

3-year growth 2017/18-2019/20 London and UK
By overlaying the sales for each sub-sector as a proportion of the UK market, the impact of stronger or weaker sales growth can be examined more closely. Table 8 shows how London compares with the UK as a whole for the 24 Level 2 sub-sectors. London as a % of UK Sales has been converted to a Proportionality Factor, where 1.0 equals the sector value (22.1%), below 1.0 represents a smaller market than the sector total proportion and above 1.0 represents a market which is larger than the sector total proportion. Likewise, the London/UK Growth Factor indicates where growth is stronger than the UK (above 1.0) or weaker than the UK (below 1.0). The 3-year growth rates have been calculated using the 2017/18 sales figures from the previous report and the 1018/19 and 2019/20 data from this report and we have not included the 2020/21 data as explained at the beginning of the report as that year is not a reflection of the overall growth trend seen over the last decade but is a reflection of the impact that the Covid-19 pandemic had.

Table 8: London and UK LCEGS Sales (£m) and 3-Year Growth Comparison

Level 1	Level 2	UK Sales £m 2019/20	UK 3-Year Growth %	London Sales £m 2019/20	London 3-Year Growth %	London as % of UK	London/ UK Sales Prop.	London/ UK Growth Factor
Environmental	Air Pollution	1,344.8	5.8%	134.5	8.5%	10.0%	0.5	1.5
Environmental	Contaminated Land	1,329.6	1.0%	129.7	12.8%	9.8%	0.4	13.3
Environmental	Environmental Consultancy	1,195.3	16.8%	170.0	13.3%	14.2%	0.6	0.8
Environmental	Environmental Monitoring	221.7	12.2%	36.5	14.0%	16.5%	0.7	1.1
Environmental	Marine Pollution Control	206.8	12.7%	26.3	14.3%	12.7%	0.6	1.1
Environmental	Noise & Vibration Control	392.5	23.3%	79.2	16.5%	20.2%	0.9	0.7
Environmental	Recovery and Recycling	12,426.0	13.7%	1,386.0	13.9%	11.2%	0.5	1.0
Environmental	Waste Management	9,060.4	12.6%	1,683.1	9.5%	18.6%	0.8	0.8
Environmental	Water & Waste Water Treatment	10,741.0	12.7%	1,853.6	6.3%	17.3%	0.8	0.5
Low Carbon	Additional Energy Sources	1,939.9	15.9%	234.5	12.8%	12.1%	0.5	0.8
Low Carbon	Alternative Fuel Vehicle	19,684.7	5.7%	2,223.4	18.3%	11.3%	0.5	3.2
Low Carbon	Alternative Fuels	27,872.2	13.8%	3,698.0	20.6%	13.3%	0.6	1.5
Low Carbon	Building Technologies	27,823.1	13.7%	3,920.5	19.5%	14.1%	0.6	1.4
Low Carbon	Carbon Capture & Storage	846.4	19.0%	87.3	11.9%	10.3%	0.5	0.6
Low Carbon	Carbon Finance	19,254.0	19.1%	17,790.7	39.3%	92.4%	4.2	2.1
Low Carbon	Energy Management	4,198.1	5.7%	536.7	14.2%	12.8%	0.6	2.5
Low Carbon	Nuclear Power	5,014.6	2.9%	616.6	14.4%	12.3%	0.6	4.9
Renewable Energy	Biomass	10,753.6	28.2%	1,966.8	22.5%	18.3%	0.8	0.8
Renewable Energy	Geothermal	20,862.6	18.8%	4,905.4	20.9%	23.5%	1.1	1.1
Renewable Energy	Hydro	720.7	1.8%	149.9	10.2%	20.8%	0.9	5.6
Renewable Energy	Photovoltaic	12,619.8	24.3%	2,916.8	25.3%	23.1%	1.0	1.0
Renewable Energy	Renewable Consultancy	795.2	10.8%	120.0	9.1%	15.1%	0.7	0.8
Renewable Energy	Wave & Tidal	169.6	24.9%	21.5	19.7%	12.7%	0.6	0.8
Renewable Energy	Wind	36,567.6	42.2%	5,271.5	27.3%	14.4%	0.7	0.6
Total		**226,040.2**	**18.3%**	**49,958.5**	**25.8%**	**22.1%**		

Figure 43 below shows how London compares with the UK for the 24 Level 2 sub-sectors, with regards to size of market and growth across three-years 2017/18 to 2019/20.

The x-axis represents the London/UK sales proportionality factor, which was calculated for each sub-sector by dividing the London sales a percentage of the UK, by 22.1%. This proportionality factor demonstrates where London holds a larger or smaller share of the UK market than would be expected, where:

- 1 = 22.1% of the UK market
- >1 = larger than 22.1% share
- <1 = smaller than 22.1% share

The y-axis represents the growth rate of London's Level 2 sub-sectors compared with the UK. This was calculated by dividing the 3-year growth rate of London by the average UK growth rate. This growth rate factor demonstrates which sub-sectors have a stronger or slower growth rate than the UK, where:
- 1 = the UK growth rate
- >1 = stronger than the UK average growth
- <1 = weaker than UK growth

The graph is split into four quadrants along 1 on each axis, with sub-sectors in each demonstrating:
- Top right = larger market share than expected and stronger growth than the UK average
- Bottom Right = larger market share than expected, but weaker growth than the UK average
- Top left = smaller market share than expected, but stronger growth than the UK average
- Bottom left = smaller market share than expected and weaker growth than the UK average

The bubbles represent the 24 Level 2 sub-sectors and are sized by the 2019/20 sales £m, illustrating the relative sizes of each sub-sector.

Figure 43 clearly illustrates the strong growth of the relatively small sub-sector, Contaminated Land, which grew by 12.8%, compared with 1.0% for the UK. Carbon Finance dominates the graph, with a larger proportion of the UK (92% of the UK market, compared with a LCEGS average of 22.1%) and stronger growth 39.3% compared with a UK average for Carbon Finance of 19.1%.

Figure 43: London/UK Sales proportionality factor vs. London/UK Growth factor of Level 2 Sub-sectors – Bubbles Sized by Sales £m

Table 9 shows similar data to Table 10, but with Carbon Finance removed and the proportionality factor re-calculated for the size of the sector excluding Carbon Finance. London's sector total with Carbon Finance excluded reduced from £50bn to £27bn, compared with the UK £226bn to £207bn. London's 3-year growth reduced from 25.8% to 19.5%, compared with the UK 18.3% to 18.2%. London's proportion of the UK market reduced from 22.1%, to 13.0%.

Table 9: London and UK LCEGS Sales (£m) and 3-Year Growth Comparison – Carbon Finance Excluded

Level 1	Level 2	UK Sales £m 2019/20	UK 3-Year Growth %	London Sales £m 2019/20	London 3-Year Growth %	London as % of UK	London/ UK Sales Prop.	London/ UK Growth Factor
Environmental	Air Pollution	1,344.8	5.8%	134.5	8.5%	10.0%	0.8	1.5
Environmental	Contaminated Land	1,329.6	1.0%	129.7	12.8%	9.8%	0.7	13.3
Environmental	Environmental Consultancy	1,195.3	16.8%	170.0	13.3%	14.2%	1.1	0.8
Environmental	Environmental Monitoring	221.7	12.2%	36.5	14.0%	16.5%	1.3	1.1
Environmental	Marine Pollution Control	206.8	12.7%	26.3	14.3%	12.7%	1.0	1.1
Environmental	Noise & Vibration Control	392.5	23.3%	79.2	16.5%	20.2%	1.5	0.7
Environmental	Recovery and Recycling	12,426.0	13.7%	1,386.0	13.9%	11.2%	0.9	1.0
Environmental	Waste Management	9,060.4	12.6%	1,683.1	9.5%	18.6%	1.4	0.8
Environmental	Water & Waste Water Treatment	10,741.0	12.7%	1,853.6	6.3%	17.3%	1.3	0.5
Low Carbon	Additional Energy Sources	1,939.9	15.9%	234.5	12.8%	12.1%	0.9	0.8
Low Carbon	Alternative Fuel Vehicle	19,684.7	5.7%	2,223.4	18.3%	11.3%	0.9	3.2
Low Carbon	Alternative Fuels	27,872.2	13.8%	3,698.0	20.6%	13.3%	1.0	1.5
Low Carbon	Building Technologies	27,823.1	13.7%	3,920.5	19.5%	14.1%	1.1	1.4
Low Carbon	Carbon Capture & Storage	846.4	19.0%	87.3	11.9%	10.3%	0.8	0.6
Low Carbon	Energy Management	4,198.1	5.7%	536.7	14.2%	12.8%	1.0	2.5
Low Carbon	Nuclear Power	5,014.6	2.9%	616.6	14.4%	12.3%	0.9	4.9
Renewable Energy	Biomass	10,753.6	28.2%	1,966.8	22.5%	18.3%	1.4	0.8
Renewable Energy	Geothermal	20,862.6	18.8%	4,905.4	20.9%	23.5%	1.8	1.1
Renewable Energy	Hydro	720.7	1.8%	149.9	10.2%	20.8%	1.6	5.6
Renewable Energy	Photovoltaic	12,619.8	24.3%	2,916.8	25.3%	23.1%	1.8	1.0
Renewable Energy	Renewable Consultancy	795.2	10.8%	120.0	9.1%	15.1%	1.2	0.8
Renewable Energy	Wave & Tidal	169.6	24.9%	21.5	19.7%	12.7%	1.0	0.8
Renewable Energy	Wind	36,567.6	42.2%	5,271.5	27.3%	14.4%	1.1	0.6
Total		**206,786.3**	**18.2%**	**26,927.0**	**19.5%**	**13.0%**		

Figure 44 illustrates the data from Table 9, which excludes Carbon Finance from the proportionality factor and also excludes Contaminated Land to enable analysis of the other sub-sectors. When Carbon Finance is excluded, Hydro has a larger share of the UK market than would be expected and extremely strong growth (London 10.2% vs UK 1.8%), Nuclear Power has a smaller market size than average, but also strong growth (14.4% vs 2.9%), Alternative Fuel

Vehicle also has a smaller market size than the average, but stronger growth than the UK (18.3% vs 5.7%) and Energy Management has a size in line with the London average, but stronger growth then the UK average (14.2% vs 5.7%).

Some of London's strongest sectors whilst having a larger share of the UK market as would be expected they were only experiencing a growth rate that is similar or a little slower than the UK average. For example Geothermal has a larger share of the UK market (23.5%) and is in line with UK growth; Photovoltaic has a larger share (23.1%) and is in line with UK growth. Whereas Waste Management has a larger share of the UK market (18.6%) but a slower growth rate than the UK average (9.5% vs 12.6%); Biomass has a larger share (18.3%) and slower growth (22.5% vs 28.2%); Water and Waste Water Treatment a larger share (17.3%) and slower growth (6.3% vs 12.7%). And then Carbon Capture and Storage has below average size and slower growth than the UK (11.9% vs 19.0%).

Figure 44: London/UK Sales proportionality factor (Excl. Carbon Finance and Contaminated Land) vs London/UK Growth factor of Level 2 Sub-sectors, Bubbles Sized by Sales £m
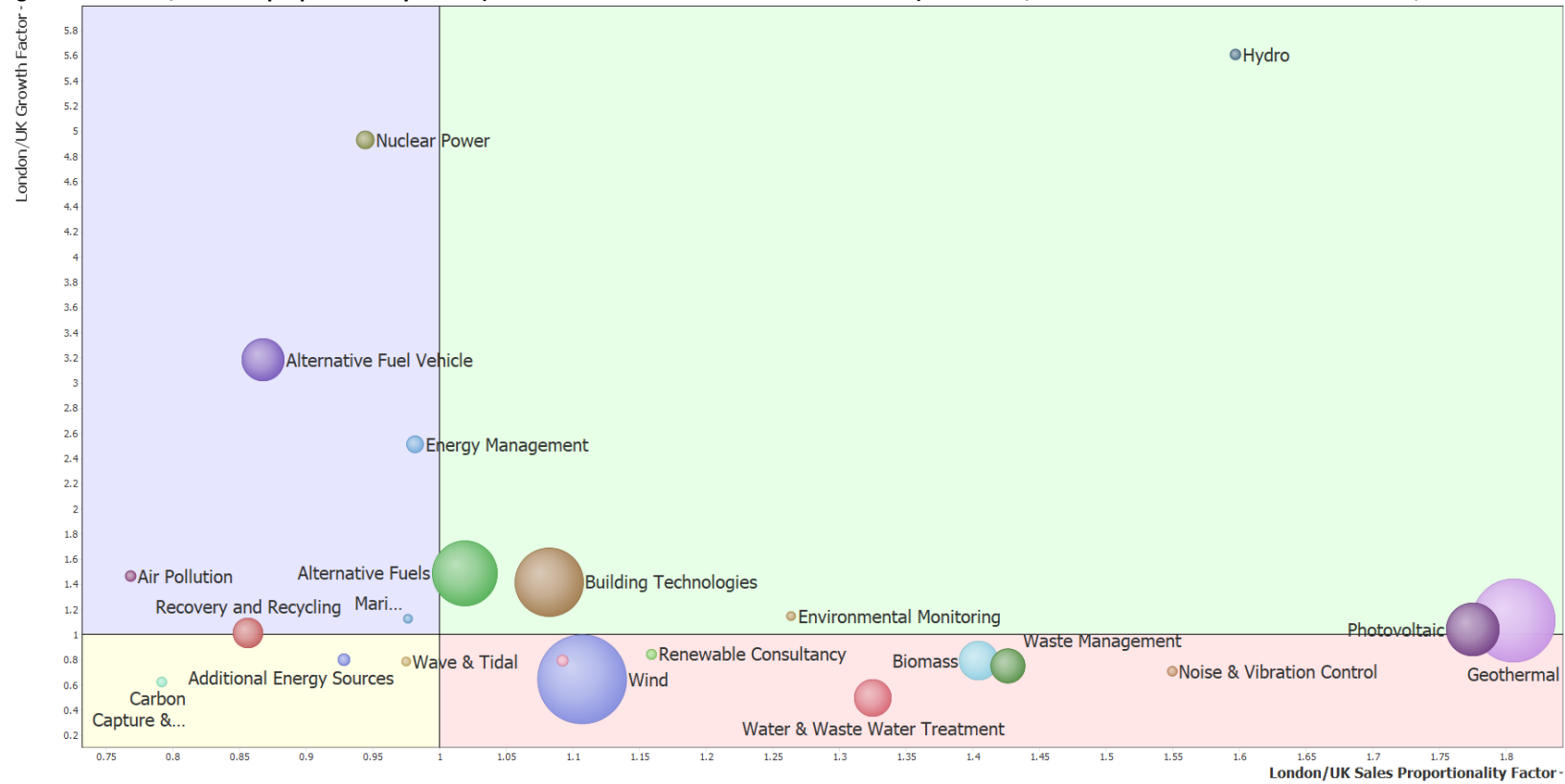
Table 10 shows sales growth forecasts (annual percentage growth from the previous year) for 2021/22 through to 2025/26. The growth rates refer to the growth expected during the financial year listed. Forecast growth for the majority of sub-sectors is generally consistent with levels of historical growth, but as forecasts stretch out beyond 2024/25, they inevitably tend to be less robust. The growth rates would be applied to the year indicated, so for example, the 2021/22 growth rate indicates the expected growth between the 2020/21 and 2021/22 sales figures.

London's LCEGS sector experienced a significant impact due to the pandemic, as did the wider economy, and this resulted in negative growth and a -14% contraction in LCEGS sales. Post-pandemic recovery of the LCEGS sector in London is expected to begin during 2021/22, increasing slowly and building up as markets, and the wider economy, recover from the impact of the pandemic.

Table 10: London's LCEGS Forecast Sales (£m) Growth 2021/22 to 2025/26

Level 1	Level 2	2021/22	2022/23	2023/24	2024/25	2025/26
Environmental	Air Pollution	2.7	3.2	3.9	4.8	5.3
Environmental	Contaminated Land	3.4	4.1	4.9	6.0	6.6
Environmental	Environmental Consultancy	3.6	4.4	5.3	6.4	7.1
Environmental	Environmental Monitoring	3.6	4.4	5.3	6.4	7.2
Environmental	Marine Pollution Control	3.8	4.6	5.6	6.8	7.3
Environmental	Noise & Vibration Control	3.7	4.4	5.4	6.5	6.9
Environmental	Recovery and Recycling	3.7	4.5	5.4	6.6	6.9
Environmental	Waste Management	3.1	3.7	4.5	5.4	5.9
Environmental	Water & Waste Water Treatment	1.9	2.3	2.8	3.3	3.8
Low Carbon	Additional Energy Sources	4.5	5.4	6.6	7.9	8.5
Low Carbon	Alternative Fuel Vehicle	5.6	6.8	8.3	10.0	11.5
Low Carbon	Alternative Fuels	6.0	7.3	8.8	10.7	11.4
Low Carbon	Building Technologies	6.6	7.9	9.6	11.6	12.3
Low Carbon	Carbon Capture & Storage	3.7	4.4	5.3	6.5	7.2
Low Carbon	Carbon Finance	9.2	11.2	13.3	16.3	17.3
Low Carbon	Energy Management	3.9	4.7	5.6	6.8	7.4
Low Carbon	Nuclear Power	3.9	4.7	5.7	6.8	7.4
Renewable Energy	Biomass	5.5	6.6	8.0	9.7	10.5
Renewable Energy	Geothermal	6.0	7.3	8.8	10.6	11.2
Renewable Energy	Hydro	3.9	4.7	5.7	6.9	7.5
Renewable Energy	Photovoltaic	7.1	8.5	10.3	12.5	13.5
Renewable Energy	Renewable Consultancy	3.0	3.7	4.4	5.4	6.0
Renewable Energy	Wave & Tidal	6.3	7.6	9.2	11.1	12.5
Renewable Energy	Wind	7.8	9.5	11.5	13.9	14.5

Figure 45 shows the annual forecast growth for London's LCEGS to 2024/25-2025/26 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 45: London's LCEGS Forecast Sales Growth 2020/21-2021/22 to 2024/25-2025/26 (including Carbon Finance)
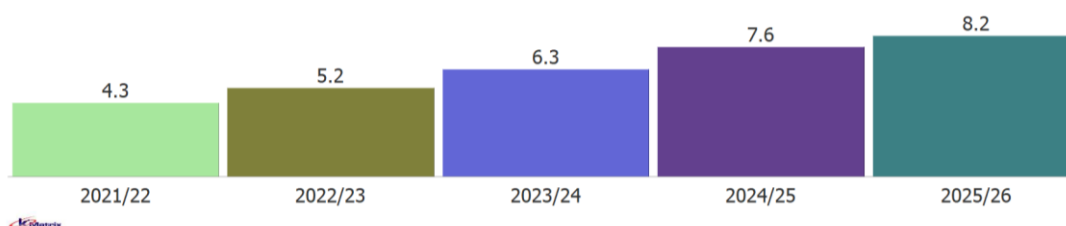
Figure 46 shows forecast growth for London's LCEGS if Carbon Finance is excluded from the predictions. This demonstrates that the sector is no longer as reliant on Carbon Finance for growth as it was in previous years.

Figure 46: London's LCEGS Forecast Sales Growth 2020/21-2021/22 to 2024/25-2025/26 (excluding Carbon Finance)
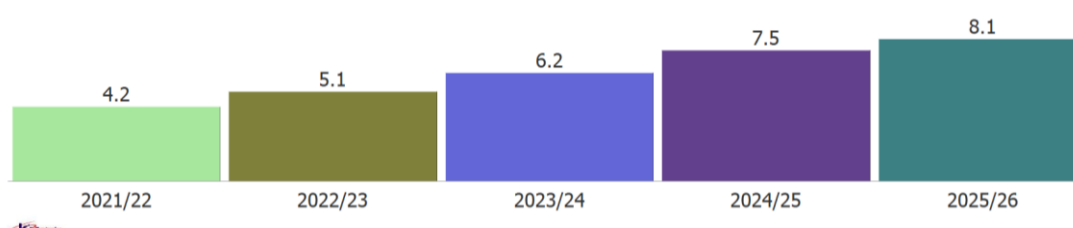
A previous report (2014/15 figures) demonstrated the clear effect that growth in Carbon Finance had on the overall growth rate of London, with a 1.5% to 2.5% decrease in growth rates when Carbon Finance was excluded, this is encouraging for the wider sectors that they are expected to start to show a stronger rate of growth than they did in the last decade.

Figures 45 and 46 illustrate that Carbon Finance does not impact significantly on the expected growth rates during this reporting period. Table 10 indicates that the growth rates for Carbon Finance are still expected to be strong, but that the growth rates for other sub-sectors such as Photovoltaic, Wind, Building Technologies and Wave and Tidal are also expected to be strong once the sector recovers from the impact of the pandemic. This results in Carbon Finance being less dominant in terms of growth and means that London's growth forecasts are aligning more closely with those of the UK (both including and excluding carbon finance). This suggests that the sector in London is becoming less dependent on Carbon Finance, compared with previous years, and this will help drive London's growth rates and consequently the economic opportunities for London's businesses and jobs for Londoners.

Figure 47 shows the annual growth forecast for the UK's LCEGS from 2021/22-2025/26 and illustrates that the forecast growth for the UK is expected to be slower than that for London.

Figure 47: UK's LCEGS Forecast Sales Growth 2020/21-2021/22 to 2024/25-2025/26
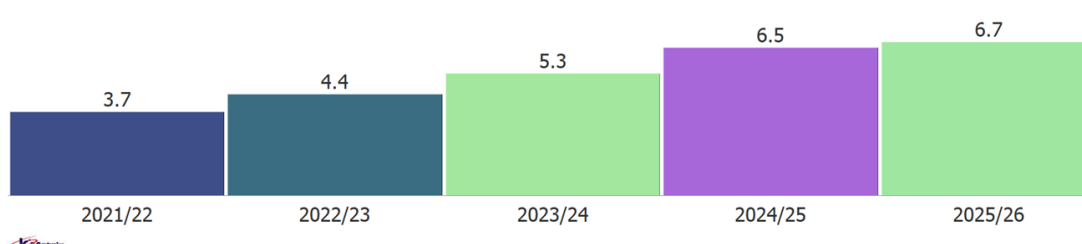
Figure 48 shows the timeline for year-on-year growth for the UK and London Sales for LCEGS from 2007-08 to 2019/20-2020/21, combined with forecast growth to 2024/25-2025/26. London has generally seen stronger growth than the rest of the UK between 2007/08 to 2019/20, had a larger contraction in 2020/21 than the rest of the UK due to the pandemic, but is expected to have stronger growth than the UK average from 2021/22 to 2025/26.

Figure 48: London's and UK's LCEGS Historical Sales Growth and Forecast Sales Growth 2020/21-2021/22 to 2024/25-2025/26

1.10   London's LCEGS Sector Scalability

In this section we explain the concept of scalability, what influences it, how it can be combined with Sales to explore opportunities and finally why it is different to using only growth.

Scalability refers to the combination of:
- Existence of appropriate available market
- The scalability of technology within a company, area or market
- Affordability of technology
- Availability of appropriate skill sets in the locality
- Historic growth
- Accessibility of networks and chains of supply

All of these factors are taken into consideration when grading scalability.

The scalability of the sector has been calculated by attributing a scalability factor of 'Low', 'Medium' or 'High' per product or service at the Local Authority level, which has been given the corresponding value of 1 = Low; 2 = Medium and 3 = High. We have then taken the average of those values for the products and services grouped together for the Levels to produce an index of scalability.

For example, there are 30 products and services within the Level 3 sub-sector of Windows, within the Building technologies (Low Carbon) sub-sector. For each Local Authority (using Croydon as an example), each product and service was allocated a scalability factor:
11 products and services listed as 'High' with a score of 3
11 products and services listed as 'Medium' with a score of 2
8 products and services listed a 'Low' with a score of 1

Calculation:

$$\frac{(11x3) + (11x2) + (8x1)}{30} = 2.1$$

The scalability index has been calculated for the 2,769 products and services at Level 5 of the dataset, for each Local Authority for 2019/20, with the average being used to plot the potential for scalability against the Sales of the sector at Level 2.

K Matrix

Figure 49 shows the Sales plotted against the scalability index of the 24 Level 2 sub-sectors for London, with each bubble sized by the Sales of that sub-sector. The most desirable position would be the top right-hand corner of the graph, with high Sales and high Scalability. Carbon Finance dominates the graph due to the high Sales of the sub-sector. Figure 50 shows the same data, with Carbon Finance excluded.

Figure 49: London's Scalability vs. Sales of Level 2 Sub-sectors, 2019/20 – Bubbles Sized by Sales
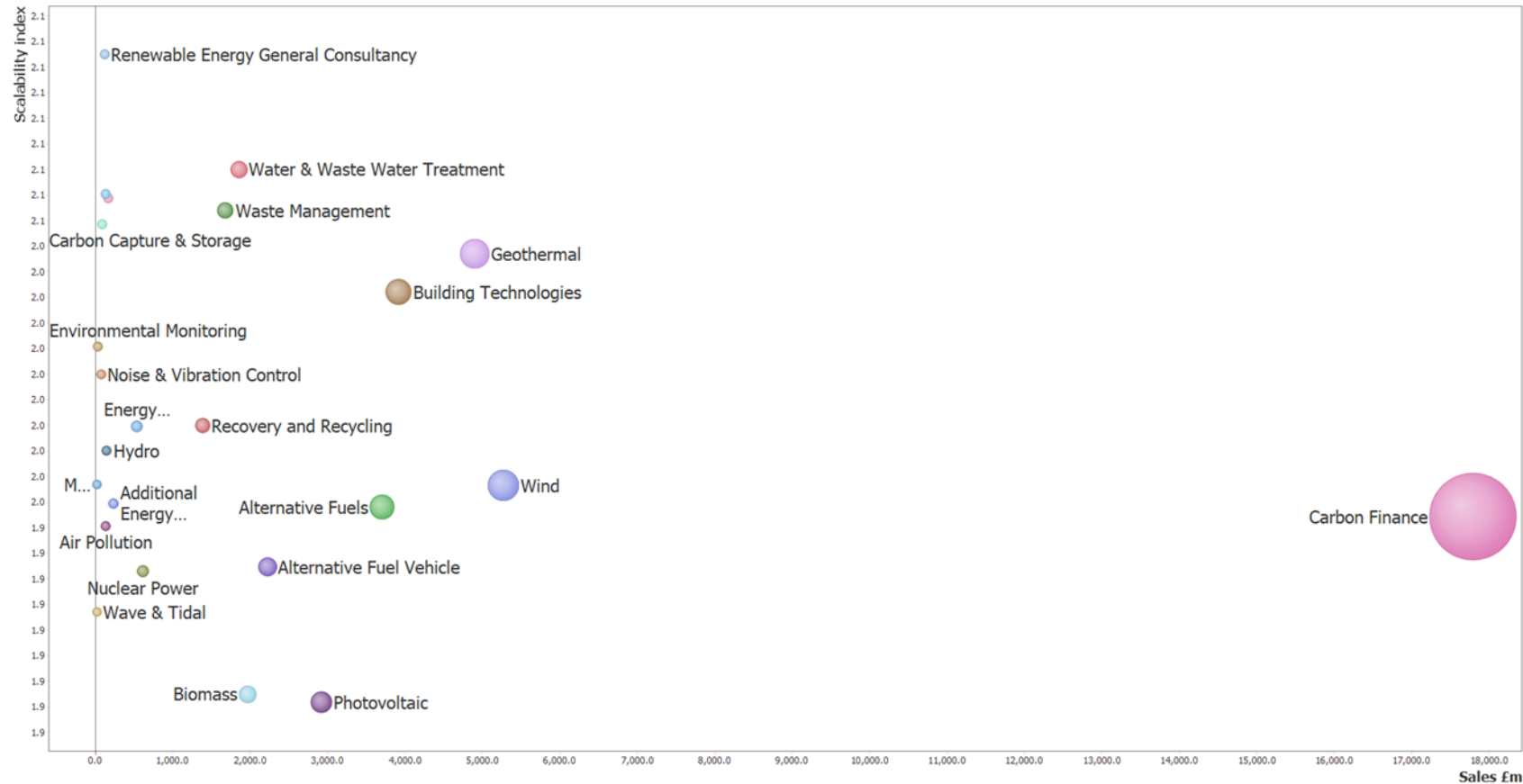
Figure 50 shows the same data as Figure 39, but with Carbon Finance excluded. Geothermal and Building Technologies have the most desirable positions, being large in terms of Sales and with good scalability. Water & Waste Water Treatment and Waste Management have high scalability and are within the top 11 sub-sectors in terms of Sales. Renewable Energy, General Consultancy is the most scalable sub-sector, although is a small sub-sector in terms of size. Environmental Consultancy, Carbon Capture and Storage and Contaminated Land all have high scalability but low Sales.

Figure 50: London's Scalability vs. Sales of Level 2 Sub-sectors, 2019/20 – Bubbles Sized by Sales – Carbon Finance Excluded
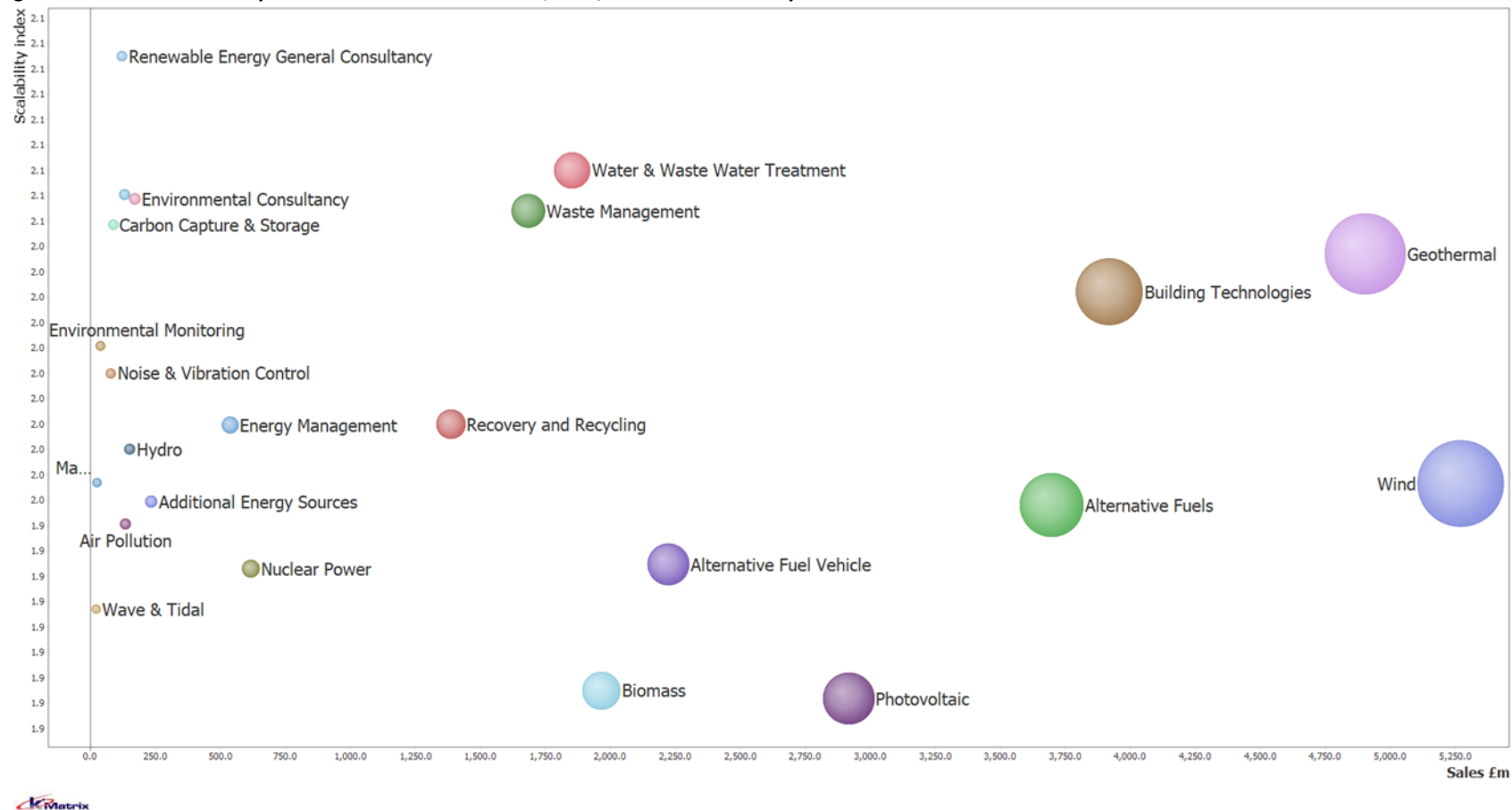
Figure 51 shows the same principle as Figure 39, but with Sales plotted against the growth rates of the Level 2 sub-sectors for 2019/20. This figure illustrates a different pattern of opportunity to the use of the scalability index. When only viewing growth, we can see that the Carbon Finance sub-sector occupies the most favourable position of large size and high growth. But when we introduce the scalability element there are a range of factors, such as restrictions in the supply chain, network of supply, or the availability of skills etc., that have an impact on growth and ultimately sales too.

Figure 51: London's 2019/20 Growth Rates vs. Sales of Level 2 Sub-sectors – Bubbles Sized by Sales
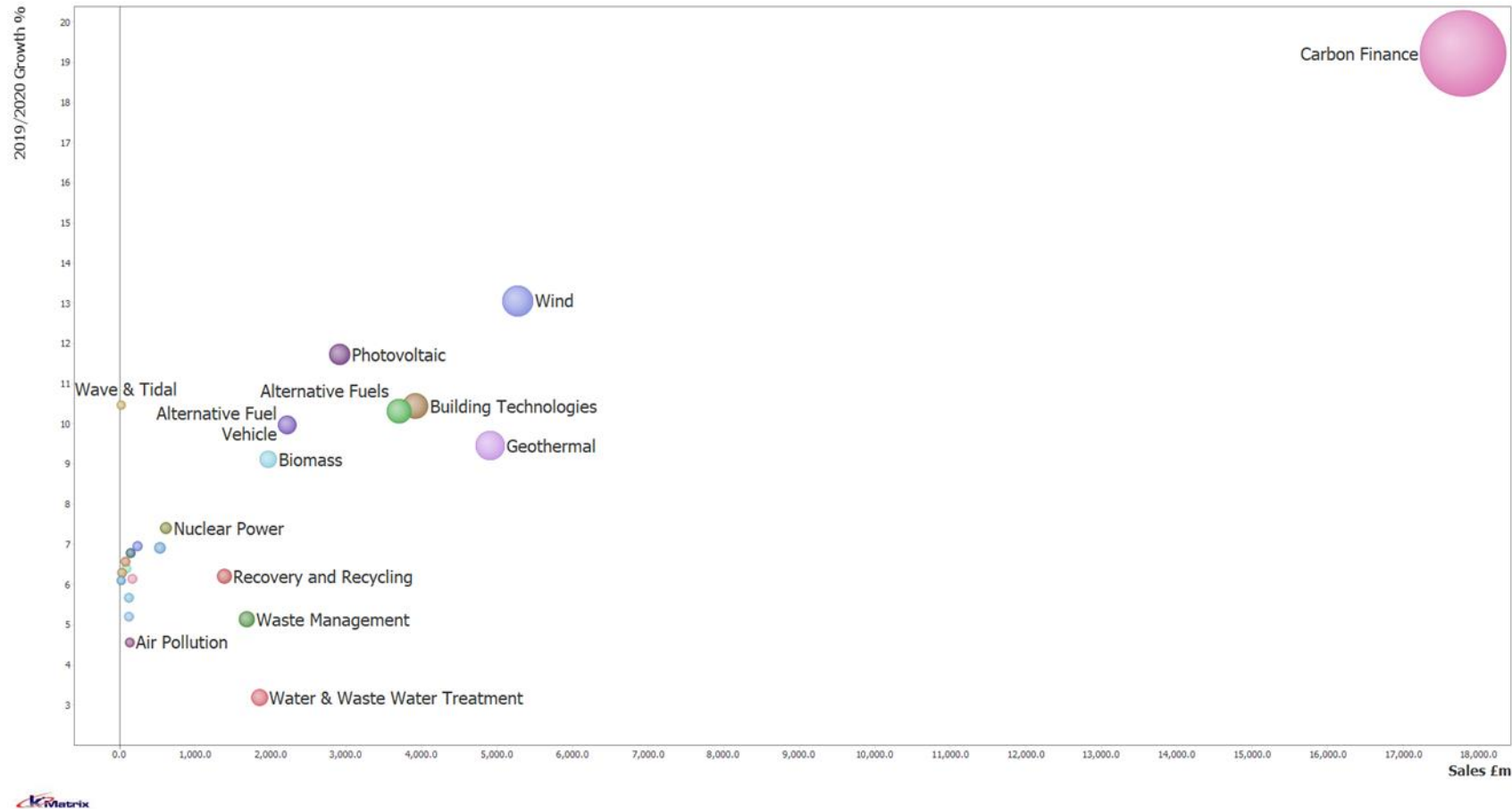
Figure 52 shows the same data as Figure 41, but with Carbon Finance excluded. Although Wind has a lower scalability than Geothermal, growth during 2019/20 was stronger for the Wind sub-sector than Geothermal. In terms of Wind, technology is advancing, which impacts on scalability. This is because an element within the calculation for scalability is the chain and network of supply. Advancing technology disrupts the chain and network of supply for a short period of time, and there is a transition phase where they adapt to new technology and or processes. Once they have adapted, scalability can return to a higher position on the index. For this reason, scalability is a more useful measure than previous growth when looking at opportunities.

Figure 52: London's 2019/20 Growth Rates vs. Sales of Level 2 Sub-sectors – Bubbles Sized by Sales – Carbon Finance Excluded
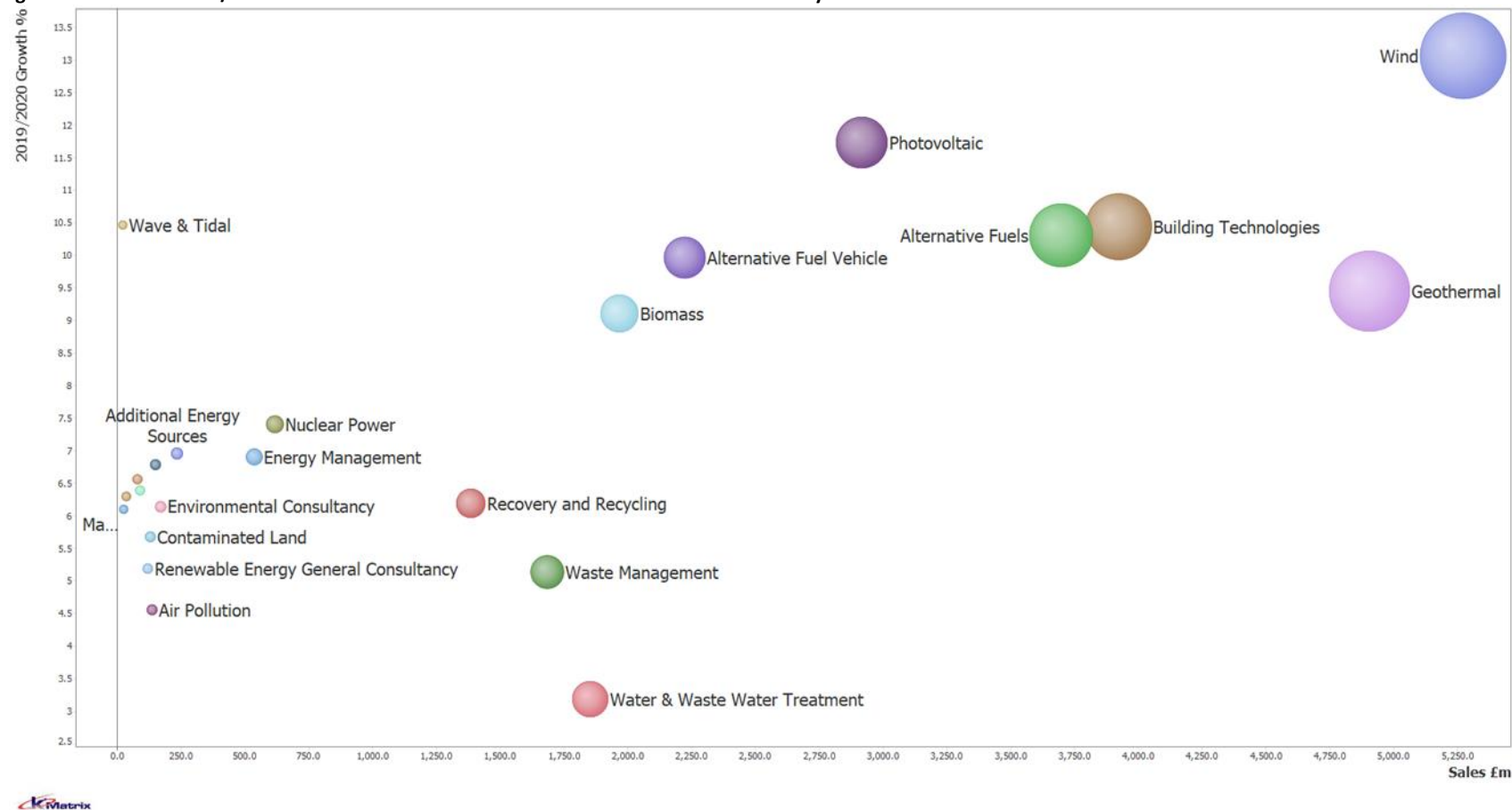
1.11   London's Impact on Regional LCEGS Chains and Network of Supply

In this section we analyse the impact of London's LCEGS sector on other regions of the UK.

This is provided as a measure of the sales within the chains and networks of supply of a region, generated by the LCEGS sector in London.

This analysis was performed by tracking sales of activities within London, through the chains and networks of supply, to determine point of origin and subsequent movement of constituent products or services.

Only value-added activities are included, from components to consultancy, R&D to assembly.

A limitation of the analysis is the activities measured are within the chain and network of supply and represent the traded activities within the sector, as such, untraded academic research is not counted.

The Sales numbers for sub-sectors within regions of the UK have been calculated through the same data triangulation process as other metrics within the study, but with additional locational data overlaid, specifically mapping the movement and trade of goods and services across the country.

This analysis included over 9,250 sources within the core source block, with additional accredited research sources augmenting the data triangulation process, and include:
- Data reported by companies
- Public sector sources
- Private sector sources
- Institutional sources
- Industrial and trade sources
- Academic Data sources (sector specific)
- Advertising and HR
- Financial, legal and investment
- Other (unpublished) sources

Table 19: 2019/20 Net benefit of London LCEGS market to the Rest of the UK, through chains and networks of supply, (£m)

Level 1	Level 2	London Total Sales (£m) 2019/20	LCEGS Supply Chain Oustide of London (£m)	Supply Chain as % of London
Environmental	Air Pollution	134.5	52.2	38.8%
Environmental	Contaminated Land	129.7	19.3	14.9%
Environmental	Environmental Consultancy	170.0	52.2	30.7%
Environmental	Environmental Monitoring	36.5	15.1	41.4%
Environmental	Marine Pollution Control	26.3	3.5	13.2%
Environmental	Noise & Vibration Control	79.2	27.9	35.2%
Environmental	Recovery and Recycling	1,386.0	438.1	31.6%
Environmental	Waste Management	1,683.1	162.8	9.7%
Environmental	Water & Waste Water Treatment	1,853.6	571.5	30.8%
Low Carbon	Additional Energy Sources	234.5	80.6	34.4%
Low Carbon	Alternative Fuel Vehicle	2,223.4	336.5	15.1%
Low Carbon	Alternative Fuels	3,698.0	1,256.9	34.0%
Low Carbon	Building Technologies	3,920.5	1,567.4	40.0%
Low Carbon	Carbon Capture & Storage	87.3	32.4	37.2%
Low Carbon	Carbon Finance	17,790.7	6,639.7	37.3%
Low Carbon	Energy Management	536.7	192.0	35.8%
Low Carbon	Nuclear Power	616.6	149.4	24.2%
Renewable Energy	Biomass	1,966.8	338.0	17.2%
Renewable Energy	Geothermal	4,905.4	539.0	11.0%
Renewable Energy	Hydro	149.9	22.5	15.0%
Renewable Energy	Photovoltaic	2,916.8	969.9	33.3%
Renewable Energy	Renewable Consultancy	120.0	44.4	37.0%
Renewable Energy	Wave & Tidal	21.5	3.1	14.2%
Renewable Energy	Wind	5,271.5	967.6	18.4%
Total		**49,958.5**	**14,481.9**	**29.0%**

Table 19 shows the net benefit of the LCEGS sector in London, to UK chains and networks of supply outside of London.

London's LCEGS sector sales in 2019/20 were ~£50.0bn and generated a further £14.5bn, or an additional 29.0% in terms of sales within the chains and networks of supply across the UK, outside of London.

The largest sub-sectors in terms of sales in London do not necessarily generate the largest sales outside of London, e.g., Wind is the 2nd largest sub-sector in terms of sales in London, but 5th for the value of sales generated outside of London. Conversely, Building technologies is the 4th largest sub-sector in terms of sales in London, but 2nd for the value of sales generated outside of London.

Sub-sectors in London which generated the highest sales in the chains and networks of supply outside of London were Carbon Finance (£6,639.7m); Building Technologies (£1,567.4m); Alternative Fuels (£1,256.9m); Photovoltaic (£969.9m) and Wind (£967.6m).

London sub-sectors that generated the largest sales within the chains and network of supply outside of London, as a percentage of additional London sales were Environmental Monitoring (41.4%); Building Technologies (40.0%); Air Pollution (38.8%); Carbon Finance (37.3%) and Carbon Capture and Storage (37.2%). The sub-sectors that created the least additional sales were Waste Management (9.7%), Geothermal (11.0%) and Marine and Pollution Control (13.2%).

Table 20: 2019/20 Net benefit of London LCEGS market to UK regions, through chains and networks of supply, (£m)

Level 1	Level 2	London Total Sales (£m) 2019/20	Rest of South East (£m)	East of England (£m)	South West (£m)	North West (£m)	North East (£m)	Yorkshire & Humber (£m)	East Midlands (£m)	West Midlands (£m)	Scotland (£m)	Wales (£m)	Northern Ireland (£m)
Environmental	Air Pollution	134.5	6.9	3.5	1.8	7.3	7.1	7.1	2.9	6.8	2.5	4.2	2.1
Environmental	Contaminated Land	129.7	1.8	1.2	1.9	4.4	1.2	2.6	0.7	2.8	0.7	1.5	0.5
Environmental	Environmental Consultancy	170.0	3.3	3.1	4.4	9.3	7.9	3.1	3.5	4.7	2.9	7.0	3.0
Environmental	Environmental Monitoring	36.5	1.7	1.4	1.3	1.7	2.1	1.1	1.0	1.7	0.9	1.7	0.6
Environmental	Marine Pollution Control	26.3	0.6	0.5	0.3	0.6	0.4	0.4	0.1	0.5	0.2	0.0	0.0
Environmental	Noise & Vibration Control	79.2	4.0	2.4	1.7	4.3	4.0	2.9	1.3	5.3	1.0	0.2	0.7
Environmental	Recovery and Recycling	1,386.0	23.2	26.7	46.9	61.1	57.5	32.8	36.8	41.8	39.9	50.4	21.0
Environmental	Waste Management	1,683.1	25.1	6.8	12.6	26.2	17.2	14.0	9.8	13.1	9.3	21.9	6.8
Environmental	Water & Waste Water Treatment	1,853.6	86.5	46.3	27.3	126.7	37.4	100.5	15.9	39.1	25.9	41.8	24.2
Low Carbon	Additional Energy Sources	234.5	12.6	3.9	4.2	13.4	13.8	4.7	4.2	6.4	4.3	9.1	4.0
Low Carbon	Alternative Fuel Vehicle	2,223.4	52.5	32.6	17.5	42.4	46.9	18.8	24.4	49.6	10.3	25.4	16.0
Low Carbon	Alternative Fuels	3,698.0	100.6	167.4	75.1	205.0	84.5	64.6	96.6	204.0	60.9	162.7	35.4
Low Carbon	Building Technologies	3,920.5	175.8	167.8	176.6	151.9	147.9	165.8	79.6	246.6	52.1	162.7	40.7
Low Carbon	Carbon Capture & Storage	87.3	2.7	4.3	1.5	6.8	3.1	4.7	0.9	1.8	2.2	3.6	0.7
Low Carbon	Carbon Finance	17,790.7	777.0	272.2	705.6	1,014.5	357.5	654.0	239.6	1,149.3	364.0	963.1	142.9
Low Carbon	Energy Management	536.7	27.0	20.5	8.8	39.2	27.5	10.5	4.7	21.1	7.7	21.1	4.0
Low Carbon	Nuclear Power	616.6	14.6	18.0	11.3	16.3	14.2	21.2	10.9	25.3	16.5	1.0	0.2
Renewable Energy	Biomass	1,966.8	45.2	37.4	27.1	64.2	36.6	27.2	9.9	50.2	16.6	16.4	7.3
Renewable Energy	Geothermal	4,905.4	103.0	0.0	0.0	155.2	52.7	116.0	0.0	82.2	30.0	0.0	0.0
Renewable Energy	Hydro	149.9	3.4	1.6	2.0	5.1	3.8	2.7	1.4	1.6	0.9	0.0	0.0
Renewable Energy	Photovoltaic	2,916.8	117.0	77.4	123.4	224.7	74.3	103.1	23.4	119.7	60.6	46.3	0.0
Renewable Energy	Renewable Consultancy	120.0	6.5	4.2	3.3	6.0	3.7	3.6	1.9	5.4	2.2	5.5	2.1
Renewable Energy	Wave & Tidal	21.5	0.3	0.4	0.4	0.6	0.5	0.2	0.1	0.4	0.2	0.0	0.0
Renewable Energy	Wind	5,271.5	76.9	85.9	93.4	172.9	107.6	43.7	53.8	107.5	61.2	122.5	42.0
Total		**49,958.5**	**1,668.1**	**985.7**	**1,348.5**	**2,359.9**	**1,109.4**	**1,405.4**	**623.2**	**2,186.8**	**772.9**	**1,668.1**	**354.0**

Table 20 shows the net benefit of the LCEGS sector in London, to UK chains and networks of supply outside of London, by Region. The North West is the greatest beneficiary, with £2.4bn (4.7% of the London total) generated in sales, as a direct result of activity in London. This is followed by the West Midlands with £2.2bn (4.4%), Wales and the rest of the South East, both with £1.7bn (3.3%).

Significant London sub-sectors which generate large sales outside of London include Photovoltaic in the North West with £224.7m (7.7%); Carbon Finance in the West Midlands with £1,149.3m (6.5%), the North West with £1,014.5m (5.7%) and Wales with £963.1m (5.4%); Water and Waste Water Treatment in the North West with £126.7m (6.8%) and Yorkshire & Humber with £100.5m (5.4%); Building Technologies in the West Midlands with £246.6m (6.3%); Alternative Fuels in the North West with £205.0m (5.5%) and East of England with £167.4m (4.5%) and Wind in the North West with £172.9m (3.3%) and Wales with £122.5m (2.3%).

Part of the benefit in the chains and networks of supply come from investment from London companies, which is made into the chains and networks of supply across the country and into Europe, another element concerns R&D within universities, where London provides financial and practical support for development within industry, additionally, head office functions also play a role. More specifically, project assembly and coordination of major large projects often occurs in London, with companies drawing from new or established chains and networks of supply from across the country, to supply and fulfil significant contracts. With regards to Carbon Finance, activity in London through the provision of finance directly leads to project delivery within the regions across the UK.

2. London's LCEGS by Local Authority

2.1 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 56 shows LCEGS for 2020/21 split by Local Authority for sales (outer circle), companies (middle circle) and employment (inner circle). The City of London accounts for 40% of London LCEGS sales, 36% of companies (34% in 2019/20) and 29% of employment (27% in 2019/20). 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 2019/20). 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 56: London's LCEGS 2020/21 by Local Authority for Sales, Companies and Employment
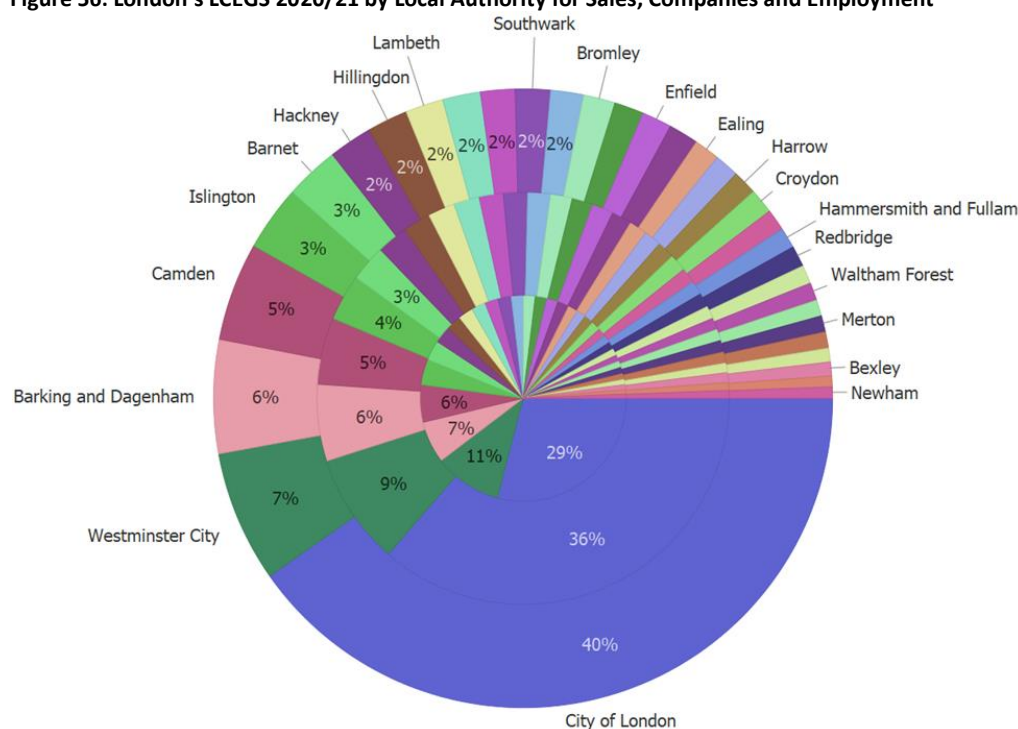
Local Authorities are analysed in more detail, by year, by economic measure and by LCEGS activity in the following section.

2.2 Local Authority Analysis by Year and Sub-Sector

Table 21 shows the two years of data for Local Authorities for sales, companies and employment. Growth between years is shown in red. Growth between 2018/19 and 2020/21 across all three measures is generally similar around 9-11% for all Local Authorities, with the City of London being the exception at 17-18%.

Growth between 2019/20 and 2020/21 is varied across Local Authorities, with Sales between -11.3% for Hammersmith and Fulham and -17.2% for Enfield; Companies between 1.3% for the City of London to -7.3% for Hackney and Employees between -5.2% for City of London and -13.6% for Haringey.

Table 21: Local Authorities Sales, Companies and Employment from 2018/19 to 2020/21

Local Authority	Sales £m					# Companies					# Employees				
	2018/19	Growth %	2019/20	Growth %	2020/21	2018/19	Growth %	2019/20	Growth %	2020/21	2018/19	Growth %	2019/20	Growth %	2020/21
Barking and Dagenham	2,683	10.3%	2,959	-13.9%	2,549	977	8.2%	1,057	-6.8%	986	18,868	8.4%	20,462	-13.0%	17,795
Barnet	1,280	10.7%	1,417	-14.2%	1,216	467	8.5%	507	-6.5%	474	9,020	8.7%	9,807	-12.7%	8,560
Bexley	334	9.7%	366	-14.6%	313	127	7.7%	136	-7.2%	126	2,313	7.8%	2,493	-13.4%	2,158
Brent	595	11.2%	662	-16.5%	553	220	8.9%	239	-6.1%	225	4,177	9.2%	4,559	-12.3%	4,000
Bromley	750	10.6%	830	-14.2%	712	277	8.4%	301	-6.6%	281	5,278	8.6%	5,734	-12.8%	5,002
Camden	2,309	10.3%	2,548	-13.4%	2,208	855	8.1%	924	-6.8%	861	16,837	8.4%	18,246	-13.1%	15,857
City of London	16,977	18.1%	20,046	-13.8%	17,277	5,036	16.8%	5,884	1.3%	5,962	70,207	17.7%	82,607	-5.2%	78,281
Croydon	577	10.2%	636	-12.0%	559	219	8.2%	237	-6.8%	221	4,196	8.4%	4,547	-13.1%	3,952
Ealing	602	10.4%	665	-14.0%	572	227	8.4%	247	-6.5%	230	4,354	8.7%	4,731	-12.8%	4,127
Enfield	734	10.4%	811	-17.2%	672	274	8.1%	296	-6.8%	276	5,139	8.4%	5,571	-13.1%	4,842
Greewich	317	9.8%	348	-12.5%	305	122	7.8%	131	-7.0%	122	2,344	8.0%	2,531	-13.4%	2,193
Hackney	1,060	9.5%	1,161	-16.0%	975	403	7.5%	433	-7.3%	401	7,792	7.7%	8,395	-13.5%	7,258
Hammersmith and Fullam	473	10.2%	521	-11.3%	462	179	8.2%	194	-6.7%	181	3,542	8.4%	3,839	-13.0%	3,338
Haringey	387	9.7%	424	-14.5%	363	147	7.6%	158	-7.2%	147	2,889	7.7%	3,113	-13.6%	2,690
Harrow	590	10.8%	654	-16.4%	547	221	8.4%	239	-6.5%	224	4,189	8.7%	4,555	-12.7%	3,975
Havering	262	9.6%	287	-15.3%	243	101	7.6%	109	-7.2%	101	1,950	7.9%	2,105	-13.5%	1,820
Hillingdon	946	10.6%	1,046	-12.8%	912	350	8.4%	380	-6.6%	355	6,778	8.6%	7,364	-12.9%	6,416
Hounslow	518	10.2%	571	-15.1%	485	195	8.3%	211	-6.7%	197	3,795	8.5%	4,118	-12.9%	3,586
Islington	1,563	9.9%	1,718	-15.1%	1,458	590	7.8%	636	-7.0%	591	11,534	8.1%	12,463	-13.4%	10,798
Kensington and Chelsea	699	10.5%	772	-13.5%	668	255	8.3%	276	-6.6%	258	5,125	8.6%	5,566	-12.8%	4,851
Kingston upon Thames	439	10.2%	484	-14.3%	415	164	8.0%	177	-6.9%	165	3,163	8.3%	3,424	-13.1%	2,974
Lambeth	927	10.5%	1,024	-17.1%	850	344	8.3%	372	-6.6%	348	6,622	8.6%	7,189	-12.9%	6,263
Lewisham	378	11.3%	421	-13.1%	366	141	9.0%	153	-6.0%	144	2,643	9.3%	2,889	-12.3%	2,534
Merton	394	10.0%	433	-15.6%	366	150	7.9%	162	-7.0%	150	2,834	8.2%	3,066	-13.3%	2,660
Newham	259	10.2%	285	-11.8%	251	100	8.0%	108	-6.9%	101	1,890	8.4%	2,047	-13.1%	1,780
Redbridge	484	11.4%	540	-12.5%	472	177	8.9%	193	-6.1%	181	3,278	9.2%	3,582	-12.4%	3,139
Richmond upon Thames	902	10.2%	995	-14.9%	847	328	8.0%	355	-6.9%	330	6,469	8.3%	7,004	-13.2%	6,078
Southwark	810	10.2%	892	-11.8%	786	309	8.1%	334	-6.9%	311	5,985	8.3%	6,481	-13.1%	5,632
Sutton	773	9.9%	850	-13.2%	737	292	7.8%	315	-7.1%	293	5,511	7.9%	5,948	-13.5%	5,145
Tower Hamlets	702	10.2%	774	-14.9%	659	267	8.1%	288	-6.8%	269	5,243	8.4%	5,681	-13.0%	4,940
Waltham Forest	408	11.0%	453	-12.2%	397	149	8.6%	162	-6.4%	151	2,865	8.9%	3,121	-12.7%	2,726
Wandsworth	817	10.1%	900	-14.1%	773	307	8.0%	331	-6.9%	309	6,022	8.2%	6,515	-13.1%	5,664
Westminster City	3,130	10.7%	3,466	-15.1%	2,943	1,395	8.1%	1,509	-6.8%	1,406	29,120	10.8%	32,268	-11.1%	28,680

Figure 57 shows the different profiles of London's Local Authorities when sales is split at Level 1. The City of London is the most extreme case due to Carbon Finance, but other Local Authorities show significant variations in Environmental 8-33% (8-34% in 2019/20), Low Carbon 18-56% (19-55% in 2019/20) and

Renewable Energy 27-61% (29-61% in 2019/20). This highlights that London's Local Authorities are not a homogeneous market, but they actually show subtle regional variations in activity within the LCEGS sector. This is highlighted by Figure 47 below.

Figure 57: London's Local Authorities LCEGS Sales 2020/21 (Level 1)
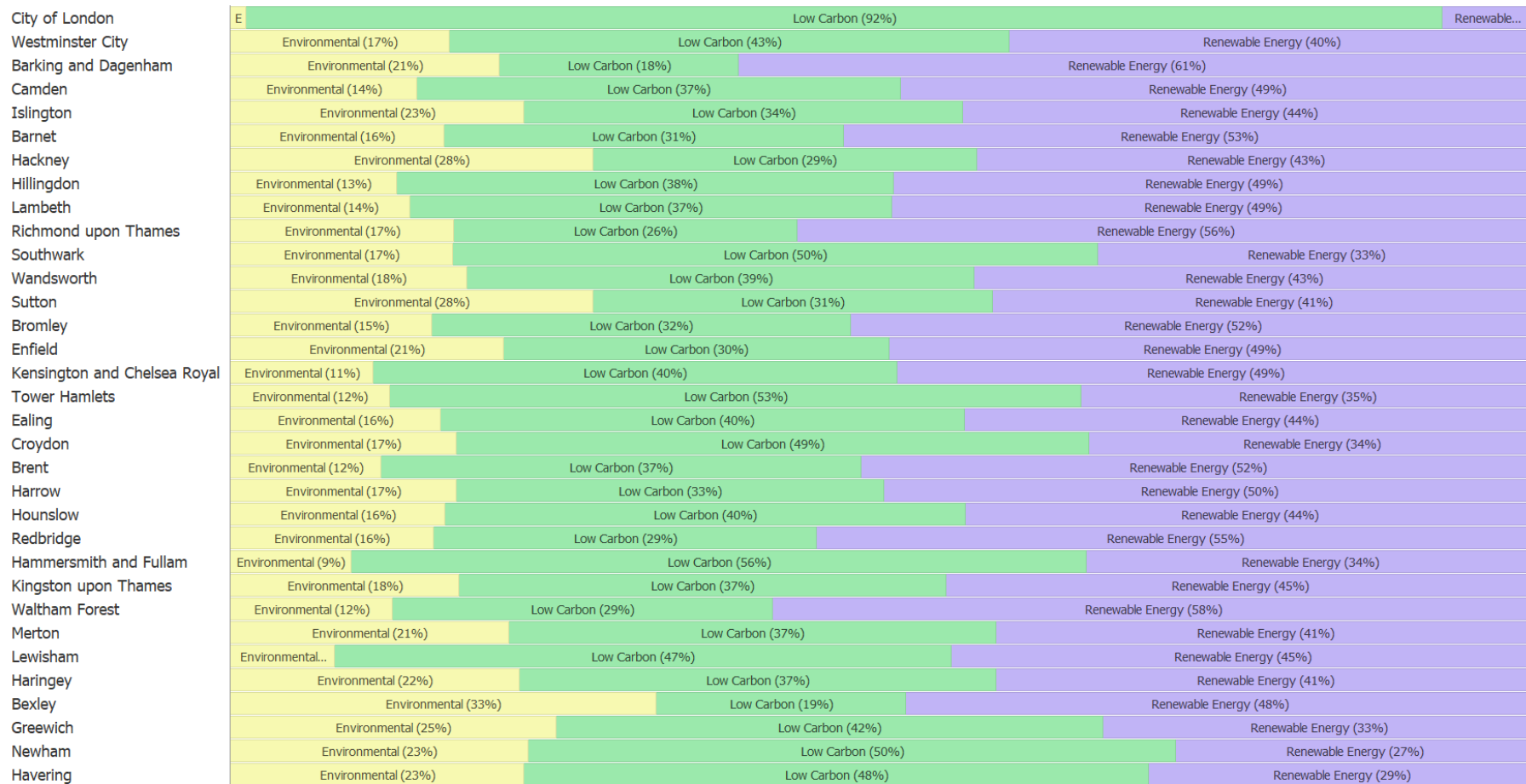
Figure 58 extends the analysis to include the Top 4 sub-sectors for each of London's Local Authorities. Typically, four sub-sectors account for over 50% of the total value, but the sub-sectors and their rankings do differ significantly across the 33 Local Authorities. But there are some consistent sub-sectors

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 58: London's Local Authorities LCEGS Sales 2020/21 at Level 2
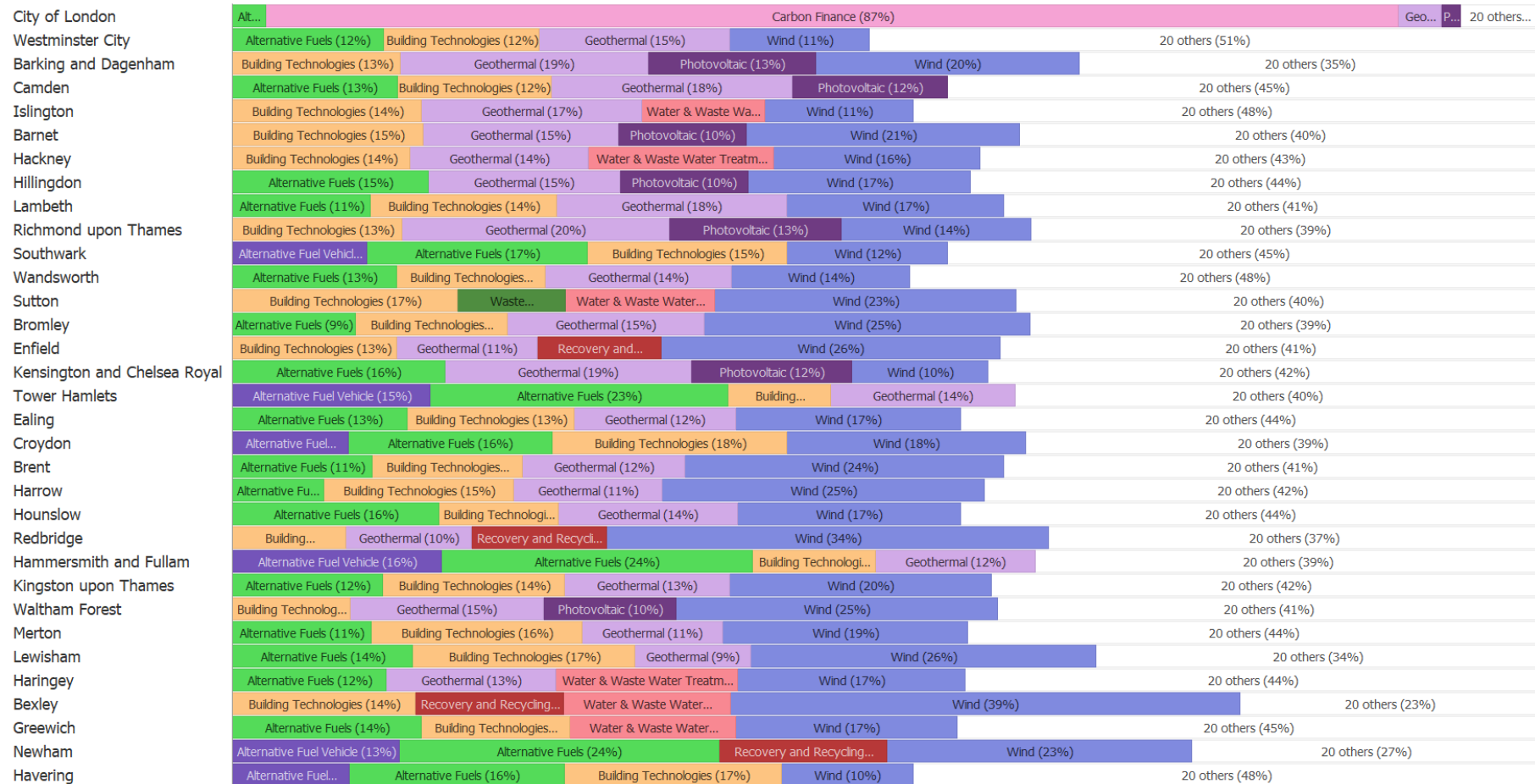
3. London's LCEGS by Sub-Region

3.1   LCEGS by London's Sub-Region

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

Figure 59 shows LCEGS for 2020/21 split by sub-region for sales (outer circle), companies (middle circle) and employment (inner circle). Central London Forward accounts for 68% of London's LCEGS sales, 67% of companies (66% in 2019/20) and 64% of employment (63% in 2019/20). 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, 52% of companies and 52% of employment (same in 2019/20). 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 59: London's LCEGS 2020/21 by Sub-Region for Sales, Companies and Employment
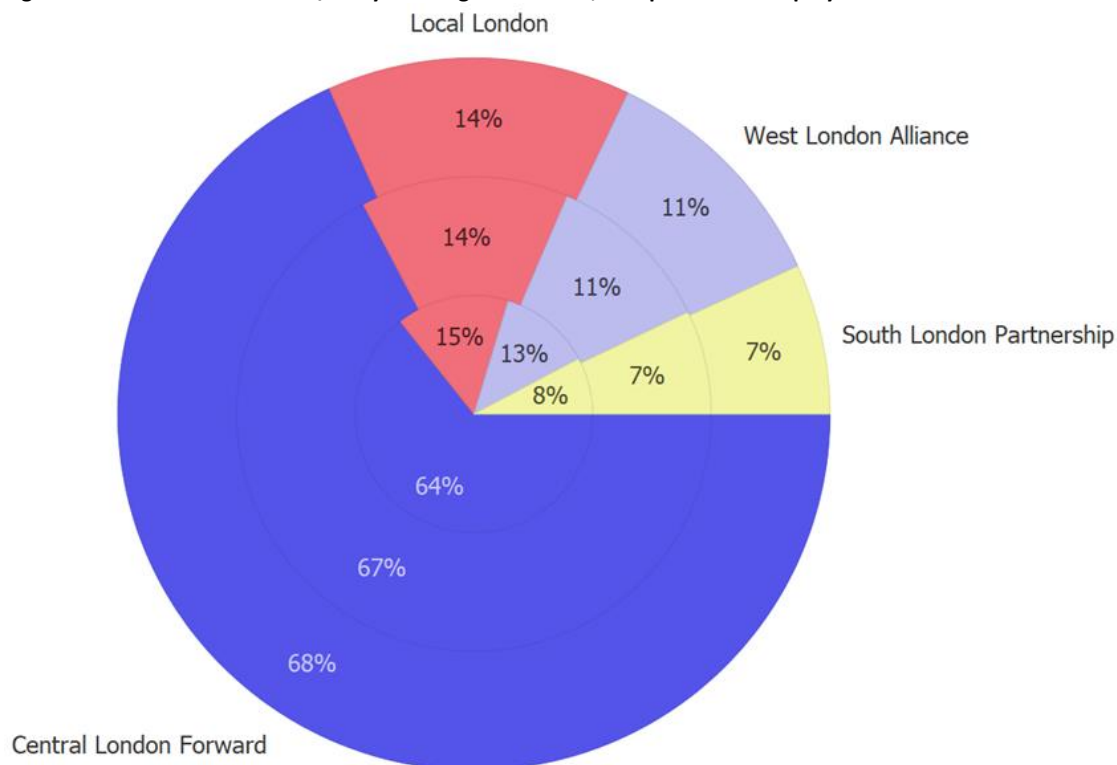
London's sub-regions are analysed in more detail, by year, by economic measure and by LCEGS activity in the following section.

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

Table 22 shows the two years of growth data for London's sub-regions for sales, companies and employment. Growth between years is shown in red. Growth between 2018/19 and 2020/21 across all three measures is generally similar around 8-11% for all London's sub-regions, with Central London Forward being the exception at 13-15%. Growth between 2019/20 and 2020/21 is similar

across all sub-regions for sales, between -13.9 and -14.2%. Central London Forward experienced less impact than other regions for Companies and Employment by several percentage points.

Table 22: London's Sub-regions Sales, Companies and Employment from 2018/19 to 2020/21

Local Authority	Sales £m					# Companies					# Employees				
	2018/19	Growth %	2019/20	Growth %	2020/21	2018/19	Growth %	2019/20	Growth %	2020/21	2018/19	Growth %	2019/20	Growth %	2020/21
Central London Forward	29,760	14.7%	34,147	-14.1%	29,325	10,048	12.5%	11,300	-2.6%	11,007	170,018	12.6%	191,413	-9.4%	173,447
Local London	6,231	10.4%	6,878	-14.0%	5,913	2,304	8.2%	2,493	-6.7%	2,325	43,926	8.5%	47,646	-13.0%	41,455
South London Partnership	3,085	10.1%	3,397	-13.9%	2,924	1,153	8.0%	1,245	-7.0%	1,158	22,173	8.2%	23,989	-13.3%	20,809
West London alliance	5,004	10.6%	5,536	-14.2%	4,747	1,859	8.5%	2,016	-6.5%	1,885	35,854	8.7%	38,973	-12.8%	34,002

Figure 60 shows the different profiles of London's sub-regions when sales is split at Level 1. Central London Forward is the most extreme case due to Carbon Finance, but other sub-regions show significant variations in Environmental 15- 20% (15-21% in 2019/20), Low Carbon 27-38% (27-37% in 2019/20) and Renewable Energy 45-53% (44-53% in 2019/20). 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 50 below.

Figure 60: London's Sub-regions LCEGS Sales 2020/21 (Level 1)
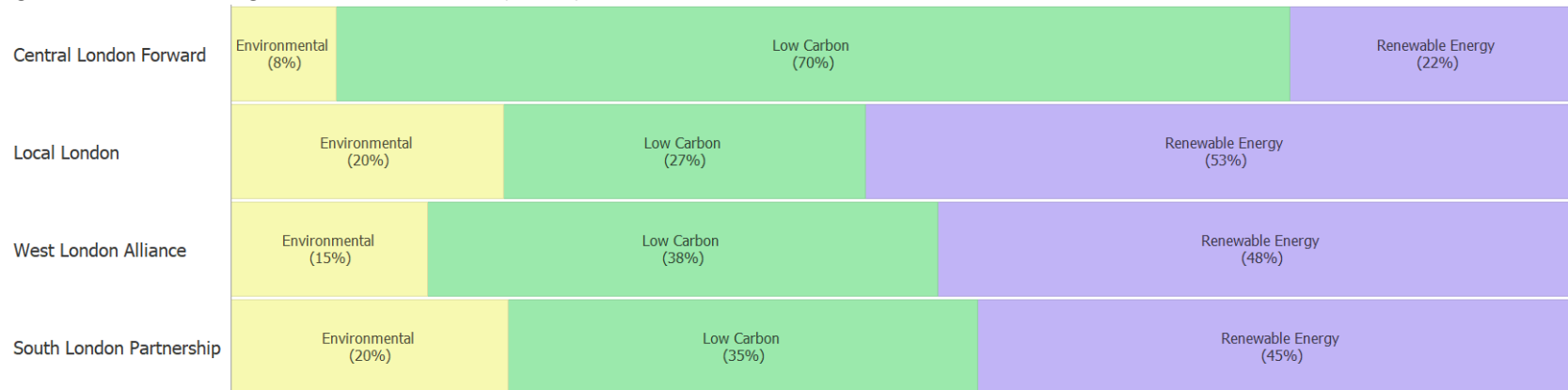
Figure 61 extends the analysis to include the Top 4 sub-sectors for each of London's sub-regions. Typically, four sub-sectors account for over 55% of the total value, whilst the sub-sectors are similar their rankings do differ across the 4 sub-regions. As would be expected these are consistent with the 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 61: London's Local Authorities LCEGS Sales 2020/21 at Level 2
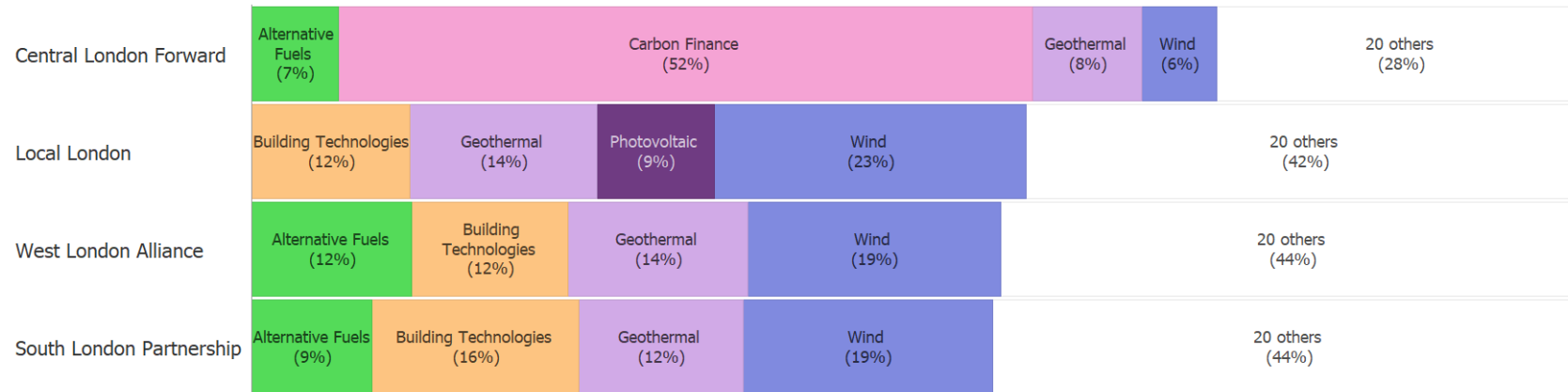
4. London's LCEGS and International Trade

4.1 London's LCEGS Exports and Imports

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 and their destination markets. Data is presented for 2019/20, to avoid the distortion of the export market through the impact of the pandemic on 2020/21 export figures.

Figure 62: London's Exports (£m) 2018/19 to 2020/21
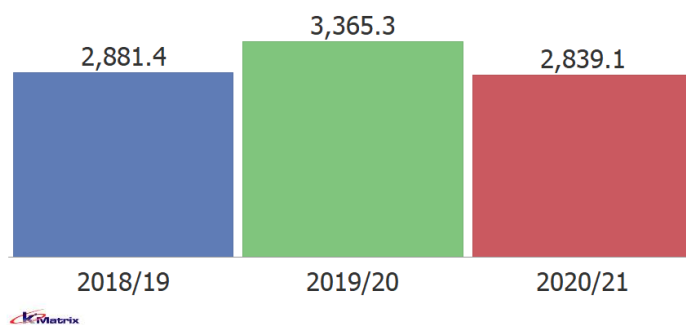
The value of London's LCEGS Exports was £2.7bn in 2017/18 (see previous report), grew to £3.4bn in 2019/20, before contracting to £2.8bn in 2020/21.

Growth between 2017/18 and 2018/19 was 8.1%, growth between 2018/19 and 2019/20 was 16.8% and growth between 2018/19 and 2020/21 was -15.6%.

This is compared to UK growth of approximately 8.7%, 9.5% and -6.4% respectively.

Figure 63: London's Exports (%) by Sub-Sector 2019/20
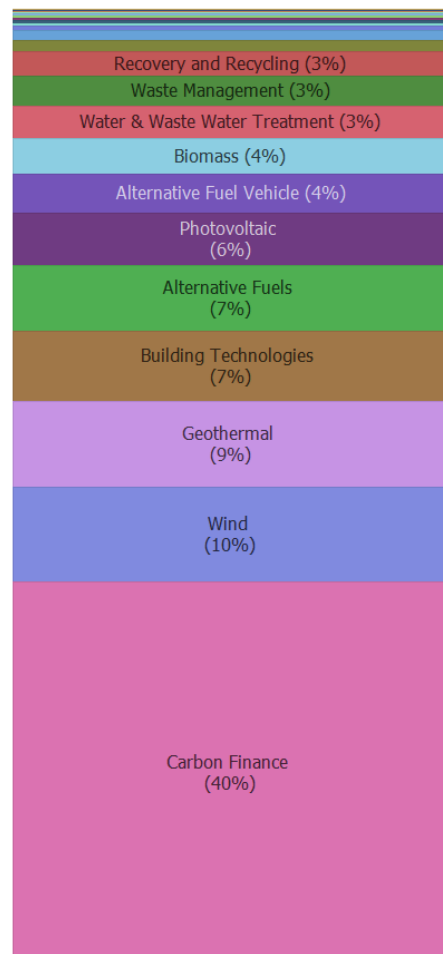
London represented 22% of all UK LCEGS exports in 2019/20. This is higher than the 18% seen since 2011/12. It is in line with London's 22% of overall UK Sales for that year. This means that although historically London's companies have had a slightly smaller share of the export market than the UK market, this gap has closed.

Figure 63 shows the proportion of London LCEGS exports by Level 2 sub-sector for 2019/20, with Carbon Finance 40% (42% in 2020/21), Wind 10% (11% in 2020/21), Geothermal 9%, Building Technologies 7% and Alternative Fuels 7% (6% in 2020/21) being the leading sub-sectors and accounting for 73% of all London LCEGS exports (75% in 2020/21).

Figure 63 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, and in 2019/20 it held 40%.

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.

Figure 64: London's Imports (£m) 2018/19 to 2020/21
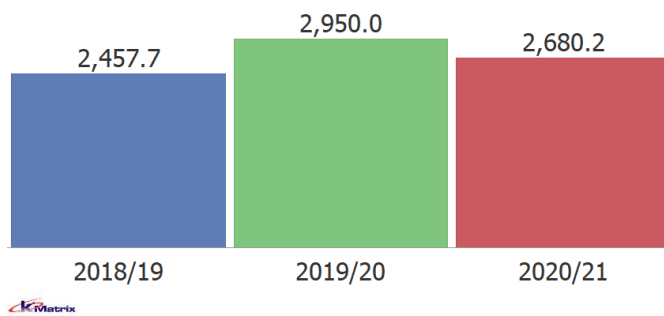
The value of London's LCEGS Imports was £2.5bn in 2018/19, grew to £3.0bn in 2019/20, before contracting to £2.7bn in 2020/21.

Growth between 2018/19 and 2019/20 was 20.0% and growth between 2018/19 and 2020/21 was -9.1%.

This is compared to UK growth of approximately 8.7%, 9.5% and -13.1% respectively.

Figure 65: London's Imports (%) by Sub-Sector 2019/20
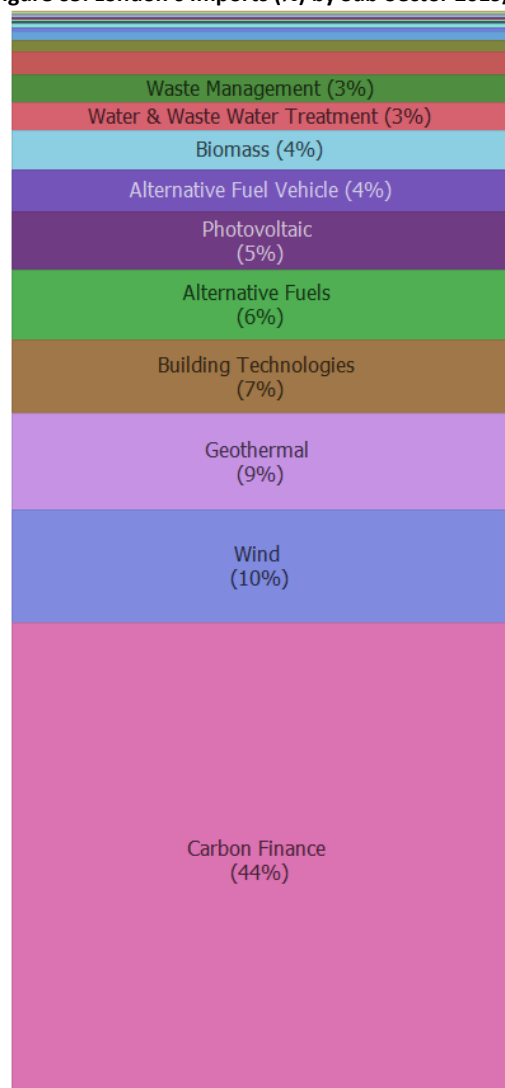
London represented 22% of all UK LCEGS imports in 2019/20, in line with London's 22% of overall UK Sales for that year.

Figure 65 shows the proportion of London LCEGS imports by Level 2 sub-sector for 2019/20, with Carbon Finance 44% (44% in 2020/21), Wind 10% (10% in 2020/21), Geothermal 9%, Building Technologies 7% and Alternative Fuels 6% (6% in 2020/21) being the leading sub-sectors and accounting for 73% of all London LCEGS exports (75% in 2020/21).

In Table 23 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 23: London's LCEGS Exports as a % of Sales 2018/19 to 2020/21

Level 1	Level 2	2018/19 Sales £m	2018/19 Exports £m	2018/19 Exports as a % of Sales	2019/20 Sales £m	2019/20 Exports £m	2019/20 Exports as a % of Sales	2020/21 Sales £m	2020/21 Exports £m	2020/21 Exports as a % of Sales
Environmental	Air Pollution	128.8	8.1	6.3%	134.5	8.4	6.3%	117.1	5.8	5.0%
Environmental	Contaminated Land	121.8	7.8	6.4%	129.7	8.2	6.3%	111.1	6.0	5.4%
Environmental	Environmental Consultancy	159.1	10.1	6.4%	170.0	10.8	6.3%	145.8	7.9	5.4%
Environmental	Environmental Monitoring	34.0	2.1	6.3%	36.5	2.3	6.2%	31.8	1.7	5.3%
Environmental	Marine Pollution Control	24.6	1.6	6.4%	26.3	1.7	6.3%	22.5	1.2	5.4%
Environmental	Noise & Vibration Control	72.7	4.6	6.3%	79.2	5.0	6.3%	68.7	4.1	5.9%
Environmental	Recovery and Recycling	1,291.6	80.7	6.2%	1,386.0	86.8	6.3%	1,207.2	65.5	5.4%
Environmental	Waste Management	1,602.4	100.0	6.2%	1,683.1	105.5	6.3%	1,434.6	73.0	5.1%
Environmental	Water & Waste Water Treatment	1,793.3	112.2	6.3%	1,853.6	116.7	6.3%	1,612.0	78.0	4.8%
Low Carbon	Additional Energy Sources	219.7	14.1	6.4%	234.5	14.8	6.3%	200.3	10.8	5.4%
Low Carbon	Alternative Fuel Vehicle	2,028.0	126.9	6.3%	2,223.4	139.1	6.3%	1,930.3	115.0	6.0%
Low Carbon	Alternative Fuels	3,341.5	216.4	6.5%	3,698.0	229.9	6.2%	3,125.9	184.5	5.9%
Low Carbon	Building Technologies	3,560.5	221.5	6.2%	3,920.5	246.1	6.3%	3,271.0	200.6	6.1%
Low Carbon	Carbon Capture & Storage	82.4	5.2	6.3%	87.3	5.6	6.4%	69.0	3.9	5.6%
Low Carbon	Carbon Finance	14,876.8	1,044.3	7.0%	17,790.7	1,346.3	7.6%	15,438.1	1,178.3	7.6%
Low Carbon	Energy Management	499.3	31.4	6.3%	536.7	33.9	6.3%	475.0	25.6	5.4%
Low Carbon	Nuclear Power	573.0	36.4	6.3%	616.6	39.2	6.4%	526.3	29.5	5.6%
Renewable Energy	Biomass	1,760.9	112.2	6.4%	1,966.8	123.5	6.3%	1,666.7	106.5	6.4%
Renewable Energy	Geothermal	4,424.0	275.6	6.2%	4,905.4	305.3	6.2%	4,250.8	264.7	6.2%
Renewable Energy	Hydro	142.1	8.9	6.3%	149.9	9.5	6.4%	124.7	6.6	5.3%
Renewable Energy	Photovoltaic	2,582.2	160.3	6.2%	2,916.8	186.3	6.4%	2,485.7	158.3	6.4%
Renewable Energy	Renewable Consultancy	114.3	7.3	6.4%	120.0	7.6	6.3%	99.9	5.4	5.5%
Renewable Energy	Wave & Tidal	19.3	1.2	6.3%	21.5	1.4	6.3%	18.3	1.2	6.5%
Renewable Energy	Wind	4,628.4	292.4	6.3%	5,271.5	331.6	6.3%	4,476.3	305.0	6.8%
Total		**44,080.7**	**2,881.4**	**6.5%**	**49,958.5**	**3,365.3**	**6.7%**	**42,909.2**	**2,839.1**	**6.6%**

The average for 2019/20 is 6.7%, with less than 1.5 percentage point variation between sub-sectors, which is consistent with 2018/9 and indicates a stable and established export market.

Previous years have shown more variation, but London now seems to be more consistent with the rest of the UK.

Exports for 2020/21 show more variation, ranging between 4.8-7.6%. The reduction in exports between 2019/20 and 2020/21 varied between 8% for Wind and 33% for Water and Waste Water Treatment.

In Table 24 London's LCEGS imports 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 24: London's LCEGS Imports as a % of Sales 2018/19 to 2020/21

Level 1	Level 2	2018/19 Sales £m	2018/19 Imports £m	2018/19 Imports as a % of Sales	2019/20 Sales £m	2019/20 Imports £m	2019/20 Imports as a % of Sales	2020/21 Sales £m	2020/21 Imports £m	2020/21 Imports as a % of Sales
Environmental	Air Pollution	128.8	4.6	3.6%	134.5	5.6	4.2%	117.1	5.1	4.4%
Environmental	Contaminated Land	121.8	4.8	4.0%	129.7	5.9	4.6%	111.1	5.4	4.8%
Environmental	Environmental Consultancy	159.1	6.3	3.9%	170.0	7.7	4.5%	145.8	7.0	4.8%
Environmental	Environmental Monitoring	34.0	1.4	4.0%	36.5	1.7	4.6%	31.8	1.5	4.8%
Environmental	Marine Pollution Control	24.6	1.0	4.0%	26.3	1.2	4.5%	22.5	1.1	4.8%
Environmental	Noise & Vibration Control	72.7	3.3	4.5%	79.2	4.0	5.1%	68.7	3.6	5.3%
Environmental	Recovery and Recycling	1,291.6	52.6	4.1%	1,386.0	64.4	4.6%	1,207.2	58.2	4.8%
Environmental	Waste Management	1,602.4	60.5	3.8%	1,683.1	73.8	4.4%	1,434.6	67.2	4.7%
Environmental	Water & Waste Water Treatment	1,793.3	64.0	3.6%	1,853.6	78.5	4.2%	1,612.0	71.3	4.4%
Low Carbon	Additional Energy Sources	219.7	8.7	4.0%	234.5	10.7	4.6%	200.3	9.7	4.8%
Low Carbon	Alternative Fuel Vehicle	2,028.0	90.8	4.5%	2,223.4	111.0	5.0%	1,930.3	101.2	5.2%
Low Carbon	Alternative Fuels	3,341.5	157.2	4.7%	3,698.0	191.5	5.2%	3,125.9	173.0	5.5%
Low Carbon	Building Technologies	3,560.5	162.4	4.6%	3,920.5	198.7	5.1%	3,271.0	180.1	5.5%
Low Carbon	Carbon Capture & Storage	82.4	3.1	3.7%	87.3	3.8	4.3%	69.0	3.4	5.0%
Low Carbon	Carbon Finance	14,876.8	1,098.5	7.4%	17,790.7	1,289.1	7.2%	15,438.1	1,172.2	7.6%
Low Carbon	Energy Management	499.3	20.7	4.2%	536.7	25.3	4.7%	475.0	23.0	4.8%
Low Carbon	Nuclear Power	573.0	24.4	4.3%	616.6	29.8	4.8%	526.3	27.1	5.1%
Renewable Energy	Biomass	1,760.9	87.6	5.0%	1,966.8	106.6	5.4%	1,666.7	97.1	5.8%
Renewable Energy	Geothermal	4,424.0	215.7	4.9%	4,905.4	263.9	5.4%	4,250.8	239.1	5.6%
Renewable Energy	Hydro	142.1	5.4	3.8%	149.9	6.6	4.4%	124.7	6.0	4.8%
Renewable Energy	Photovoltaic	2,582.2	128.7	5.0%	2,916.8	158.5	5.4%	2,485.7	143.9	5.8%
Renewable Energy	Renewable Consultancy	114.3	4.4	3.8%	120.0	5.4	4.5%	99.9	4.9	4.9%
Renewable Energy	Wave & Tidal	19.3	0.9	4.9%	21.5	1.2	5.4%	18.3	1.1	5.8%
Renewable Energy	Wind	4,628.4	250.7	5.4%	5,271.5	305.1	5.8%	4,476.3	277.9	6.2%
Total		**44,080.7**	**2,457.7**	**5.6%**	**49,958.5**	**2,950.0**	**5.9%**	**42,909.2**	**2,680.2**	**6.2%**

The average for 2019/20 is 5.9%, with up to 3.2 percentage point variation between sub-sectors, compared with up to 3.8 percentage point variation in 2018/9.

Imports for 2020/21 show similar variation to 2019/20, ranging by up to 3.2 percentage points, from 4.4% to 7.6%.

Matrix

Figure 66 shows the 2019/20 Exports plotted against London's 2019/20 Growth for all Level 2 sub-sectors, with the bubbles sized according to the size of the Exports. The 2019/20 export figures have been used to avoid the outlier results of the 2020/21 pandemic. Here we can see that the Carbon Finance holds the most desirable position of large export market and extremely strong growth. Figure 67 shows the same data, but with Carbon Finance excluded to enable analysis of the other Level 2 sub-sectors.

Figure 66: London's LCEGS Exports vs Level 2 Growth for 2019/20
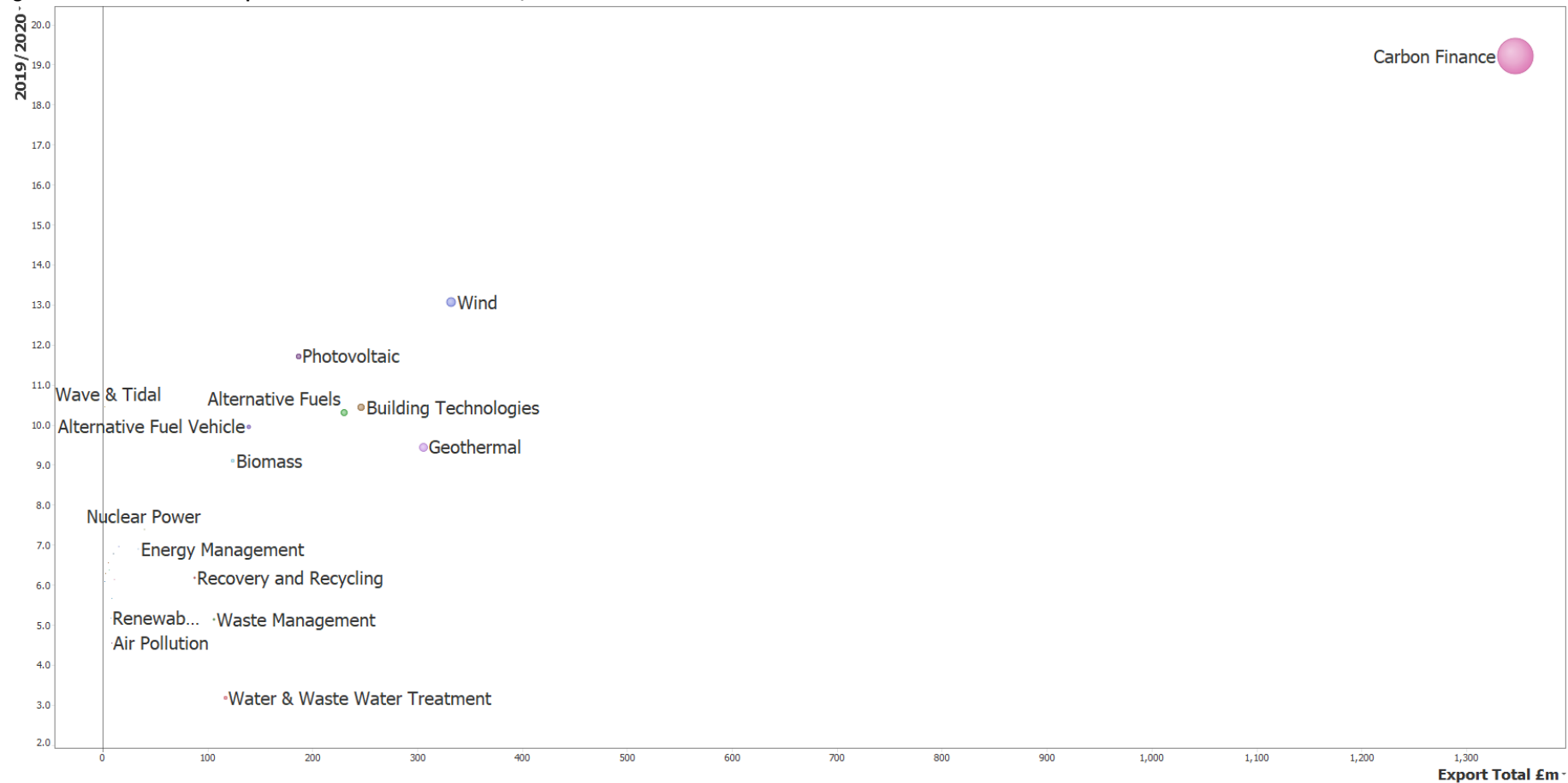
Figure 67 shows the same data as Figure 53, but with Carbon Finance excluded to enable analysis of the other Level 2 sub-sectors. Wind now holds the most desirable position of large export market and very strong growth. Photovoltaic, Alternative Fuels, Building Technologies and Geothermal should also be considered strengths.

Figure 67: London's LCEGS Exports vs Level 2 Growth for 2019/20 – Carbon Finance Excluded
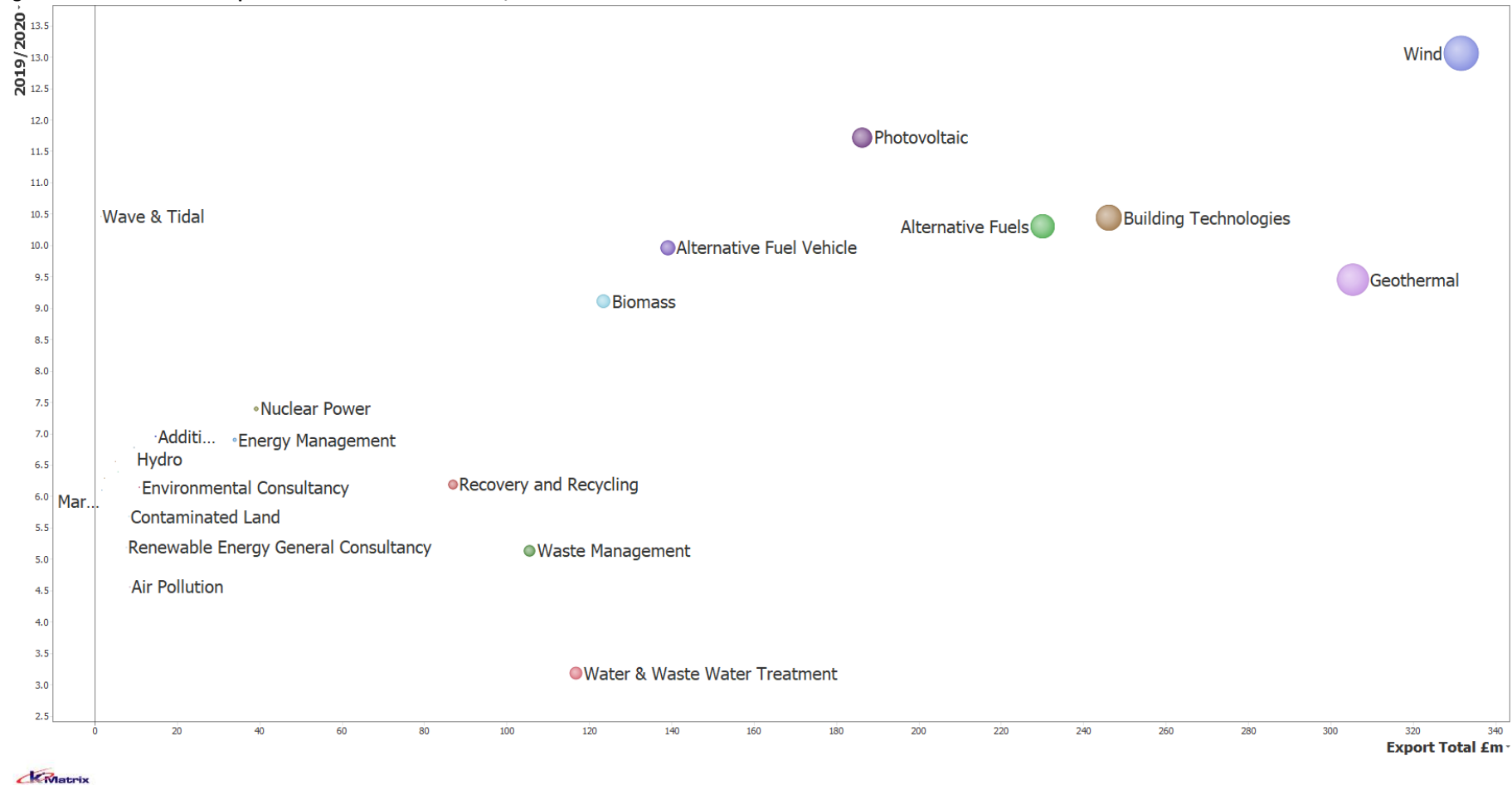
The Top 12 destinations London's LCEGS exports are shown in Figure 68. China is the top destination, followed by Pakistan, India, Taiwan, Thailand, Hong Kong, Saudi Arabia, Malaysia, Brazil, Singapore, Poland, and Turkey. These top destinations are not dissimilar to 2017/18, but Brazil have come in to the top 12 destinations and replaced UAE.

The USA, Germany and France, who are three of the UK's largest trading partners, are conspicuously absent from the Top 12 destinations for LCEGS and this has been a feature of international trade in LCEGS since 2007/08 when the analysis first began. The LCEGS sector has a very different trading pattern to other mainstream UK sectors, predominantly due to long term, historic trading relationships within this sector.

Figure 68: London's Top 12 LCEGS Export Destinations 2019/20
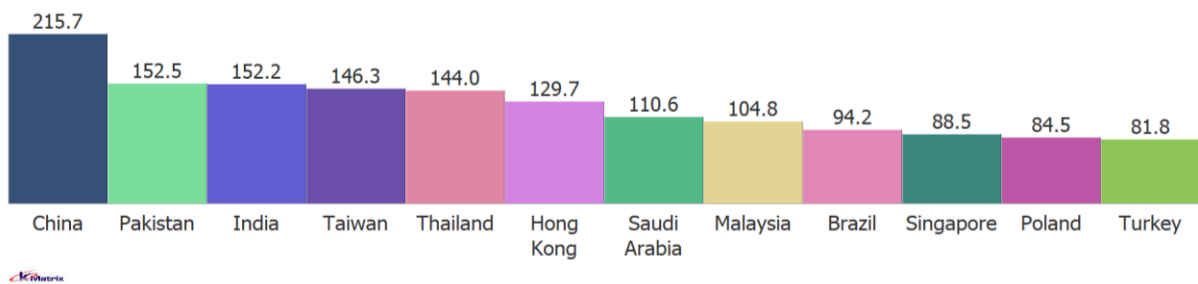
In Figure 69 London's exports to each of the Top 12 countries are shown in relation to exports from the rest of the UK regions and Devolved Administrations. London consistently represents the largest exporting region and makes up between 25-29% of UK exports to each country.

Figure 69: Top 12 London LCEGS Export Destinations (and other UK Regions) 2019/20
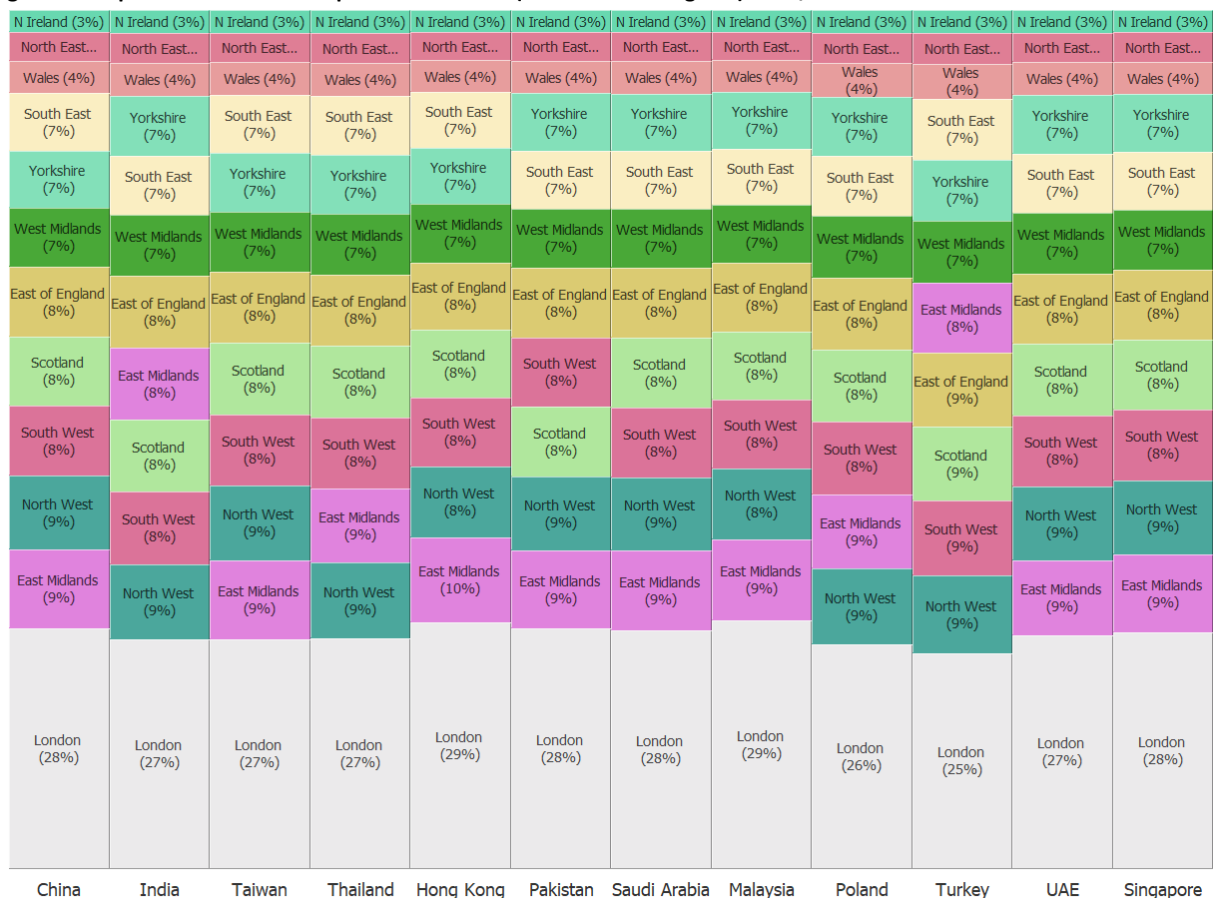
4.2   London's LCEGS Priority Markets

Table 25 combines analysis of London's LCEGS product and service exports with destination countries using a heat map. The table shows the value of exports in £m and then colour codes the values – dark green for higher values and white for lower values. The table has been simplified by excluding the lowest value destination countries and lowest value products/services. The results show the top 32 export destinations and the top 11 (out of 24) sub-sectors. Table 24 shows the same data, with Carbon Finance removed to allow easier identification of priority markets for other sub-sectors.

Table 25: London's Level 2 Exports by Country for 2019/20 in £m

Level 1	Level 2	Australia	Brazil	Canada	Chile	China	Denmark	France	Germany	Hong Kong	Hungary	India	Indonesia	Italy	Japan	Malaysia	Mexico
Environmental	Recovery and Recycling	0.98	2.18	1.71	0.25	5.15	1.24	1.11	1.24	3.07	1.67	4.03	0.97	1.08	1.19	2.44	0.58
Environmental	Waste Management	1.20	2.65	2.14	0.30	6.40	1.52	1.32	1.49	3.71	2.01	4.82	1.18	1.32	1.47	2.95	0.71
Environmental	Water & Waste Water Treatment	1.32	2.93	2.32	0.34	6.87	1.65	1.48	1.65	4.02	2.21	5.44	1.32	1.42	1.61	3.24	0.79
Low Carbon	Alternative Fuel Vehicle	1.61	3.47	2.78	0.39	8.57	1.98	1.75	1.94	4.87	2.66	6.28	1.55	1.73	1.95	3.88	0.92
Low Carbon	Alternative Fuels	2.67	5.72	4.63	0.66	14.41	3.12	2.88	3.25	7.75	4.22	10.41	2.65	2.85	3.15	6.56	1.53
Low Carbon	Building Technologies	2.81	6.09	4.94	0.70	14.97	3.47	3.07	3.50	8.45	4.74	11.43	2.75	3.02	3.42	6.76	1.68
Low Carbon	Carbon Finance	14.35	43.92	24.03	4.12	93.04	15.42	12.34	15.90	59.64	19.11	58.67	13.11	17.23	23.71	48.76	10.53
Low Carbon	Energy Management	0.38	0.85	0.68	0.10	2.03	0.49	0.42	0.49	1.17	0.64	1.60	0.38	0.42	0.48	0.94	0.23
Renewable Energy	Biomass	1.36	3.11	2.45	0.35	7.42	1.76	1.57	1.77	4.24	2.29	5.85	1.37	1.47	1.73	3.49	0.81
Renewable Energy	Geothermal	3.44	7.58	6.17	0.86	18.65	4.32	3.78	4.22	10.61	5.95	14.30	3.56	3.78	4.25	8.30	2.10
Renewable Energy	Photovoltaic	2.12	4.58	3.72	0.54	11.45	2.76	2.30	2.62	6.58	3.62	8.69	2.12	2.29	2.58	5.18	1.27
Renewable Energy	Wind	3.80	8.27	6.56	0.96	19.83	4.75	4.15	4.70	11.60	6.38	15.35	3.74	4.00	4.63	9.11	2.24

Level 1	Level 2	Netherlands	Pakistan	Poland	Portugal	Romania	Russia	Saudi Arabia	Singapore	A Africa	S Korea	Sweden	Taiwan	Thailand	Turkey	UAE	US
Environmental	Recovery and Recycling	1.41	3.75	2.29	0.97	1.43	1.11	2.74	2.18	1.08	1.19	0.74	3.79	3.87	2.34	2.06	0.77
Environmental	Waste Management	1.74	4.58	2.85	1.19	1.70	1.36	3.29	2.70	1.33	1.43	0.90	4.55	4.66	2.86	2.55	0.93
Environmental	Water & Waste Water Treatment	1.92	4.89	3.13	1.32	1.91	1.48	3.67	2.96	1.48	1.62	1.00	5.12	5.02	3.13	2.75	1.06
Low Carbon	Alternative Fuel Vehicle	2.31	6.02	3.69	1.54	2.38	1.77	4.35	3.57	1.78	1.94	1.16	6.14	6.06	3.79	3.38	1.29
Low Carbon	Alternative Fuels	3.80	10.37	6.02	2.56	3.77	3.12	7.32	5.89	2.88	3.17	1.96	9.86	9.64	6.10	5.47	2.05
Low Carbon	Building Technologies	4.00	10.53	6.44	2.82	4.10	3.17	7.71	6.19	3.08	3.39	2.08	10.88	10.81	6.52	5.91	2.21
Low Carbon	Carbon Finance	23.26	65.78	31.14	16.35	25.68	18.98	47.25	37.10	14.50	14.95	9.97	57.56	56.83	26.93	33.19	11.56
Low Carbon	Energy Management	0.55	1.46	0.90	0.39	0.56	0.44	1.05	0.87	0.43	0.47	0.29	1.47	1.50	0.92	0.81	0.30
Renewable Energy	Biomass	2.00	5.21	3.30	1.39	2.06	1.55	3.85	3.16	1.57	1.65	1.09	5.33	5.25	3.32	2.95	1.11
Renewable Energy	Geothermal	4.96	12.98	8.06	3.43	5.07	3.86	9.49	7.72	3.84	4.11	2.65	13.67	13.36	8.47	7.32	2.74
Renewable Energy	Photovoltaic	3.09	8.02	4.84	2.13	3.08	2.37	5.87	4.78	2.33	2.45	1.59	8.31	8.08	5.14	4.51	1.66
Renewable Energy	Wind	5.46	14.02	8.86	3.72	5.51	4.31	10.44	8.51	4.15	4.61	2.77	14.65	13.93	9.14	8.02	2.94

Table 25 can be read horizontally to identify the strongest exporting sub-sectors i.e. Carbon Finance, vertically to identify the strongest trading partners i.e. China, and using both vertical and horizontal you can identify strong niches like Geothermal to Taiwan and Alternative Fuels to India.

Table 26 shows the same data, with Carbon Finance removed to allow easier identification of priority markets for other sub-sectors.

Table 26: London's Level 2 Exports by Country for 2019/20 in £m – Carbon Finance Excluded

Level 1	Level 2	Australia	Brazil	Canada	Chile	China	Denmark	France	Germany	Hong Kong	Hungary	India	Indonesia	Italy	Japan	Malaysia	Mexico
Environmental	Recovery and Recycling	0.98	2.18	1.71	0.25	5.15	1.24	1.11	1.24	3.07	1.67	4.03	0.97	1.08	1.19	2.44	0.58
Environmental	Waste Management	1.20	2.65	2.14	0.30	6.40	1.52	1.32	1.49	3.71	2.01	4.82	1.18	1.32	1.47	2.95	0.71
Environmental	Water & Waste Water Treatment	1.32	2.93	2.32	0.34	6.87	1.65	1.48	1.65	4.02	2.21	5.44	1.32	1.42	1.61	3.24	0.79
Low Carbon	Alternative Fuel Vehicle	1.61	3.47	2.78	0.39	8.57	1.98	1.75	1.94	4.87	2.66	6.28	1.55	1.73	1.95	3.88	0.92
Low Carbon	Alternative Fuels	2.67	5.72	4.63	0.66	14.41	3.12	2.88	3.25	7.75	4.22	10.41	2.65	2.85	3.15	6.56	1.53
Low Carbon	Building Technologies	2.81	6.09	4.94	0.70	14.97	3.47	3.07	3.50	8.45	4.74	11.43	2.75	3.02	3.42	6.76	1.68
Low Carbon	Energy Management	0.38	0.85	0.68	0.10	2.03	0.49	0.42	0.49	1.17	0.64	1.60	0.38	0.42	0.48	0.94	0.23
Renewable Energy	Biomass	1.36	3.11	2.45	0.35	7.42	1.76	1.57	1.77	4.24	2.29	5.85	1.37	1.47	1.73	3.49	0.81
Renewable Energy	Geothermal	3.44	7.58	6.17	0.86	18.65	4.32	3.78	4.22	10.61	5.95	14.30	3.56	3.78	4.25	8.30	2.10
Renewable Energy	Photovoltaic	2.12	4.58	3.72	0.54	11.45	2.76	2.30	2.62	6.58	3.62	8.69	2.12	2.29	2.58	5.18	1.27
Renewable Energy	Wind	3.80	8.27	6.56	0.96	19.83	4.75	4.15	4.70	11.60	6.38	15.35	3.74	4.00	4.63	9.11	2.24

Level 1	Level 2	Netherlands	Pakistan	Poland	Portugal	Romania	Russia	Saudi Arabia	Singapore	A Africa	S Korea	Sweden	Taiwan	Thailand	Turkey	UAE	US
Environmental	Recovery and Recycling	1.41	3.75	2.29	0.97	1.43	1.11	2.74	2.18	1.08	1.19	0.74	3.79	3.87	2.34	2.06	0.77
Environmental	Waste Management	1.74	4.58	2.85	1.19	1.70	1.36	3.29	2.70	1.33	1.43	0.90	4.55	4.66	2.86	2.55	0.93
Environmental	Water & Waste Water Treatment	1.92	4.89	3.13	1.32	1.91	1.48	3.67	2.96	1.48	1.62	1.00	5.12	5.02	3.13	2.75	1.06
Low Carbon	Alternative Fuel Vehicle	2.31	6.02	3.69	1.54	2.38	1.77	4.35	3.57	1.78	1.94	1.16	6.14	6.06	3.79	3.38	1.29
Low Carbon	Alternative Fuels	3.80	10.37	6.02	2.56	3.77	3.12	7.32	5.89	2.88	3.17	1.96	9.86	9.64	6.10	5.47	2.05
Low Carbon	Building Technologies	4.00	10.53	6.44	2.82	4.10	3.17	7.71	6.19	3.08	3.39	2.08	10.88	10.81	6.52	5.91	2.21
Low Carbon	Energy Management	0.55	1.46	0.90	0.39	0.56	0.44	1.05	0.87	0.43	0.47	0.29	1.47	1.50	0.92	0.81	0.30
Renewable Energy	Biomass	2.00	5.21	3.30	1.39	2.06	1.55	3.85	3.16	1.57	1.65	1.09	5.33	5.25	3.32	2.95	1.11
Renewable Energy	Geothermal	4.96	12.98	8.06	3.43	5.07	3.86	9.49	7.72	3.84	4.11	2.65	13.67	13.36	8.47	7.32	2.74
Renewable Energy	Photovoltaic	3.09	8.02	4.84	2.13	3.08	2.37	5.87	4.78	2.33	2.45	1.59	8.31	8.08	5.14	4.51	1.66
Renewable Energy	Wind	5.46	14.02	8.86	3.72	5.51	4.31	10.44	8.51	4.15	4.61	2.77	14.65	13.93	9.14	8.02	2.94

Tables 27a, 27b and 27c apply the same conventions as Table 25, but this time broken down to Level 3, which reveals London's priority exports in more detail. The tables show the same 32 destination countries but for 30 out of a total of 126 Level 3 market activities.

Table 27a: London's Level 3 Exports by Country for 2019/20 in £m

Level 2	Level 3	Australia	Brazil	Canada	Chile	China	Denmark	France	Germany	Hong Kong	Hungary	India
Recovery and Recycling	Waste Collection	0.42	0.92	0.72	0.10	2.17	0.53	0.46	0.53	1.28	0.70	1.72
Waste Management	Construction & Operation of Waste Treatment Facilities	0.37	0.82	0.67	0.09	2.00	0.47	0.42	0.47	1.16	0.63	1.54
Waste Management	Equipment For Waste Treatment	0.44	1.00	0.79	0.11	2.39	0.56	0.48	0.56	1.35	0.74	1.73
Water & Waste Water Treatment	Engineering	0.28	0.63	0.50	0.07	1.43	0.36	0.32	0.35	0.87	0.48	1.16
Water & Waste Water Treatment	Water Treatment and Distribution	1.01	2.26	1.79	0.26	5.33	1.27	1.13	1.28	3.09	1.70	4.21
Alternative Fuel Vehicle	Alternative Fuels (main Stream) for Vehicles Only	1.21	2.62	2.08	0.29	6.52	1.49	1.32	1.48	3.66	2.01	4.61
Alternative Fuel Vehicle	Other Fuels and Vehicles	0.41	0.85	0.70	0.10	2.05	0.49	0.43	0.46	1.20	0.66	1.67
Alternative Fuels	Main Stream Bio Fuels	0.58	1.35	1.07	0.16	3.34	0.76	0.68	0.77	1.71	1.04	2.55
Alternative Fuels	Other Bio Fuels	1.71	3.51	2.88	0.40	9.06	1.90	1.78	1.99	4.86	2.53	6.33
Alternative Fuels	Other Fuels	0.20	0.48	0.38	0.05	1.09	0.25	0.24	0.28	0.67	0.36	0.83
Building Technologies	Doors	0.68	1.45	1.20	0.17	3.70	0.87	0.75	0.86	2.06	1.24	2.82
Building Technologies	Insulation and Heat Retention Materials	0.45	0.97	0.79	0.11	2.30	0.56	0.49	0.55	1.39	0.74	1.81
Building Technologies	Monitoring and Control Systems	0.55	1.23	0.96	0.14	2.88	0.68	0.60	0.67	1.63	0.91	2.23
Building Technologies	Windows	1.14	2.44	2.00	0.28	6.09	1.36	1.22	1.42	3.36	1.86	4.57
Carbon Finance	Carbon Credits Finance & Fund Management	4.84	9.25	6.82	0.81	18.05	3.43	3.89	5.13	9.02	5.15	18.72
Carbon Finance	Carbon Credits Trading	8.40	32.33	15.39	3.07	69.64	10.63	7.20	9.24	47.60	11.96	36.26
Carbon Finance	Carbon Market Intelligence & Forecasting	1.03	2.18	1.71	0.22	4.98	1.28	1.16	1.42	2.77	1.85	3.33
Biomass	Biomass Energy Systems	0.63	1.48	1.15	0.16	3.53	0.85	0.73	0.86	1.99	1.07	2.87
Biomass	Boilers and related Systems	0.44	1.03	0.79	0.12	2.40	0.57	0.51	0.56	1.39	0.74	1.83
Biomass	Manufacturing Of Boilers and Related Systems	0.17	0.35	0.30	0.04	0.87	0.19	0.19	0.20	0.49	0.28	0.69
Geothermal	Consulting & Related Services	0.52	1.13	0.89	0.13	2.79	0.64	0.58	0.64	1.56	0.85	2.08
Geothermal	Manufacture and Supply of Specialist Equipment	0.86	1.90	1.57	0.21	4.60	1.10	0.95	1.06	2.62	1.52	3.70
Geothermal	Suppliers of Systems	1.15	2.49	2.03	0.29	6.10	1.44	1.25	1.41	3.46	1.97	4.72
Geothermal	Whole Systems Manufacture	0.83	1.88	1.54	0.21	4.74	1.05	0.91	1.01	2.73	1.49	3.51
Photovoltaic	Other Related Equipment and Chemicals	0.49	1.09	0.86	0.12	2.62	0.61	0.54	0.61	1.55	0.84	1.99
Photovoltaic	Photovoltaic Cells	0.53	1.05	0.89	0.13	2.69	0.70	0.56	0.63	1.55	0.85	2.16
Photovoltaic	Systems & Equipment	1.04	2.32	1.87	0.27	5.82	1.38	1.14	1.31	3.31	1.83	4.30
Wind	Large Wind Turbine	1.40	3.06	2.45	0.35	7.52	1.74	1.54	1.71	4.22	2.39	5.77
Wind	Small Wind Turbine	1.06	2.36	1.83	0.27	5.52	1.35	1.13	1.33	3.27	1.76	4.23
Wind	Wind Farm Systems	1.34	2.84	2.28	0.34	6.79	1.66	1.47	1.67	4.11	2.22	5.35

At Level 3 greater levels of detail are created that reveal more niche export markets.

Table 27b: London's Level 3 Exports by Country for 2019/20 in £m

Level 2	Level 3	Indonesia	Italy	Japan	Malaysia	Mexico	Netherlands	Pakistan	Poland	Portugal	Romania	Russia
Recovery and Recycling	Waste Collection	0.41	0.46	0.50	1.03	0.25	0.60	1.59	0.97	0.41	0.62	0.46
Waste Management	Construction & Operation of Waste Treatment Facilities	0.37	0.42	0.46	0.91	0.22	0.54	1.39	0.89	0.38	0.54	0.42
Waste Management	Equipment For Waste Treatment	0.44	0.49	0.54	1.10	0.26	0.64	1.72	1.06	0.43	0.62	0.50
Water & Waste Water Treatment	Engineering	0.28	0.31	0.35	0.70	0.17	0.43	1.03	0.68	0.29	0.42	0.31
Water & Waste Water Treatment	Water Treatment and Distribution	1.02	1.10	1.23	2.49	0.61	1.46	3.78	2.41	1.02	1.46	1.15
Alternative Fuel Vehicle	Alternative Fuels (main Stream) for Vehicles Only	1.16	1.32	1.47	2.92	0.70	1.75	4.54	2.77	1.15	1.77	1.34
Alternative Fuel Vehicle	Other Fuels and Vehicles	0.39	0.42	0.48	0.96	0.22	0.56	1.47	0.92	0.39	0.61	0.43
Alternative Fuels	Main Stream Bio Fuels	0.61	0.62	0.76	1.49	0.34	0.88	2.39	1.41	0.61	0.91	0.70
Alternative Fuels	Other Bio Fuels	1.66	1.82	1.95	4.14	0.96	2.38	6.53	3.71	1.58	2.30	2.00
Alternative Fuels	Other Fuels	0.22	0.22	0.24	0.51	0.13	0.30	0.80	0.51	0.20	0.32	0.22
Building Technologies	Doors	0.66	0.74	0.83	1.68	0.42	0.99	2.57	1.59	0.70	1.01	0.76
Building Technologies	Insulation and Heat Retention Materials	0.44	0.47	0.53	1.06	0.27	0.64	1.65	1.05	0.43	0.65	0.50
Building Technologies	Monitoring and Control Systems	0.54	0.59	0.65	1.31	0.33	0.78	2.07	1.26	0.54	0.78	0.62
Building Technologies	Windows	1.11	1.21	1.41	2.70	0.67	1.58	4.24	2.55	1.15	1.65	1.29
Carbon Finance	Carbon Credits Finance & Fund Management	3.19	2.99	4.63	9.73	2.32	5.82	12.10	7.22	4.57	6.08	3.47
Carbon Finance	Carbon Credits Trading	8.82	13.12	17.73	36.27	7.52	15.94	50.32	21.48	10.67	18.03	14.24
Carbon Finance	Carbon Market Intelligence & Forecasting	1.02	1.04	1.25	2.56	0.64	1.38	3.11	2.25	1.04	1.47	1.19
Biomass	Biomass Energy Systems	0.67	0.68	0.83	1.67	0.38	0.97	2.49	1.56	0.65	0.98	0.71
Biomass	Boilers and related Systems	0.44	0.49	0.55	1.12	0.27	0.64	1.69	1.08	0.46	0.66	0.52
Biomass	Manufacturing Of Boilers and Related Systems	0.15	0.17	0.20	0.40	0.10	0.23	0.61	0.39	0.16	0.25	0.19
Geothermal	Consulting & Related Services	0.52	0.56	0.62	1.29	0.31	0.74	1.96	1.22	0.52	0.76	0.57
Geothermal	Manufacture and Supply of Specialist Equipment	0.89	0.95	1.05	2.03	0.52	1.26	3.28	2.05	0.85	1.22	0.98
Geothermal	Suppliers of Systems	1.14	1.23	1.38	2.75	0.70	1.63	4.13	2.63	1.13	1.66	1.27
Geothermal	Whole Systems Manufacture	0.93	0.96	1.11	2.03	0.52	1.21	3.29	1.97	0.85	1.32	0.95
Photovoltaic	Other Related Equipment and Chemicals	0.51	0.54	0.58	1.20	0.30	0.71	1.88	1.16	0.48	0.71	0.55
Photovoltaic	Photovoltaic Cells	0.53	0.53	0.62	1.22	0.30	0.75	1.96	1.16	0.53	0.77	0.56
Photovoltaic	Systems & Equipment	1.03	1.16	1.31	2.63	0.64	1.54	3.97	2.39	1.07	1.52	1.19
Wind	Large Wind Turbine	1.37	1.46	1.69	3.37	0.81	2.03	5.32	3.32	1.36	2.04	1.59
Wind	Small Wind Turbine	1.07	1.14	1.32	2.56	0.64	1.51	3.86	2.49	1.08	1.55	1.21
Wind	Wind Farm Systems	1.29	1.40	1.62	3.17	0.79	1.92	4.84	3.04	1.29	1.92	1.51

Table 27c: London's Level 3 Exports by Country for 2019/20 in £m

Level 2	Level 3	Saudi Arabia	Singapore	South Africa	South Korea	Sweden	Taiwan	Thailand	Turkey	UAE	US
Recovery and Recycling	Waste Collection	1.15	0.90	0.46	0.51	0.31	1.60	1.67	0.99	0.88	0.32
Waste Management	Construction & Operation of Waste Treatment Facilities	1.05	0.84	0.42	0.45	0.28	1.43	1.42	0.92	0.81	0.29
Waste Management	Equipment For Waste Treatment	1.18	1.02	0.49	0.53	0.33	1.64	1.74	1.03	0.94	0.34
Water & Waste Water Treatment	Engineering	0.79	0.64	0.31	0.34	0.21	1.09	1.09	0.67	0.58	0.23
Water & Waste Water Treatment	Water Treatment and Distribution	2.83	2.28	1.14	1.25	0.77	3.95	3.85	2.41	2.13	0.81
Alternative Fuel Vehicle	Alternative Fuels (main Stream) for Vehicles Only	3.27	2.71	1.35	1.47	0.87	4.65	4.61	2.86	2.51	0.97
Alternative Fuel Vehicle	Other Fuels and Vehicles	1.08	0.86	0.43	0.46	0.29	1.49	1.45	0.92	0.87	0.32
Alternative Fuels	Main Stream Bio Fuels	1.75	1.39	0.68	0.75	0.45	2.34	2.30	1.45	1.30	0.47
Alternative Fuels	Other Bio Fuels	4.49	3.66	1.78	1.97	1.23	6.10	5.99	3.72	3.36	1.28
Alternative Fuels	Other Fuels	0.62	0.45	0.23	0.25	0.16	0.76	0.73	0.52	0.45	0.17
Building Technologies	Doors	1.90	1.52	0.77	0.84	0.51	2.65	2.63	1.54	1.45	0.53
Building Technologies	Insulation and Heat Retention Materials	1.23	1.01	0.47	0.53	0.34	1.70	1.69	1.07	0.93	0.36
Building Technologies	Monitoring and Control Systems	1.52	1.20	0.61	0.66	0.41	2.14	2.06	1.32	1.15	0.43
Building Technologies	Windows	3.06	2.45	1.23	1.36	0.83	4.40	4.43	2.59	2.37	0.89
Carbon Finance	Carbon Credits Finance & Fund Management	8.94	6.74	5.17	3.44	2.88	11.08	14.34	6.08	7.79	3.43
Carbon Finance	Carbon Credits Trading	35.52	28.25	8.01	9.90	6.47	41.74	38.59	18.66	22.63	7.03
Carbon Finance	Carbon Market Intelligence & Forecasting	2.59	1.91	1.25	1.51	0.54	4.41	3.60	1.99	2.60	1.05
Biomass	Biomass Energy Systems	1.79	1.54	0.76	0.77	0.53	2.51	2.46	1.58	1.39	0.53
Biomass	Boilers and related Systems	1.26	0.99	0.49	0.54	0.35	1.72	1.72	1.06	0.98	0.36
Biomass	Manufacturing Of Boilers and Related Systems	0.47	0.37	0.18	0.20	0.12	0.63	0.61	0.39	0.33	0.13
Geothermal	Consulting & Related Services	1.37	1.14	0.58	0.61	0.39	2.02	1.91	1.21	1.09	0.40
Geothermal	Manufacture and Supply of Specialist Equipment	2.42	1.88	0.96	1.05	0.64	3.33	3.35	2.17	1.81	0.67
Geothermal	Suppliers of Systems	3.16	2.58	1.26	1.36	0.89	4.48	4.44	2.71	2.46	0.91
Geothermal	Whole Systems Manufacture	2.32	1.94	0.96	1.00	0.68	3.53	3.36	2.18	1.79	0.69
Photovoltaic	Other Related Equipment and Chemicals	1.38	1.08	0.53	0.58	0.38	1.95	1.89	1.19	1.06	0.39
Photovoltaic	Photovoltaic Cells	1.35	1.19	0.57	0.58	0.37	1.92	1.91	1.25	1.06	0.39
Photovoltaic	Systems & Equipment	2.99	2.38	1.17	1.23	0.79	4.21	4.05	2.56	2.26	0.84
Wind	Large Wind Turbine	3.81	3.16	1.53	1.70	1.03	5.43	5.19	3.44	2.98	1.09
Wind	Small Wind Turbine	3.05	2.42	1.15	1.31	0.77	3.93	3.87	2.50	2.22	0.80
Wind	Wind Farm Systems	3.59	2.93	1.47	1.60	0.97	5.29	4.88	3.19	2.83	1.04

Tables 28a, 28b and 28c show the same data as Table 27, with Carbon Finance excluded to allow easier identification of priority markets.

Table 28a: London's Level 3 Exports by Country for 2019/20 in £m - Carbon Finance Excluded

Level 2	Level 3	Australia	Brazil	Canada	Chile	China	Denmark	France	Germany	Hong Kong	Hungary	India
Recovery and Recycling	Waste Collection	0.42	0.92	0.72	0.10	2.17	0.53	0.46	0.53	1.28	0.70	1.72
Waste Management	Construction & Operation of Waste Treatment Facilities	0.37	0.82	0.67	0.09	2.00	0.47	0.42	0.47	1.16	0.63	1.54
Waste Management	Equipment For Waste Treatment	0.44	1.00	0.79	0.11	2.39	0.56	0.48	0.56	1.35	0.74	1.73
Water & Waste Water Treatment	Engineering	0.28	0.63	0.50	0.07	1.43	0.36	0.32	0.35	0.87	0.48	1.16
Water & Waste Water Treatment	Water Treatment and Distribution	1.01	2.26	1.79	0.26	5.33	1.27	1.13	1.28	3.09	1.70	4.21
Alternative Fuel Vehicle	Alternative Fuels (main Stream) for Vehicles Only	1.21	2.62	2.08	0.29	6.52	1.49	1.32	1.48	3.66	2.01	4.61
Alternative Fuel Vehicle	Other Fuels and Vehicles	0.41	0.85	0.70	0.10	2.05	0.49	0.43	0.46	1.20	0.66	1.67
Alternative Fuels	Main Stream Bio Fuels	0.58	1.35	1.07	0.16	3.34	0.76	0.68	0.77	1.71	1.04	2.55
Alternative Fuels	Other Bio Fuels	1.71	3.51	2.88	0.40	9.06	1.90	1.78	1.99	4.86	2.53	6.33
Alternative Fuels	Other Fuels	0.20	0.48	0.38	0.05	1.09	0.25	0.24	0.28	0.67	0.36	0.83
Building Technologies	Doors	0.68	1.45	1.20	0.17	3.70	0.87	0.75	0.86	2.06	1.24	2.82
Building Technologies	Insulation and Heat Retention Materials	0.45	0.97	0.79	0.11	2.30	0.56	0.49	0.55	1.39	0.74	1.81
Building Technologies	Monitoring and Control Systems	0.55	1.23	0.96	0.14	2.88	0.68	0.60	0.67	1.63	0.91	2.23
Building Technologies	Windows	1.14	2.44	2.00	0.28	6.09	1.36	1.22	1.42	3.36	1.86	4.57
Biomass	Biomass Energy Systems	0.63	1.48	1.15	0.16	3.53	0.85	0.73	0.86	1.99	1.07	2.87
Biomass	Boilers and related Systems	0.44	1.03	0.79	0.12	2.40	0.57	0.51	0.56	1.39	0.74	1.83
Biomass	Manufacturing Of Boilers and Related Systems	0.17	0.35	0.30	0.04	0.87	0.19	0.19	0.20	0.49	0.28	0.69
Geothermal	Consulting & Related Services	0.52	1.13	0.89	0.13	2.79	0.64	0.58	0.64	1.56	0.85	2.08
Geothermal	Manufacture and Supply of Specialist Equipment	0.86	1.90	1.57	0.21	4.60	1.10	0.95	1.06	2.62	1.52	3.70
Geothermal	Suppliers of Systems	1.15	2.49	2.03	0.29	6.10	1.44	1.25	1.41	3.46	1.97	4.72
Geothermal	Whole Systems Manufacture	0.83	1.88	1.54	0.21	4.74	1.05	0.91	1.01	2.73	1.49	3.51
Photovoltaic	Other Related Equipment and Chemicals	0.49	1.09	0.86	0.12	2.62	0.61	0.54	0.61	1.55	0.84	1.99
Photovoltaic	Photovoltaic Cells	0.53	1.05	0.89	0.13	2.69	0.70	0.56	0.63	1.55	0.85	2.16
Photovoltaic	Systems & Equipment	1.04	2.32	1.87	0.27	5.82	1.38	1.14	1.31	3.31	1.83	4.30
Wind	Large Wind Turbine	1.40	3.06	2.45	0.35	7.52	1.74	1.54	1.71	4.22	2.39	5.77
Wind	Small Wind Turbine	1.06	2.36	1.83	0.27	5.52	1.35	1.13	1.33	3.27	1.76	4.23
Wind	Wind Farm Systems	1.34	2.84	2.28	0.34	6.79	1.66	1.47	1.67	4.11	2.22	5.35

At Level 3 greater levels of detail are created that reveal more niche export markets, i.e. Other Bio Fuels to Pakistan, Large Wind Turbine to India, Taiwan and Thailand, Alternative Fuels (Main Stream for Vehicles Only) to Pakistan and Water Treatment and Distribution to China.

Table 28b: London's Level 3 Exports by Country for 2019/20 in £m - Carbon Finance Excluded

Level 2	Level 3	Indonesia	Italy	Japan	Malaysia	Mexico	Netherlands	Pakistan	Poland	Portugal	Romania	Russia
Recovery and Recycling	Waste Collection	0.41	0.46	0.50	1.03	0.25	0.60	1.59	0.97	0.41	0.62	0.46
Waste Management	Construction & Operation of Waste Treatment Facilities	0.37	0.42	0.46	0.91	0.22	0.54	1.39	0.89	0.38	0.54	0.42
Waste Management	Equipment For Waste Treatment	0.44	0.49	0.54	1.10	0.26	0.64	1.72	1.06	0.43	0.62	0.50
Water & Waste Water Treatment	Engineering	0.28	0.31	0.35	0.70	0.17	0.43	1.03	0.68	0.29	0.42	0.31
Water & Waste Water Treatment	Water Treatment and Distribution	1.02	1.10	1.23	2.49	0.61	1.46	3.78	2.41	1.02	1.46	1.15
Alternative Fuel Vehicle	Alternative Fuels (main Stream) for Vehicles Only	1.16	1.32	1.47	2.92	0.70	1.75	4.54	2.77	1.15	1.77	1.34
Alternative Fuel Vehicle	Other Fuels and Vehicles	0.39	0.42	0.48	0.96	0.22	0.56	1.47	0.92	0.39	0.61	0.43
Alternative Fuels	Main Stream Bio Fuels	0.61	0.62	0.76	1.49	0.34	0.88	2.39	1.41	0.61	0.91	0.70
Alternative Fuels	Other Bio Fuels	1.66	1.82	1.95	4.14	0.96	2.38	6.53	3.71	1.58	2.30	2.00
Alternative Fuels	Other Fuels	0.22	0.22	0.24	0.51	0.13	0.30	0.80	0.51	0.20	0.32	0.22
Building Technologies	Doors	0.66	0.74	0.83	1.68	0.42	0.99	2.57	1.59	0.70	1.01	0.76
Building Technologies	Insulation and Heat Retention Materials	0.44	0.47	0.53	1.06	0.27	0.64	1.65	1.05	0.43	0.65	0.50
Building Technologies	Monitoring and Control Systems	0.54	0.59	0.65	1.31	0.33	0.78	2.07	1.26	0.54	0.78	0.62
Building Technologies	Windows	1.11	1.21	1.41	2.70	0.67	1.58	4.24	2.55	1.15	1.65	1.29
Biomass	Biomass Energy Systems	0.67	0.68	0.83	1.67	0.38	0.97	2.49	1.56	0.65	0.98	0.71
Biomass	Boilers and related Systems	0.44	0.49	0.55	1.12	0.27	0.64	1.69	1.08	0.46	0.66	0.52
Biomass	Manufacturing Of Boilers and Related Systems	0.15	0.17	0.20	0.40	0.10	0.23	0.61	0.39	0.16	0.25	0.19
Geothermal	Consulting & Related Services	0.52	0.56	0.62	1.29	0.31	0.74	1.96	1.22	0.52	0.76	0.57
Geothermal	Manufacture and Supply of Specialist Equipment	0.89	0.95	1.05	2.03	0.52	1.26	3.28	2.05	0.85	1.22	0.98
Geothermal	Suppliers of Systems	1.14	1.23	1.38	2.75	0.70	1.63	4.13	2.63	1.13	1.66	1.27
Geothermal	Whole Systems Manufacture	0.93	0.96	1.11	2.03	0.52	1.21	3.29	1.97	0.85	1.32	0.95
Photovoltaic	Other Related Equipment and Chemicals	0.51	0.54	0.58	1.20	0.30	0.71	1.88	1.16	0.48	0.71	0.55
Photovoltaic	Photovoltaic Cells	0.53	0.53	0.62	1.22	0.30	0.75	1.96	1.16	0.53	0.77	0.56
Photovoltaic	Systems & Equipment	1.03	1.16	1.31	2.63	0.64	1.54	3.97	2.39	1.07	1.52	1.19
Wind	Large Wind Turbine	1.37	1.46	1.69	3.37	0.81	2.03	5.32	3.32	1.36	2.04	1.59
Wind	Small Wind Turbine	1.07	1.14	1.32	2.56	0.64	1.51	3.86	2.49	1.08	1.55	1.21
Wind	Wind Farm Systems	1.29	1.40	1.62	3.17	0.79	1.92	4.84	3.04	1.29	1.92	1.51

Table 28c: London's Level 3 Exports by Country for 2019/20 in £m – Carbon Finance Excluded

Level 2	Level 3	Saudi Arabia	Singapore	South Africa	South Korea	Sweden	Taiwan	Thailand	Turkey	UAE	US
Recovery and Recycling	Waste Collection	1.15	0.90	0.46	0.51	0.31	1.60	1.67	0.99	0.88	0.32
Waste Management	Construction & Operation of Waste Treatment Facilities	1.05	0.84	0.42	0.45	0.28	1.43	1.42	0.92	0.81	0.29
Waste Management	Equipment For Waste Treatment	1.18	1.02	0.49	0.53	0.33	1.64	1.74	1.03	0.94	0.34
Water & Waste Water Treatment	Engineering	0.79	0.64	0.31	0.34	0.21	1.09	1.09	0.67	0.58	0.23
Water & Waste Water Treatment	Water Treatment and Distribution	2.83	2.28	1.14	1.25	0.77	3.95	3.85	2.41	2.13	0.81
Alternative Fuel Vehicle	Alternative Fuels (main Stream) for Vehicles Only	3.27	2.71	1.35	1.47	0.87	4.65	4.61	2.86	2.51	0.97
Alternative Fuel Vehicle	Other Fuels and Vehicles	1.08	0.86	0.43	0.46	0.29	1.49	1.45	0.92	0.87	0.32
Alternative Fuels	Main Stream Bio Fuels	1.75	1.39	0.68	0.75	0.45	2.34	2.30	1.45	1.30	0.47
Alternative Fuels	Other Bio Fuels	4.49	3.66	1.78	1.97	1.23	6.10	5.99	3.72	3.36	1.28
Alternative Fuels	Other Fuels	0.62	0.45	0.23	0.25	0.16	0.76	0.73	0.52	0.45	0.17
Building Technologies	Doors	1.90	1.52	0.77	0.84	0.51	2.65	2.63	1.54	1.45	0.53
Building Technologies	Insulation and Heat Retention Materials	1.23	1.01	0.47	0.53	0.34	1.70	1.69	1.07	0.93	0.36
Building Technologies	Monitoring and Control Systems	1.52	1.20	0.61	0.66	0.41	2.14	2.06	1.32	1.15	0.43
Building Technologies	Windows	3.06	2.45	1.23	1.36	0.83	4.40	4.43	2.59	2.37	0.89
Biomass	Biomass Energy Systems	1.79	1.54	0.76	0.77	0.53	2.51	2.46	1.58	1.39	0.53
Biomass	Boilers and related Systems	1.26	0.99	0.49	0.54	0.35	1.72	1.72	1.06	0.98	0.36
Biomass	Manufacturing Of Boilers and Related Systems	0.47	0.37	0.18	0.20	0.12	0.63	0.61	0.39	0.33	0.13
Geothermal	Consulting & Related Services	1.37	1.14	0.58	0.61	0.39	2.02	1.91	1.21	1.09	0.40
Geothermal	Manufacture and Supply of Specialist Equipment	2.42	1.88	0.96	1.05	0.64	3.33	3.35	2.17	1.81	0.67
Geothermal	Suppliers of Systems	3.16	2.58	1.26	1.36	0.89	4.48	4.44	2.71	2.46	0.91
Geothermal	Whole Systems Manufacture	2.32	1.94	0.96	1.00	0.68	3.53	3.36	2.18	1.79	0.69
Photovoltaic	Other Related Equipment and Chemicals	1.38	1.08	0.53	0.58	0.38	1.95	1.89	1.19	1.06	0.39
Photovoltaic	Photovoltaic Cells	1.35	1.19	0.57	0.58	0.37	1.92	1.91	1.25	1.06	0.39
Photovoltaic	Systems & Equipment	2.99	2.38	1.17	1.23	0.79	4.21	4.05	2.56	2.26	0.84
Wind	Large Wind Turbine	3.81	3.16	1.53	1.70	1.03	5.43	5.19	3.44	2.98	1.09
Wind	Small Wind Turbine	3.05	2.42	1.15	1.31	0.77	3.93	3.87	2.50	2.22	0.80
Wind	Wind Farm Systems	3.59	2.93	1.47	1.60	0.97	5.29	4.88	3.19	2.83	1.04

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 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.	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. 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		

Appendix 4 - London's LCEGS by Occupation - New analysis for informing intelligence and future research

In this section we look at the existing skills represented within London, by using the number of employees listed in accordance with Standard Occupational Classification 2020 Index as a proxy for skills. This analysis is then repeated for additional employee skills, where they are identified as highly skilled and relevant to the sector, but not well defined by the SOC classification. Data will then be overlaid with demand mapping in the Demand Analysis section in Appendix 5.

Table 1: London's LCEGS Skills/Occupations, measured as Job Descriptions with growth 2018/19 to 2020/21 – LCEGS Sector Table – SOC Classification

Skill	LCEGS Sector Totals				
	2018/19	Growth %	2019/20	Growth %	2020/21
Technicians	19,472	17.7%	22,917	-9.7%	20,699
Snr Management SME	9,996	17.3%	11,730	-9.6%	10,609
Supervisory	10,120	18.2%	11,960	-11.7%	10,566
Middle / Junior Management	9,987	19.0%	11,883	-10.8%	10,598
Designer / Developer	8,702	21.8%	10,599	-8.7%	9,679
Clerical	5,230	18.9%	6,216	-10.7%	5,548
Self Employed	8,169	22.1%	9,972	-11.2%	8,855
Advisor or Agent	2,504	19.0%	2,978	-11.8%	2,626
Educator	1,525	43.8%	2,193	-28.1%	1,578
Specialist or Consultant	9,490	21.8%	11,556	-10.5%	10,338
Editor	1,370	15.9%	1,588	-11.7%	1,401
Industrial Researchers	3,007	16.6%	3,508	-14.2%	3,010
Scientist	3,498	14.9%	4,018	-14.4%	3,440
Maintenance Engineer	18,101	23.4%	22,333	-9.8%	20,147
Civil Engineer	5,368	20.8%	6,483	-8.0%	5,962
Production Engineer	10,400	18.1%	12,284	-10.4%	11,011
Power distribution Engineer	8,450	23.1%	10,401	-9.3%	9,433
Construction Engineer	6,091	20.8%	7,360	-9.6%	6,653
Sales Exec	5,703	14.6%	6,535	-12.7%	5,702
Marketing Personnel	4,947	15.1%	5,692	-13.0%	4,953
General Semi Skilled Worker	15,610	19.9%	18,712	-11.8%	16,499
General Labour	23,060	16.2%	26,786	-11.0%	23,844
Other Employees	14,842	17.9%	17,502	-9.3%	15,883
Administrative workers	8,341	19.5%	9,967	-11.1%	8,856
Total Number of Employees	**213,981**	**19.3%**	**255,173**	**-10.7%**	**227,889**

Skills by SOC Classification

Table 1 shows the number of employees within each Standard Occupational Class for the whole LCEGS sector, per year.

Due to the varied nature of the LCEGS sector, which draws from many more traditional sectors, such as Engineering, Construction and many others, a decrease in employee numbers from year to year can be a result of employees working within the same company, but moving to a different sector. An example would be a company engineering components within both the Wind sub-sector and Automotive sector, where one year the company services more Wind than Automotive contracts, the employee numbers would count more Wind employees; the following year the company services more Automotive contracts than Wind contracts, resulting in an apparent reduction in the number of employees for the Wind sector, which is true with regards to those working *within the LCEGS Sector* but it does not necessarily follow that they are job losses within companies themselves.

The decrease in employment numbers between 2019/20 and 2020/21 are not a reflection of normal employment fluctuation within the sector, but due to wider economic contraction across the UK predominantly as a consequence of the Covid-19 Pandemic.

KMatrix

Table 2 shows the number of employees within each standard Occupational Class for the Level 1 sub-sectors.

Table 2: London's LCEGS Skills/Occupations, measured as Job Descriptions with growth 2018/19 to 2020/21 – Level 1 – SOC Classification

	Low Carbon					Renewable Energy					Environmental				
Skill	2018/19	Growth %	2019/20	Growth %	2020/21	2018/19	Growth %	2019/20	Growth %	2020/21	2018/19	Growth %	2019/20	Growth %	2020/21
Technicians	9,413	22.0%	11,482	-6.0%	10,797	6,279	16.3%	7,300	-11.6%	6,456	3,780	9.4%	4,135	-16.7%	3,447
Snr Management SME	4,936	21.2%	5,980	-5.8%	5,633	3,310	15.7%	3,829	-11.8%	3,377	1,750	9.8%	1,920	-16.8%	1,598
Supervisory	4,979	22.5%	6,098	-10.0%	5,486	3,264	16.4%	3,801	-11.4%	3,366	1,878	9.8%	2,061	-16.8%	1,714
Middle / Junior Management	4,863	24.3%	6,044	-8.2%	5,548	3,254	16.6%	3,794	-11.7%	3,350	1,870	9.4%	2,045	-16.9%	1,701
Designer / Developer	5,171	27.4%	6,586	-5.4%	6,233	1,703	17.0%	1,992	-11.8%	1,758	1,829	10.5%	2,020	-16.5%	1,688
Clerical	2,554	24.3%	3,174	-8.1%	2,916	1,715	16.1%	1,990	-11.7%	1,757	961	9.4%	1,052	-16.8%	875
Self Employed	4,914	27.7%	6,277	-9.4%	5,685	1,738	17.0%	2,034	-12.0%	1,790	1,517	9.6%	1,662	-17.0%	1,379
Advisor or Agent	1,148	23.0%	1,411	-11.1%	1,254	949	17.9%	1,119	-10.8%	998	407	10.0%	448	-16.6%	373
Educator	504	27.8%	644	-21.3%	507	954	54.5%	1,474	-31.8%	1,006	68	11.3%	75	-14.0%	65
Specialist or Consultant	5,681	27.4%	7,237	-8.7%	6,605	2,133	15.6%	2,465	-11.2%	2,188	1,676	10.7%	1,855	-16.7%	1,544
Editor	593	15.5%	685	-11.2%	609	533	19.0%	635	-10.3%	570	243	10.1%	268	-16.7%	223
Industrial Researchers	1,822	19.0%	2,168	-14.5%	1,852	683	15.2%	787	-11.8%	694	503	10.1%	554	-16.3%	464
Scientist	2,137	15.2%	2,462	-15.3%	2,085	853	16.6%	995	-11.0%	885	507	10.6%	561	-16.3%	470
Maintenance Engineer	9,294	32.8%	12,346	-6.6%	11,529	5,165	16.2%	6,001	-11.6%	5,307	3,641	9.5%	3,986	-17.0%	3,310
Civil Engineer	2,851	27.6%	3,639	-3.7%	3,505	1,267	16.4%	1,474	-10.8%	1,314	1,250	9.7%	1,371	-16.6%	1,143
Production Engineer	4,972	23.1%	6,119	-7.4%	5,667	3,533	15.8%	4,092	-11.3%	3,629	1,895	9.4%	2,073	-17.3%	1,715
Power distribution Engineer	4,391	32.1%	5,801	-5.7%	5,471	2,276	16.5%	2,651	-11.5%	2,345	1,783	9.3%	1,949	-17.0%	1,617
Construction Engineer	3,025	28.7%	3,892	-5.8%	3,664	1,567	16.3%	1,822	-11.1%	1,620	1,499	9.8%	1,646	-16.8%	1,369
Sales Exec	2,324	14.0%	2,649	-11.8%	2,335	2,096	17.6%	2,465	-11.5%	2,182	1,283	10.7%	1,421	-16.6%	1,184
Marketing Personnel	2,117	14.9%	2,433	-12.9%	2,119	1,831	17.7%	2,156	-11.4%	1,909	1,000	10.4%	1,104	-16.2%	925
General Semi Skilled Worker	7,763	26.5%	9,824	-10.3%	8,809	4,405	15.9%	5,104	-11.3%	4,529	3,441	10.0%	3,784	-16.5%	3,161
General Labour	9,626	20.1%	11,562	-8.3%	10,607	8,450	15.5%	9,759	-11.1%	8,672	4,984	9.6%	5,465	-16.5%	4,565
Other Employees	6,764	22.8%	8,309	-4.8%	7,908	5,283	16.1%	6,135	-11.4%	5,438	2,795	9.5%	3,059	-17.1%	2,537
Administrative workers	4,266	25.3%	5,345	-9.1%	4,858	2,408	16.3%	2,800	-11.3%	2,483	1,666	9.3%	1,821	-16.8%	1,515
Total Number of Employees	**106,108**	**24.6%**	**132,166**	**-7.9%**	**121,682**	**65,648**	**16.8%**	**76,671**	**-11.8%**	**67,624**	**42,227**	**9.7%**	**46,336**	**-16.7%**	**38,584**

Growth was strongest between 2018/19 and 2019/20 for Maintenance Engineers and Production Engineers within Low Carbon, Educators within Renewable Energy and Environmental.

Contraction was highest between 2019/20 and 2020/21 for Educators within Low Carbon and Renewable Energy and Production Engineers within Environmental.

The top 11 sub-sectors account for 96% of employment in the LCEGS sector in London. Tables 3a-3d shows the numbers of employees within each standard Occupational Class for the top 11 Level 2 sub-sectors of the LCEGS sector.

Table 3a: London's LCEGS Skills/Occupations, measured as Job Descriptions with growth 2018/19 to 2020/21 – Alternative Fuel Vehicle, Alternative Fuels and Biomass – SOC Classification

Skill	Alternative Fuel Vehicle					Alternative Fuels					Biomass				
	2018/19	Growth %	2019/20	Growth %	2020/21	2018/19	Growth %	2019/20	Growth %	2020/21	2018/19	Growth %	2019/20	Growth %	2020/21
Technicians	656	13.5%	744	-15.3%	631	3,016	10.6%	3,335	-14.7%	2,845	859	16.5%	1,001	-10.6%	895
Snr Management SME	530	15.8%	614	-13.8%	529	1,502	12.4%	1,688	-13.8%	1,455	595	15.6%	688	-12.6%	601
Supervisory	638	14.3%	729	-13.9%	628	1,340	12.7%	1,510	-14.5%	1,292	464	17.0%	542	-11.5%	480
Middle / Junior Management	632	15.8%	732	-14.2%	628	1,345	11.4%	1,498	-14.3%	1,284	464	17.6%	546	-12.2%	479
Designer / Developer	149	11.8%	166	-16.6%	139	352	9.8%	387	-13.8%	333	194	12.6%	218	-13.8%	188
Clerical	324	13.9%	369	-13.9%	318	685	14.3%	783	-14.4%	670	251	16.1%	292	-12.3%	256
Self Employed	216	17.8%	255	-12.7%	223	578	12.6%	651	-17.6%	537	131	12.0%	147	-14.8%	125
Advisor or Agent	44	14.2%	50	-15.9%	42	2	16.6%	2	-13.6%	2	35	13.9%	40	-14.0%	34
Educator	21	41.5%	30	-37.7%	19	147	56.5%	230	-32.2%	156	159	54.0%	245	-32.1%	166
Specialist or Consultant	459	12.4%	516	-16.1%	433	446	12.6%	502	-12.5%	439	356	14.5%	407	-13.0%	354
Editor	0	0.0%	0	0.0%	0	9	19.7%	11	-6.4%	10	41	13.7%	47	-13.8%	40
Industrial Researchers	281	11.4%	313	-16.3%	262	277	10.4%	306	-14.3%	262	38	11.3%	42	-15.3%	35
Scientist	485	11.6%	542	-15.7%	456	62	16.2%	72	-13.6%	62	81	13.2%	91	-13.5%	79
Maintenance Engineer	845	15.3%	975	-14.2%	836	1,573	14.8%	1,806	-16.2%	1,512	466	17.6%	548	-12.0%	483
Civil Engineer	9	14.6%	10	-19.0%	8	254	11.3%	283	-18.4%	231	47	12.8%	53	-13.9%	46
Production Engineer	417	13.3%	473	-17.6%	390	1,074	14.4%	1,228	-17.3%	1,016	563	17.1%	659	-9.6%	596
Power distribution Engineer	112	14.1%	128	-17.5%	106	856	14.0%	976	-17.1%	809	220	17.2%	258	-11.0%	229
Construction Engineer	9	12.7%	10	-16.8%	8	497	12.5%	559	-16.2%	469	41	12.9%	46	-14.3%	39
Sales Exec	728	16.2%	846	-12.4%	741	741	11.5%	827	-12.4%	725	243	16.2%	283	-11.5%	250
Marketing Personnel	735	15.7%	850	-13.7%	734	740	11.1%	822	-14.1%	706	232	16.8%	271	-11.7%	240
General Semi Skilled Worker	846	13.8%	963	-14.0%	828	1,860	13.1%	2,104	-16.1%	1,765	488	16.8%	570	-11.7%	504
General Labour	1,166	14.3%	1,333	-14.1%	1,145	3,453	11.2%	3,842	-13.1%	3,339	1,169	15.5%	1,350	-12.2%	1,185
Other Employees	748	14.0%	853	-14.1%	732	1,741	14.3%	1,990	-15.5%	1,681	691	17.5%	812	-12.5%	711
Administrative workers	436	13.8%	496	-14.2%	425	942	15.1%	1,084	-16.6%	904	271	16.2%	315	-11.9%	277
Total Number of Employees	**10,487**	**14.4%**	**11,996**	**-14.5%**	**10,261**	**23,492**	**12.8%**	**26,495**	**-15.1%**	**22,504**	**8,100**	**16.9%**	**9,472**	**-12.4%**	**8,294**

Table 3b: London's LCEGS Skills/Occupations, measured as Job Descriptions with growth 2018/19 to 2020/21 – Building Technologies, Energy Management and Geothermal – SOC Classification

Skill	Building Technologies					Carbon Finance					Geothermal				
	2018/19	Growth %	2019/20	Growth %	2020/21	2018/19	Growth %	2019/20	Growth %	2020/21	2018/19	Growth %	2019/20	Growth %	2020/21
Technicians	1,224	12.9%	1,383	-13.0%	1,204	3,608	38.8%	5,009	5.3%	5,275	2,564	15.1%	2,952	-12.8%	2,573
Snr Management SME	651	13.7%	740	-13.0%	644	1,813	35.1%	2,449	6.0%	2,595	1,194	14.6%	1,368	-13.8%	1,180
Supervisory	668	13.6%	759	-12.7%	662	1,853	38.7%	2,570	-4.3%	2,461	1,347	15.5%	1,556	-12.7%	1,358
Middle / Junior Management	632	14.0%	720	-13.0%	627	1,782	44.2%	2,570	0.0%	2,571	1,340	15.7%	1,550	-12.9%	1,350
Designer / Developer	1,120	12.1%	1,256	-12.6%	1,098	3,080	38.2%	4,255	-0.6%	4,231	1,095	18.8%	1,301	-11.1%	1,156
Clerical	359	12.7%	404	-12.8%	353	940	43.1%	1,344	0.2%	1,347	689	15.2%	793	-12.5%	694
Self Employed	896	13.2%	1,015	-12.7%	886	2,699	39.9%	3,775	-5.9%	3,553	1,051	17.6%	1,236	-12.0%	1,088
Advisor or Agent	429	13.3%	487	-12.4%	426	528	34.8%	711	-8.9%	648	637	20.0%	764	-9.5%	691
Educator	283	14.1%	323	-13.5%	279	9	26.0%	11	-12.8%	10	479	53.8%	737	-31.2%	507
Specialist or Consultant	1,238	12.8%	1,397	-13.5%	1,209	3,076	40.2%	4,311	-4.9%	4,098	1,064	15.6%	1,230	-10.7%	1,098
Editor	382	13.0%	431	-12.6%	377	113	26.4%	142	-4.0%	137	406	20.9%	491	-9.5%	444
Industrial Researchers	475	13.3%	538	-13.2%	467	680	30.8%	889	-14.7%	759	317	17.2%	371	-10.6%	332
Scientist	713	12.8%	804	-13.0%	699	755	20.2%	908	-17.2%	752	449	18.9%	534	-8.8%	487
Maintenance Engineer	631	15.0%	726	-11.6%	642	5,148	48.1%	7,626	-1.3%	7,526	2,501	15.1%	2,878	-12.6%	2,514
Civil Engineer	276	15.4%	318	-12.0%	280	1,966	34.5%	2,644	0.9%	2,667	859	17.4%	1,009	-10.5%	903
Production Engineer	303	14.1%	346	-11.8%	305	2,686	31.3%	3,526	-0.8%	3,500	1,416	14.6%	1,623	-13.5%	1,403
Power distribution Engineer	312	15.0%	359	-12.2%	315	2,610	45.0%	3,785	-0.2%	3,779	1,105	16.1%	1,284	-12.8%	1,119
Construction Engineer	261	15.3%	301	-11.6%	266	1,855	39.0%	2,578	-1.0%	2,551	862	16.6%	1,005	-11.6%	889
Sales Exec	405	14.1%	461	-11.6%	408	223	17.7%	263	-4.7%	250	1,161	18.7%	1,378	-11.4%	1,221
Marketing Personnel	302	14.6%	346	-10.5%	309	152	35.5%	206	-5.9%	194	950	18.9%	1,129	-11.8%	996
General Semi Skilled Worker	609	14.4%	696	-11.5%	617	3,649	41.7%	5,172	-6.0%	4,860	2,088	15.2%	2,406	-11.9%	2,120
General Labour	1,084	14.8%	1,244	-11.1%	1,105	2,885	38.5%	3,995	1.5%	4,054	3,506	14.4%	4,011	-11.5%	3,552
Other Employees	778	13.2%	881	-12.5%	771	2,749	36.8%	3,760	7.2%	4,031	2,099	15.4%	2,423	-12.7%	2,116
Administrative workers	536	13.2%	607	-12.1%	534	1,914	39.5%	2,670	-3.1%	2,587	1,091	16.0%	1,265	-11.8%	1,116
Total Number of Employees	**14,567**	**13.6%**	**16,542**	**-12.5%**	**14,482**	**46,771**	**39.3%**	**65,169**	**-1.1%**	**64,433**	**30,268**	**16.6%**	**35,295**	**-12.4%**	**30,907**

Table 3c: London's LCEGS Skills/Occupations, measured as Job Descriptions with growth 2018/19 to 2020/21 – Photovoltaic, Recovery & Recycling and Waste Management – SOC Classification

Skill	Photovoltaic					Recovery & Recycling					Waste Management				
	2018/19	Growth %	2019/20	Growth %	2020/21	2018/19	Growth %	2019/20	Growth %	2020/21	2018/19	Growth %	2019/20	Growth %	2020/21
Technicians	473	15.3%	545	-12.3%	478	970	11.3%	1,080	-15.6%	912	999	8.5%	1,085	-17.0%	900
Snr Management SME	314	15.5%	362	-10.6%	323	470	11.7%	526	-15.9%	442	429	8.9%	467	-17.4%	386
Supervisory	229	14.9%	263	-11.7%	232	498	11.9%	558	-16.2%	467	468	9.0%	510	-16.6%	426
Middle / Junior Management	231	14.7%	265	-12.4%	232	497	11.5%	555	-15.6%	468	467	8.2%	505	-16.9%	420
Designer / Developer	272	14.7%	312	-12.2%	274	798	12.1%	895	-15.9%	753	297	9.4%	324	-17.2%	269
Clerical	142	15.1%	163	-11.8%	144	250	11.4%	279	-15.8%	235	243	8.8%	265	-17.0%	220
Self Employed	169	16.7%	198	-12.4%	173	274	11.5%	305	-15.9%	257	365	8.0%	394	-16.4%	330
Advisor or Agent	208	14.9%	239	-13.4%	207	80	9.7%	87	-16.1%	73	152	10.9%	169	-16.3%	141
Educator	106	50.0%	159	-34.3%	105	2	11.2%	3	-18.5%	2	27	9.1%	29	-11.6%	26
Specialist or Consultant	238	13.4%	270	-12.8%	235	637	12.4%	716	-15.8%	603	289	8.7%	315	-17.6%	259
Editor	51	12.1%	57	-11.0%	51	51	10.4%	56	-15.5%	47	76	10.8%	84	-16.4%	70
Industrial Researchers	272	14.4%	311	-11.8%	274	202	12.0%	227	-16.0%	191	170	9.1%	185	-15.8%	156
Scientist	264	14.9%	303	-13.5%	262	227	11.8%	253	-15.8%	213	147	10.1%	162	-16.0%	136
Maintenance Engineer	325	15.3%	375	-12.4%	328	787	11.9%	881	-16.3%	737	847	8.0%	914	-17.2%	757
Civil Engineer	137	13.2%	155	-12.2%	136	432	11.5%	482	-15.6%	407	237	8.6%	258	-16.8%	214
Production Engineer	138	10.4%	152	-13.0%	132	525	11.9%	587	-16.0%	494	393	8.8%	428	-18.0%	351
Power distribution Engineer	175	14.7%	201	-12.2%	176	460	11.2%	511	-15.1%	434	398	8.2%	431	-17.8%	354
Construction Engineer	145	15.3%	167	-11.6%	148	426	12.0%	477	-16.0%	400	339	8.6%	368	-17.3%	304
Sales Exec	179	13.9%	204	-13.3%	177	655	11.6%	731	-15.8%	616	263	10.9%	292	-16.9%	243
Marketing Personnel	152	15.9%	176	-13.1%	153	458	11.8%	512	-15.5%	433	230	10.1%	253	-16.7%	211
General Semi Skilled Worker	360	16.0%	417	-11.7%	368	1,247	11.5%	1,390	-15.3%	1,177	715	9.0%	779	-16.7%	649
General Labour	798	14.9%	916	-11.4%	812	1,755	11.4%	1,955	-15.3%	1,656	1,177	8.7%	1,279	-16.7%	1,065
Other Employees	336	15.1%	387	-12.0%	340	594	11.4%	662	-16.1%	555	730	8.3%	790	-17.2%	654
Administrative workers	227	15.1%	262	-11.7%	231	459	12.0%	514	-16.1%	432	403	8.7%	438	-17.1%	363
Total Number of Employees	**5,940**	**15.5%**	**6,859**	**-12.6%**	**5,993**	**12,755**	**11.6%**	**14,241**	**-15.7%**	**12,004**	**9,859**	**8.8%**	**10,722**	**-17.0%**	**8,903**

Table 3d: London's LCEGS Skills/Occupations, measured as Job Descriptions with growth 2018/19 to 2020/21 – Water & Waste Water Treatment and Wind – SOC Classification

Skill	Water & Waste Water Treatment					Wind				
	2018/19	Growth %	2019/20	Growth %	2020/21	2018/19	Growth %	2019/20	Growth %	2020/21
Technicians	1,547	8.8%	1,682	-17.1%	1,395	2,184	18.3%	2,585	-9.9%	2,329
Snr Management SME	731	9.0%	797	-16.9%	662	1,117	17.5%	1,312	-9.2%	1,191
Supervisory	765	8.9%	834	-17.4%	688	1,138	18.0%	1,343	-9.5%	1,216
Middle / Junior Management	765	8.7%	831	-17.7%	684	1,131	18.2%	1,336	-9.6%	1,208
Designer / Developer	593	9.0%	647	-16.6%	539	102	14.9%	118	-11.7%	104
Clerical	392	8.4%	425	-17.3%	351	587	17.9%	692	-10.1%	622
Self Employed	739	9.5%	809	-17.7%	666	339	18.3%	401	-9.9%	361
Advisor or Agent	71	7.6%	76	-16.1%	64	50	10.8%	56	-12.8%	49
Educator	3	6.5%	3	-17.2%	2	193	59.5%	308	-31.2%	212
Specialist or Consultant	615	9.9%	676	-17.3%	559	436	17.9%	514	-9.7%	465
Editor	47	8.1%	51	-17.6%	42	27	14.1%	31	-13.0%	27
Industrial Researchers	65	7.2%	70	-17.4%	58	30	10.8%	33	-15.0%	28
Scientist	50	7.9%	54	-17.5%	44	43	12.3%	48	-14.2%	42
Maintenance Engineer	1,748	9.1%	1,907	-17.1%	1,581	1,748	18.0%	2,063	-9.4%	1,870
Civil Engineer	480	8.7%	522	-17.3%	432	192	15.8%	222	-9.6%	201
Production Engineer	850	8.1%	919	-17.7%	756	1,341	17.4%	1,575	-9.2%	1,430
Power distribution Engineer	812	8.7%	883	-17.7%	727	712	17.8%	838	-9.2%	761
Construction Engineer	635	9.0%	692	-17.1%	573	473	17.1%	554	-9.3%	502
Sales Exec	227	8.9%	248	-18.4%	202	458	17.8%	540	-10.2%	485
Marketing Personnel	204	8.2%	221	-16.5%	185	447	17.2%	523	-9.4%	474
General Semi Skilled Worker	1,265	9.1%	1,380	-17.3%	1,141	1,339	17.1%	1,568	-9.4%	1,420
General Labour	1,690	8.6%	1,836	-17.4%	1,517	2,742	17.6%	3,225	-9.8%	2,910
Other Employees	1,255	9.2%	1,370	-17.5%	1,131	2,033	17.0%	2,378	-9.2%	2,159
Administrative workers	676	7.8%	729	-17.1%	604	751	17.7%	884	-9.8%	797
Total Number of Employees	**16,226**	**8.8%**	**17,661**	**-17.3%**	**14,604**	**19,613**	**18.0%**	**23,148**	**-9.9%**	**20,863**

Again, a similar pattern is seen in the Level 2 figures as for those in Level 1. At Level 1, the numbers do give an indication of the relative scale of different employment levels between sub-sectors in the different occupational classes. Contraction in employee numbers between 2019/20 and 2020/21 varies between Level 2 sub-sectors as the chains and networks of supply were unevenly affected by the economic impact of Covid-19 during 2020/21.

Skills by Additional Skills/Occupations Classification

Table 4: London's LCEGS Skills/Occupations, measured as Job Descriptions with growth 2018/19 to 2020/21 – LCEGS Sector Table – Additional Skills/Occupations Classification

| Additional Skill | LCEGS Sector Totals | | | | |
	2018/19	Growth %	2019/20	Growth %	2020/21
Installers	11,876	20.0%	14,257	-8.7%	13,014
Multi Engineers	11,981	19.6%	14,333	-10.5%	12,830
Specialist Engineer	13,848	19.5%	16,543	-13.3%	14,341

Table 4 shows the number of employees within the Additional Skills/ Occupations Classification for the LCEGS sector as a whole, per year. Again the Occupations were used as a proxy for skills.

Growth was similar across the different Additional Skills/Occupations groups between 2018/19 and 2019/20.

While contraction between 2019/20 and 2020/21 was similar across the Additional Skills/Occupations groups with the greatest contraction seen for Specialist Engineers and the lowest for installers.

Table 5 shows the number of employees within each Additional Skill group for the Level 1 sub-sectors.

Table 5: London's LCEGS Skills/Occupations, measured as Job Descriptions with growth 2018/19 to 2020/21 – Level 1 – Additional Skills/Occupations Classification

| Skill | Low Carbon | | | | | Renewable Energy | | | | | Environmental | | | | |
	2018/19	Growth %	2019/20	Growth %	2020/21	2018/19	Growth %	2019/20	Growth %	2020/21	2018/19	Growth %	2019/20	Growth %	2020/21
Installers	6,957	25.0%	8,697	-5.0%	8,258	2,952	15.9%	3,421	-12.7%	2,986	1,968	8.7%	2,138	-17.2%	1,770
Multi Engineers	6,916	24.5%	8,611	-8.5%	7,875	3,314	15.1%	3,813	-11.7%	3,366	1,751	9.0%	1,909	-16.8%	1,588
Specialist Engineer	8,304	23.7%	10,270	-13.2%	8,910	3,859	15.3%	4,450	-12.2%	3,907	1,685	8.2%	1,823	-16.4%	1,524
Adaptive Process Engineer	8,995	32.2%	11,887	-7.3%	11,023	7,330	16.3%	8,524	-11.7%	7,529	2,886	8.6%	3,135	-17.4%	2,591
Total Number of Employees	**31,172**	**26.6%**	**39,465**	**-8.6%**	**36,066**	**17,455**	**15.8%**	**20,209**	**-12.0%**	**17,788**	**8,290**	**8.6%**	**9,006**	**-17.0%**	**7,473**

Growth was strongest between 2018/19 and 2019/20 in Adaptive Process Engineers in both the Low Carbon and Renewable Energy sub-sectors and for Multi Engineers in the Environmental sub-sector.

Contraction in the three Level 1 sub-sectors was greatest between 2019/20 and 2020/21 for Specialist Engineers for Low Carbon, Installers for Renewable Energy and Adaptive Process Engineers for Environmental.

The top 11 sub-sectors account for 96% of employment in the LCEGS sector in London. Tables 6a-6d shows the numbers of employees within each Additional Skills/Occupations Classification for the top 11 Level 2 sub-sectors of the LCEGS sector.

Table 6a: London's LCEGS Skills/Occupations, measured as Job Descriptions with growth 2018/19 to 2020/21 – Alternative Fuel Vehicle, Alternative Fuels and Biomass – Additional Skills/Occupations Classification

	Alternative Fuel Vehicle					Alternative Fuels					Biomass				
		Growth		Growth			Growth		Growth			Growth		Growth	
Skill	2018/19	%	2019/20	%	2020/21	2018/19	%	2019/20	%	2020/21	2018/19	%	2019/20	%	2020/21
Installers	0	0.0%	0	0.0%	0	2,712	11.4%	3,020	-16.3%	2,527	413	15.6%	477	-11.6%	421
Multi Engineers	178	9.3%	194	-15.4%	164	1,188	14.2%	1,357	-15.8%	1,142	384	16.9%	449	-10.7%	401
Specialist Engineer	577	12.0%	646	-15.8%	544	1,061	14.3%	1,213	-15.7%	1,022	557	15.5%	643	-10.4%	576
Adaptive Process Engineer	0	0.0%	0	0.0%	0	2,692	17.1%	3,152	-13.0%	2,743	1,446	17.3%	1,697	-11.0%	1,510
Total Number of Employees	**755**	**11.4%**	**840**	**-15.7%**	**708**	**7,653**	**14.2%**	**8,743**	**-15.0%**	**7,434**	**2,800**	**16.7%**	**3,267**	**-11.0%**	**2,909**

Table 6b: London's LCEGS Skills/Occupations, measured as Job Descriptions with growth 2018/19 to 2020/21 – Building Technologies, Carbon Finance and Geothermal – Additional Skills/Occupations Classification

	Building Technologies					Carbon Finance					Geothermal				
		Growth		Growth			Growth		Growth			Growth		Growth	
Skill	2018/19	%	2019/20	%	2020/21	2018/19	%	2019/20	%	2020/21	2018/19	%	2019/20	%	2020/21
Installers	448	16.1%	520	-10.9%	464	3,180	40.7%	4,473	5.0%	4,697	1,282	15.2%	1,476	-14.7%	1,258
Multi Engineers	851	13.4%	964	-13.2%	837	4,104	32.5%	5,437	-4.7%	5,179	1,067	12.2%	1,197	-13.6%	1,034
Specialist Engineer	1,134	13.3%	1,285	-12.8%	1,120	4,945	30.9%	6,474	-12.3%	5,676	1,101	13.5%	1,249	-14.5%	1,068
Adaptive Process Engineer	449	13.2%	508	-12.9%	443	5,004	45.6%	7,284	-3.3%	7,047	2,393	12.9%	2,702	-14.6%	2,309
Total Number of Employees	**2,882**	**13.7%**	**3,278**	**-12.6%**	**2,864**	**17,233**	**37.3%**	**23,668**	**-4.5%**	**22,599**	**5,843**	**13.4%**	**6,624**	**-14.4%**	**5,669**

Table 6c: London's LCEGS Skills/Occupations, measured as Job Descriptions with growth 2018/19 to 2020/21 – Photovoltaic, Recovery & Recycling and Waste Management – Additional Skills/Occupations Classification

Skill	Photovoltaic 2018/19	Growth %	2019/20	Growth %	2020/21	Recovery & Recycling 2018/19	Growth %	2019/20	Growth %	2020/21	Waste Management 2018/19	Growth %	2019/20	Growth %	2020/21
Installers	325	17.0%	381	-10.7%	340	94	12.8%	106	-16.1%	89	676	7.9%	730	-17.7%	601
Multi Engineers	656	14.6%	752	-12.9%	655	119	10.9%	132	-15.9%	111	615	8.5%	667	-17.3%	552
Specialist Engineer	888	13.9%	1,012	-13.6%	874	147	10.7%	163	-16.3%	136	609	7.9%	657	-16.3%	550
Adaptive Process Engineer	231	11.6%	258	-14.7%	221	325	11.6%	362	-16.7%	302	744	7.9%	803	-18.4%	655
Total Number of Employees	**2,101**	**14.4%**	**2,402**	**-13.0%**	**2,089**	**685**	**11.4%**	**763**	**-16.4%**	**638**	**2,645**	**8.0%**	**2,857**	**-17.5%**	**2,357**

Table 6d: London's LCEGS Skills/Occupations, measured as Job Descriptions with growth 2018/19 to 2020/21 – Water & Waste Water Treatment and Wind – Additional Skills/Occupations Classification

Skill	Water & Waste Water Treatment 2018/19	Growth %	2019/20	Growth %	2020/21	Wind 2018/19	Growth %	2019/20	Growth %	2020/21
Installers	1,086	8.7%	1,181	-17.0%	980	774	18.0%	914	-10.0%	823
Multi Engineers	861	9.0%	938	-16.5%	783	1,111	17.9%	1,310	-9.2%	1,190
Specialist Engineer	748	7.5%	804	-16.3%	673	1,223	18.3%	1,446	-9.8%	1,305
Adaptive Process Engineer	1,642	8.4%	1,779	-17.1%	1,474	3,090	19.1%	3,682	-9.4%	3,336
Total Number of Employees	**4,337**	**8.4%**	**4,703**	**-16.8%**	**3,910**	**6,198**	**18.6%**	**7,352**	**-9.5%**	**6,654**

Appendix 5 - London's LCEGS Demand Analysis - New analysis for informing intelligence and future research

This section provides data and analysis regarding demand analysis, there are three sub-sections:
- Current employment and growth required for 2030 and 2050 net zero targets
- Current training provision and potential for upskilling of the current workforce within each Level 2 sub-sector
- Potential of Level 2 sub-sectors to impact on CO2 reduction

Current employment, skills gaps and forecasts for employment needed to get to net zero in 2030 and 2050

In this section we explore the current levels of employment, per Standard Occupational Classification, identifying skills gaps that are present in the sector and sub-sectors, and then estimate the skills requirements in employees needed to achieve net zero targets for 2030 and 2050. This is then repeated for additional skills/occupations identified as highly skilled and relevant to the sector, but not well defined by the SOC classification.

Forecasts for skills within the context of Net zero 2030 and 2050 targets are triangulated from industry forecasts, which are informed by policy targets, during their forecasting process. As such, additional scenarios or assumptions have not been overlaid within this study, to avoid multiple-allocation of increased scaling of the workforce. They are regionally focused and represent the employment specifically within the LCEGS sector expected to be required for the region to reach net zero by 2030 or 2050. Additional policy, such as large infrastructure projects have not been applied to these forecasts, rather they are a baseline of expected growth required within the LCEGS sector workforce, to deliver products and services to the wider economy, for which LCEGS-specific activities will be relevant.

The employment figures relate to those employed within the LCEGS sector, who are providing the goods and services to the wider economy to reach net zero, they do not include employees, such as sustainability officers from sectors within the wider economy, who then apply them in their own companies.

It is difficult to untangle the impact of Covid and the impact of Brexit on the LCEGS sector and for the purposes of this study, we have not attempted to do so. Although there has been support for business during the pandemic, many people and businesses have postponed work. There is a large section of the LCEGS sector that will always function, for example waste will be collected, water purified, electricity produced etc. Unfortunately, much of the innovation and market development activity in the sector can and has been postponed until there is more certainty in the market. It is anticipated that the sector will bounce back as restrictions are lifted, particularly with not just the political will, but more so the social and environmental emphasis around the need to tackle climate change and get to net zero.

Due to the uncertainty surrounding the current and future economic performance of the UK (and global) economy, the forecasting estimates have been produced on a best case vs. worst case scenario basis:

Timeline for Net Zero	Implications of Covid-19 and Brexit
Net Zero 2030	Best-Case Scenario Economic Recovery
	Worst-Case Scenario Economic Recovery
Net Zero 2050	Best-Case Scenario Economic Recovery
	Worst-Case Scenario Economic Recovery

Worst-case scenario refers to a situation with the economy being slow to recover, with slow growth and therefore slow recovery of the LCEGS sector. Best-case scenario refers to a situation where the economy 'bounces' back, with strong growth and rapid recovery in the LCEGS sector.

Worst-case scenario refers to a situation with the economy being slow to recover, with slow growth and therefore slow recovery of the LCEGS sector. Best-case scenario refers to a situation where the economy 'bounces' back, with strong growth and rapid recovery in the LCEGS sector. As such, the forecasts for best-case and worst-case can be viewed as a potential growth range, i.e., forecast employment in LCEGS for regional 2030 net zero targets ranges from 334,507 to 435,589, depending on the strength and growth of the wider economy.

Whilst initially counter-intuitive, the number of employees required to reach net zero will be larger in a best-case scenario than in a worst-case scenario, as the effort required to decarbonize will increase with the expansion of the whole economy.

The growth forecasts for both 2030 and 2050 begin with the same baseline employment figures for 2019/20, illustrated by the same dark blue base layer in the diagram:

Growth in the whole economy is the largest factor on employment growth for LCEGS

2030 regional net zero targets
Forecast LCEGS employment ranges between:
334,507 - 435,589

'Additional' for Net Zero: refers to new LCEGS employment needed to reach regional net zero targets.

There are on top of 'normal' sectoral growth and influenced by:
• new technologies
• technology compression
• changes in practice

2030 total 435,589 (BC)
'Additional' for Net Zero
'normal' LCEGS growth (10 years)

2030 total 334,507 (WC)
'Additional' for Net Zero
'normal' LCEGS growth
LCEGS Employees 2019/20 (255,173)

2050 regional net zero targets
Forecast LCEGS employment range:
517,884 - 1,222,806

2050 total 1,222,806 (BC)
'Additional' for Net Zero

Extra 20 years 'normal' growth

2050 total 517,884 (WC)
'Additional' for Net Zero
'normal' LCEGS growth
LCEGS Employees 2019/20 (255,173)

'normal' LCEGS growth (30 years)

LCEGS expected to generate up to 967,633 new jobs in London, between now and 2050

WC = Worst Case (weak) and BC = Best Case (strong) UK economic recovery
WC and BC forecasts represent total LCEGS employment ranges

On top of that, the normal growth in the sector that will increase between 2020 and 2030 or 2050 sits on top of that base and has the greatest effect on the growth of the employment numbers. The effect of normal sector growth is more significant for the 2050 target than the 2030 target due to an additional 20 years of normal growth. The extent of growth is determined by whether the UK economy as a whole bounces back from 2020 or takes more time.

On top of that initial employment growth there is also additional employment required to develop the sector's capacity to achieve net zero. In this diagram, the additional employment section is sized the same for both targets. This is to emphasise that to reach net zero by 2030 would require *relatively* more people with less technology, whereas by 2050, the combination of streamlined processes, new technologies, technology compression and changes in working practices are likely to lead to a situation requiring *relatively* fewer people combined with improved technology and processes. In addition, whilst the transition to net zero will create significant jobs within the LCEGS sector in London, it will also create many jobs in traditional 'non-LCEGS' sectors, such as construction of large infrastructure projects, which are not captured here.

In essence, most of the employment growth is likely to be a consequence of traditional sector growth, resulting in a higher number of employees in 2050 than 2030, regardless of the impact of net zero targets. The LCEGS sector will not stand still during decarbonisation and the transition to a low carbon and circular economy as new technologies and processes will be developed, and the wider economy will continue to grow.

Decarbonisation will not be linear, the quicker it is achieved, the more people are likely to be needed, however, the longer it takes, the more opportunity there is for technology to make a greater impact. But in reality, the additional employment component of growth required in pursuit of net zero is more nuanced and varies between sub-sectors and geographical area.

Current employment by SOC Classification

Table 11 shows the current 2019/20 employment figures and the estimated employment required to achieve net zero by 2030 and 2050, best- and worst-case scenarios for the LCEGS sector for London.

Shortage of employees refers to the employees that are either 'imported' from outside the area, have transferable skills from other sectors or are new employees that have been trained up, as it represents a skills gap and so the estimated employment requirement and growth in employment assumes those skills gaps are filled.

Employment Total in this analysis is lower than elsewhere in the study. The total employment count in other areas of the study are triangulated from the output and are the number of people required to produce the output recorded, bearing in mind the skills, technology and nature of the sector and sub-sectors in each location. When this data is then overlaid with the data on the SOC classification, there are some jobs that do not 'fit'. Not all jobs can be split into the SOC classification system, because there are new sectors whose job descriptions are not an exact match. It is not appropriate to allocate them as "Other Employees" because they are often combinations of the SOC classifications, also in start-ups and micro companies the same person can be performing several roles with different SOCs for a few days at a time each week. In a sector comprised of predominately micro and SMEs, this lack of transparency has a higher impact than other sectors comprised of fewer, larger companies.

The purpose of presenting this data is to help indicate where the skills gaps, in those jobs we *can* measure within this project are so that we can help inform the training needs etc. of employees. Therefore, we have based these forecasts on those job roles/descriptions that we can measure and we have forecast on those. In order to reach net zero, the estimated requirement for employment not only takes into account the number of people required to achieve net zero across the entire supply chain but it also forecasts potential changes in processes and practices, e.g. improved manufacturing processes.

In summary, the estimation of employment requirements to get to net zero represents the number of employees likely to be employed in 2030 or 2050, to achieve net zero and can be considered as the target level of employment for each SOC. In terms of changes in number of employees, there are three factors in play:

- The usual increase in employment numbers through normal sector growth
- The additional increase in employment numbers that are needed to provide the capacity within the sector to achieve net zero by 2030 or 2050
- These two growths are then moderated by the introduction of new technologies, technology compression and changes in processes and practice over time

Table 11: London's LCEGS Current Employment and Net Zero 2030 and 2050 Estimated Employment Requirements – Sector Data and SOC Classification

| | Current Employment | | | | Net Zero by 2030 | | | | Net Zero by 2050 | | | |
| | | | | | Worst Case Scenario | | Best Case Scenario | | Worst Case Scenario | | Best Case Scenario | |
SOC	# Employees 2019/20	Shortage of Employees 2019/20	Shortage as a % of Total Employees	# Employees if Skills Gap Filled	Estimated # Employees Needed to Reach Net Zero by 2030	Growth in Employees Required (assumes no skills gap)	Estimated # Employees Needed to Reach Net Zero by 2030	Growth in Employees Required (assumes no skills gap)	Estimated # Employees Needed to Reach Net Zero by 2050	Growth in Employees Required (assumes no skills gap)	Estimated # Employees Needed to Reach Net Zero by 2050	Growth in Employees Required (assumes no skills gap)
Technicians	22,917	7,941	34.7%	30,858	30,231	-2.0%	39,464	27.9%	46,340	50.2%	111,351	260.9%
Snr Management SME	11,730	1,808	15.4%	13,538	15,226	12.5%	20,291	49.9%	24,024	77.5%	56,273	315.7%
Supervisory	11,960	1,932	16.2%	13,892	15,786	13.6%	20,324	46.3%	24,149	73.8%	57,854	316.4%
Middle / Junior Management	11,883	1,941	16.3%	13,825	15,608	12.9%	20,485	48.2%	24,013	73.7%	56,514	308.8%
Designer / Developer	10,599	3,730	35.2%	14,329	13,844	-3.4%	18,130	26.5%	21,394	49.3%	50,653	253.5%
Clerical	6,216	20	0.3%	6,236	8,202	31.5%	10,648	70.8%	12,621	102.4%	29,790	377.7%
Self Employed	9,972	1,874	18.8%	11,846	13,158	11.1%	16,952	43.1%	20,068	69.4%	47,887	304.2%
Advisor or Agent	2,978	460	15.4%	3,438	3,902	13.5%	5,126	49.1%	6,073	76.7%	14,161	311.9%
Educator	2,193	226	10.3%	2,419	3,109	28.5%	2,609	7.9%	3,961	63.7%	4,215	74.2%
Specialist or Consultant	11,556	671	5.8%	12,227	15,076	23.3%	19,797	61.9%	23,797	94.6%	56,452	361.7%
Editor	1,588	53	3.3%	1,640	2,076	26.5%	2,734	66.6%	3,202	95.2%	7,622	364.6%
Industrial Researchers	3,508	280	8.0%	3,788	4,681	23.6%	5,921	56.3%	6,943	83.3%	17,030	349.6%
Scientist	4,018	1,362	33.9%	5,380	5,347	-0.6%	7,038	30.8%	8,148	51.4%	19,571	263.8%
Maintenance Engineer	22,333	2,551	11.4%	24,885	29,041	16.7%	38,023	52.8%	45,649	83.4%	108,835	337.4%
Civil Engineer	6,483	2,171	33.5%	8,654	8,557	-1.1%	11,267	30.2%	13,036	50.6%	31,506	264.1%
Production Engineer	12,284	6,337	51.6%	18,621	16,063	-13.7%	20,769	11.5%	25,374	36.3%	59,624	220.2%
Power distribution Engineer	10,401	5,352	51.5%	15,753	13,802	-12.4%	17,944	13.9%	20,870	32.5%	50,078	217.9%
Construction Engineer	7,360	1,882	25.6%	9,242	9,648	4.4%	12,613	36.5%	15,054	62.9%	35,121	280.0%
Sales Exec	6,535	1,142	17.5%	7,676	8,568	11.6%	11,210	46.0%	13,208	72.1%	31,313	307.9%
Marketing Personnel	5,692	981	17.2%	6,673	7,444	11.6%	9,719	45.6%	11,526	72.7%	27,235	308.1%
General Semi Skilled Worker	18,712	645	3.4%	19,357	24,295	25.5%	31,900	64.8%	37,821	95.4%	89,309	361.4%
General Labour	26,786	0	0.0%	26,786	35,064	30.9%	45,738	70.8%	54,518	103.5%	129,065	381.8%
Other Employees	17,502	1,357	7.8%	18,860	22,788	20.8%	29,910	58.6%	35,745	89.5%	83,556	343.0%
Administrative workers	9,967	334	3.4%	10,301	12,991	26.1%	16,976	64.8%	20,352	97.6%	47,793	364.0%
Total	255,173	45,050	17.7%	300,224	334,507	11.4%	435,589	45.1%	517,884	72.5%	1,222,806	307.3%

Table 11 shows that the total skills gap for the LCEGS sector in London is 17.7%, where the skills gap refers to those workers which travel from outside the area, have transferable skills from other sectors or are new employees that have been trained up. The skills gap throughout the sector varies considerably between SOCs within the sector, with significant gaps within large occupational groupings for Production Engineers 51.6%, Power Distribution Engineers 51.5% and Technicians 34.7%. Conversely, there are low skills gaps within large occupational groupings such as General Semi-skilled Worker 3.4%, Specialist or Consultant 5.8% and Administrative Workers 3.4%.

Key points at a sector-level:
- Estimated growth in employees to reach net zero under worst-case scenario economic growth conditions by 2030 is 11.4%
- Estimated growth in employees to reach net zero under best-case scenario economic growth conditions by 2030 is 45.1%
- Estimated growth in employees to reach net zero under worst-case scenario economic growth conditions by 2050 is 72.5%
- Estimated growth in employees to reach net zero under best-case scenario economic growth conditions by 2050 is 307.3%

The growth in employment to 2050 is larger than for 2030, because the wider economy and the LCEGS sector will continue to grow from 2030 to 2050. Although net zero will require a significant workforce to achieve this, the majority of the workforce will be undertaking the usual sector activities, such as waste collection and water treatment, which will be larger in 2050 than 2030 regardless of the move to net zero. The demand created by net zero targets necessitates an increase in the workforce to achieve targets on top of the usual workforce. So although the number of employees within the sector in 2050 is larger than 2030, there will be relatively more people required to perform or enable the net zero tasks in the workforce to be able to reach the net zero target in 2030 than 2050. This represents a significant employment opportunity if net zero 2030 targets are implemented.

Tables 12, 13 and 14 provide the estimated employment growth needed for the three Level 1 sub-sectors.

The Level 1 sub-sectors have different shortages of employees, and these are the proxy used to represent the skills gaps in London:
- Low Carbon – 21.0%
- Renewable Energy – 15.4%
- Environmental – 11.8%

Skill gaps between SOC's also varies between Level 1 sub-sectors:
- Production Engineers: Low Carbon 63.2%; Renewable Energy 44.2% and Environmental 32.0%
- Power Distribution Engineers: Low Carbon 60.6%; Renewable Energy 46.2% and Environmental 31.4%
- Technicians: Low Carbon 42.8%; Renewable Energy 29.5% and Environmental 21.1%

The relative shortages also vary between Level 2 sub-sectors, for example the shortage in Production Engineers for Alternative Fuel Vehicle is 73.2%, but only 13.0% in Waster & Waste Water Treatment. Several factors can influence the variation in shortages between SOCs and sub-sectors, for example, the

skills needed in these SOCs may be new in those sub-sectors, resulting in labour shortages; rapidly developing technology in some sub-sectors can require lead times for training; rate of growth of the sub-sector can also be a factor. Level 2 tables are located in Appendix 4.

Growth requirements are similar at the sub-sector level of analysis, but demonstrates more variation in SOC's between sub-sectors, for example to reach net zero by 2030, in the best case scenario, would require growth in:

- Production Engineers of: Low Carbon 2.3%; Renewable Energy 18.7% and Environmental 29.7%
- Power Distribution Engineers of: Low Carbon 7.9%; Renewable Energy 17.3% and Environmental 30.4%
- Technicians of: Low Carbon 20.9%; Renewable Energy 32.6% and Environmental 41.9%

Where there is a negative growth requirement, for example the growth required for Technicians to reach worst case scenario net zero by 2030 for Low Carbon is -6.9%, there would already be enough workers if the skills shortage were filled.

Table 12: London's LCEGS Current Employment and Net Zero 2030 and 2050 Estimated Employment Requirements – Low Carbon – SOC Classification

SOC	Low Carbon Current Employment				Net Zero by 2030				Net Zero by 2050			
					Worst Case Scenario		Best Case Scenario		Worst Case Scenario		Best Case Scenario	
	# Employees 2019/20	Shortage of Employees 2019/20	Shortage as a % of Total Employees	# Employees if Skills Gap Filled	Estimated # Employees Needed to Reach Net Zero by 2030	Growth in Employees Required (assumes no skills gap)	Estimated # Employees Needed to Reach Net Zero by 2030	Growth in Employees Required (assumes no skills gap)	Estimated # Employees Needed to Reach Net Zero by 2050	Growth in Employees Required (assumes no skills gap)	Estimated # Employees Needed to Reach Net Zero by 2050	Growth in Employees Required (assumes no skills gap)
Technicians	11,482	4,910	42.8%	16,391	15,266	-6.9%	19,818	20.9%	23,258	41.9%	56,520	244.8%
Snr Management SME	5,980	1,067	17.8%	7,047	7,709	9.4%	10,413	47.8%	12,425	76.3%	28,593	305.7%
Supervisory	6,098	1,143	18.7%	7,241	8,116	12.1%	10,284	42.0%	12,310	70.0%	29,693	310.1%
Middle / Junior Management	6,044	1,155	19.1%	7,199	7,972	10.7%	10,461	45.3%	12,213	69.6%	28,446	295.1%
Designer / Developer	6,586	2,479	37.6%	9,066	8,613	-5.0%	11,241	24.0%	13,275	46.4%	31,383	246.2%
Clerical	3,174	12	0.4%	3,186	4,224	32.6%	5,435	70.6%	6,486	103.6%	15,147	375.4%
Self Employed	6,277	1,343	21.4%	7,620	8,332	9.3%	10,596	39.1%	12,605	65.4%	30,103	295.1%
Advisor or Agent	1,411	184	13.0%	1,595	1,853	16.2%	2,443	53.2%	2,906	82.2%	6,614	314.6%
Educator	644	60	9.4%	704	871	23.6%	930	32.0%	1,233	75.0%	2,151	205.3%
Specialist or Consultant	7,237	483	6.7%	7,720	9,445	22.3%	12,393	60.5%	15,083	95.4%	35,694	362.4%
Editor	685	18	2.6%	703	895	27.4%	1,183	68.3%	1,374	95.4%	3,286	367.4%
Industrial Researchers	2,168	181	8.4%	2,349	2,931	24.8%	3,627	54.4%	4,238	80.4%	10,574	350.2%
Scientist	2,462	862	35.0%	3,324	3,308	-0.5%	4,357	31.1%	5,005	50.6%	12,099	264.0%
Maintenance Engineer	12,346	1,747	14.1%	14,093	15,967	13.3%	20,862	48.0%	25,453	80.6%	60,802	331.4%
Civil Engineer	3,639	1,300	35.7%	4,939	4,848	-1.8%	6,386	29.3%	7,286	47.5%	17,824	260.9%
Production Engineer	6,119	3,866	63.2%	9,984	7,994	-19.9%	10,218	2.3%	12,934	29.5%	29,992	200.4%
Power distribution Engineer	5,801	3,514	60.6%	9,315	7,785	-16.4%	10,054	7.9%	11,558	24.1%	27,980	200.4%
Construction Engineer	3,892	1,160	29.8%	5,052	5,108	1.1%	6,660	31.8%	8,042	59.2%	18,468	265.6%
Sales Exec	2,649	508	19.2%	3,156	3,503	11.0%	4,540	43.8%	5,374	70.3%	12,759	304.2%
Marketing Personnel	2,433	461	18.9%	2,894	3,175	9.7%	4,132	42.8%	4,945	70.9%	11,594	300.7%
General Semi Skilled Worker	9,824	398	4.1%	10,222	12,682	24.1%	16,634	62.7%	19,869	94.4%	46,555	355.5%
General Labour	11,562	0	0.0%	11,562	15,135	30.9%	19,630	69.8%	23,728	105.2%	55,823	382.8%
Other Employees	8,309	759	9.1%	9,067	10,770	18.8%	14,166	56.2%	17,196	89.7%	39,439	335.0%
Administrative workers	5,345	208	3.9%	5,554	6,938	24.9%	9,041	62.8%	11,000	98.1%	25,589	360.8%
Total	**132,166**	**27,817**	**21.0%**	**159,983**	**173,439**	**8.4%**	**225,506**	**41.0%**	**269,795**	**68.6%**	**637,127**	**298.2%**

Table 13: London's LCEGS Current Employment and Net Zero 2030 and 2050 Estimated Employment Requirements – Renewable Energy – SOC Classification

| SOC | Renewable Energy Current Employment | | | | Net Zero by 2030 | | | | Net Zero by 2050 | | | |
| | | | | | Worst Case Scenario | | Best Case Scenario | | Worst Case Scenario | | Best Case Scenario | |
	# Employees 2019/20	Shortage of Employees 2019/20	Shortage as a % of Total Employees	# Employees if Skills Gap Filled	Estimated # Employees Needed to Reach Net Zero by 2030	Growth in Employees Required (assumes no skills gap)	Estimated # Employees Needed to Reach Net Zero by 2030	Growth in Employees Required (assumes no skills gap)	Estimated # Employees Needed to Reach Net Zero by 2050	Growth in Employees Required (assumes no skills gap)	Estimated # Employees Needed to Reach Net Zero by 2050	Growth in Employees Required (assumes no skills gap)
Technicians	7,300	2,157	29.5%	9,457	9,559	1.1%	12,538	32.6%	14,746	55.9%	35,020	270.3%
Snr Management SME	3,829	533	13.9%	4,362	5,005	14.7%	6,574	50.7%	7,726	77.1%	18,431	322.5%
Supervisory	3,801	563	14.8%	4,363	4,973	14.0%	6,510	49.2%	7,678	76.0%	18,266	318.6%
Middle / Junior Management	3,794	562	14.8%	4,356	4,959	13.9%	6,521	49.7%	7,663	75.9%	18,234	318.6%
Designer / Developer	1,992	712	35.7%	2,704	2,590	-4.2%	3,419	26.4%	4,030	49.0%	9,575	254.1%
Clerical	1,990	6	0.3%	1,996	2,601	30.4%	3,413	71.0%	4,012	101.1%	9,589	380.5%
Self Employed	2,034	355	17.4%	2,388	2,660	11.4%	3,499	46.5%	4,104	71.9%	9,805	310.6%
Advisor or Agent	1,119	198	17.7%	1,317	1,461	11.0%	1,915	45.4%	2,261	71.7%	5,388	309.2%
Educator	1,474	142	9.7%	1,616	2,139	32.4%	1,550	-4.1%	2,576	59.4%	1,700	5.2%
Specialist or Consultant	2,465	118	4.8%	2,582	3,217	24.6%	4,233	63.9%	4,979	92.8%	11,860	359.3%
Editor	635	25	3.9%	659	831	26.0%	1,092	65.5%	1,285	94.9%	3,053	363.0%
Industrial Researchers	787	58	7.3%	844	1,028	21.8%	1,345	59.3%	1,586	87.8%	3,790	348.9%
Scientist	995	312	31.3%	1,306	1,303	-0.2%	1,714	31.2%	2,010	53.8%	4,777	265.6%
Maintenance Engineer	6,001	560	9.3%	6,560	7,862	19.8%	10,319	57.3%	12,127	84.9%	28,830	339.5%
Civil Engineer	1,474	534	36.2%	2,007	1,912	-4.7%	2,530	26.1%	2,977	48.3%	7,089	253.2%
Production Engineer	4,092	1,808	44.2%	5,899	5,348	-9.4%	7,001	18.7%	8,264	40.1%	19,692	233.8%
Power distribution Engineer	2,651	1,226	46.2%	3,877	3,468	-10.5%	4,549	17.3%	5,366	38.4%	12,736	228.5%
Construction Engineer	1,822	453	24.8%	2,275	2,385	4.8%	3,126	37.4%	3,685	62.0%	8,747	284.5%
Sales Exec	2,465	413	16.8%	2,878	3,209	11.5%	4,227	46.9%	4,968	72.6%	11,733	307.7%
Marketing Personnel	2,156	356	16.5%	2,512	2,825	12.5%	3,698	47.2%	4,355	73.4%	10,338	311.6%
General Semi Skilled Worker	5,104	158	3.1%	5,262	6,667	26.7%	8,745	66.2%	10,300	95.7%	24,545	366.4%
General Labour	9,759	0	0.0%	9,759	12,786	31.0%	16,747	71.6%	19,750	102.4%	46,981	381.4%
Other Employees	6,135	441	7.2%	6,576	8,017	21.9%	10,497	59.6%	12,386	88.4%	29,433	347.6%
Administrative workers	2,800	85	3.0%	2,885	3,660	26.9%	4,805	66.6%	5,665	96.4%	13,445	366.0%
Total	**76,671**	**11,771**	**15.4%**	**88,442**	**100,465**	**13.6%**	**130,567**	**47.6%**	**154,501**	**74.7%**	**363,056**	**310.5%**

Table 14: London's LCEGS Current Employment and Net Zero 2030 and 2050 Estimated Employment Requirements – Environmental – SOC Classification

SOC	Environmental Current Employment				Net Zero by 2030				Net Zero by 2050			
					Worst Case Scenario		Best Case Scenario		Worst Case Scenario		Best Case Scenario	
	# Employees 2019/20	Shortage of Employees 2019/20	Shortage as a % of Total Employees	# Employees if Skills Gap Filled	Estimated # Employees Needed to Reach Net Zero by 2030	Growth in Employees Required (assumes no skills gap)	Estimated # Employees Needed to Reach Net Zero by 2030	Growth in Employees Required (assumes no skills gap)	Estimated # Employees Needed to Reach Net Zero by 2050	Growth in Employees Required (assumes no skills gap)	Estimated # Employees Needed to Reach Net Zero by 2050	Growth in Employees Required (assumes no skills gap)
Technicians	4,135	874	21.1%	5,010	5,406	7.9%	7,108	41.9%	8,336	66.4%	19,811	295.5%
Snr Management SME	1,920	208	10.8%	2,128	2,512	18.1%	3,304	55.3%	3,872	82.0%	9,249	334.7%
Supervisory	2,061	227	11.0%	2,288	2,697	17.9%	3,531	54.3%	4,160	81.8%	9,895	332.4%
Middle / Junior Management	2,045	224	11.0%	2,270	2,677	17.9%	3,503	54.3%	4,137	82.3%	9,835	333.3%
Designer / Developer	2,020	539	26.7%	2,560	2,641	3.2%	3,470	35.6%	4,090	59.8%	9,695	278.8%
Clerical	1,052	2	0.2%	1,054	1,376	30.6%	1,800	70.7%	2,123	101.4%	5,054	379.4%
Self Employed	1,662	177	10.6%	1,839	2,167	17.8%	2,857	55.4%	3,358	82.6%	7,979	334.0%
Advisor or Agent	448	78	17.4%	526	587	11.7%	767	45.9%	906	72.3%	2,158	310.6%
Educator	75	23	31.2%	99	98	-0.4%	129	31.1%	152	54.4%	364	269.1%
Specialist or Consultant	1,855	70	3.8%	1,925	2,415	25.4%	3,172	64.8%	3,734	94.0%	8,899	362.3%
Editor	268	10	3.9%	278	349	25.7%	459	64.9%	543	95.4%	1,283	361.5%
Industrial Researchers	554	41	7.4%	595	722	21.4%	950	59.6%	1,119	88.1%	2,666	348.2%
Scientist	561	188	33.5%	749	735	-1.9%	967	29.0%	1,133	51.3%	2,695	259.8%
Maintenance Engineer	3,986	245	6.1%	4,231	5,212	23.2%	6,841	61.7%	8,069	90.7%	19,203	353.9%
Civil Engineer	1,371	337	24.6%	1,708	1,797	5.2%	2,351	37.6%	2,772	62.3%	6,593	285.9%
Production Engineer	2,073	664	32.0%	2,737	2,722	-0.5%	3,550	29.7%	4,177	52.6%	9,939	263.1%
Power distribution Engineer	1,949	612	31.4%	2,561	2,549	-0.5%	3,341	30.4%	3,947	54.1%	9,362	265.6%
Construction Engineer	1,646	269	16.3%	1,915	2,155	12.5%	2,826	47.6%	3,327	73.8%	7,906	312.9%
Sales Exec	1,421	221	15.6%	1,642	1,857	13.1%	2,443	48.8%	2,866	74.5%	6,820	315.3%
Marketing Personnel	1,104	164	14.9%	1,268	1,445	13.9%	1,889	49.0%	2,226	75.6%	5,303	318.2%
General Semi Skilled Worker	3,784	89	2.4%	3,873	4,945	27.7%	6,520	68.4%	7,652	97.6%	18,209	370.1%
General Labour	5,465	0	0.0%	5,465	7,144	30.7%	9,361	71.3%	11,039	102.0%	26,261	380.5%
Other Employees	3,059	157	5.1%	3,217	4,001	24.4%	5,247	63.1%	6,163	91.6%	14,684	356.5%
Administrative workers	1,821	41	2.2%	1,862	2,393	28.5%	3,130	68.1%	3,686	97.9%	8,760	370.3%
Total	**46,336**	**5,463**	**11.8%**	**51,799**	**60,602**	**17.0%**	**79,516**	**53.5%**	**93,588**	**80.7%**	**222,623**	**329.8%**

Additional Skills/Occupations

Table 15 shows the current 2019/20 employment figures for the identified additional skills/occupations and the estimated employment required to achieve net zero by 2030 and 2050, using best- and worst-case scenarios for the LCEGS sector for London. There is a very small shortage of these skilled workers for each skill classification, varying from 3.1% for Specialist Engineers to 3.5% for Installers and Adaptive Process Engineers. Although the skills gap is relatively small, the estimated growth requirements to reach net zero are much higher than for the wider SOC classifications in Table 11.

Table 15: London's LCEGS Current Employment and Net Zero 2030 and 2050 Estimated Employment Requirements – Sector Data – Additional Skills/Occupations

| | Current Employment | | | | Net Zero by 2030 | | | | Net Zero by 2050 | | | |
| | | | | | Worst Case Scenario | | Best Case Scenario | | Worst Case Scenario | | Best Case Scenario | |
Additional Skills	# Employees 2019/20	Shortage of Employees 2019/20	Shortage as a % of Total Employees	# Employees if Skills Gap Filled	Estimated # Employees Needed to Reach Net Zero by 2030	Growth in Employees Required (assumes no skills gap)	Estimated # Employees Needed to Reach Net Zero by 2030	Growth in Employees Required (assumes no skills gap)	Estimated # Employees Needed to Reach Net Zero by 2050	Growth in Employees Required (assumes no skills gap)	Estimated # Employees Needed to Reach Net Zero by 2050	Growth in Employees Required (assumes no skills gap)
Installers	14,257	500	3.5%	14,756	18,364	24.5%	24,582	66.6%	28,485	93.0%	68,738	365.8%
Multi Engineers	14,333	469	3.3%	14,802	18,643	25.9%	24,682	66.7%	28,776	94.4%	68,519	362.9%
Specialist Engineer	16,543	509	3.1%	17,052	21,193	24.3%	28,920	69.6%	33,632	97.2%	79,304	365.1%
Adaptive Process Engineer	23,546	830	3.5%	24,376	30,574	25.4%	39,968	64.0%	47,269	93.9%	113,980	367.6%
Total	68,679	2,307	3.4%	70,986	88,774	25.1%	118,150	66.4%	138,162	94.6%	330,542	365.6%

Key points at a sector-level:
- Estimated growth in employees to reach net zero under worst-case scenario economic growth conditions by 2030 is 25.1% (11.4% for SOC's)
- Estimated growth in employees to reach net zero under best-case scenario economic growth conditions by 2030 is 66.4% (45.1% for SOC's)
- Estimated growth in employees to reach net zero under worst-case scenario economic growth conditions by 2050 is 94.6% (72.5% for SOC's)
- Estimated growth in employees to reach net zero under best-case scenario economic growth conditions by 2050 is 365.6% (307.3% for SOC's)

Tables 16, 17 and 18 provide the estimated employment growth for the three Level 1 sub-sectors.

The Level 1 sub-sectors have different shortages of employees, representing London's skills gaps:
- Low Carbon – 4.1%
- Renewable Energy – 2.7%
- Environmental – 1.7%

Skill gaps for these 'Additional' skills also varies between Level 1 sub-sectors:
- Installers: Low Carbon 4.2%; Renewable Energy 3.0% and Environmental 1.4%
- Multi Engineers: Low Carbon 3.9%; Renewable Energy 2.5% and Environmental 1.7%
- Specialist Engineers: Low Carbon 3.6%; Renewable Energy 2.4% and Environmental 1.9%
- Adaptive Process Engineers: Low Carbon 4.6%; Renewable Energy 2.7% and Environmental 1.7%

Shortages, skill gaps in London, also vary between Level 2 sub-sectors, for example the shortage in Specialist Engineers for Alternative Fuel Vehicle is 4.7% but only 0.9% in Water & Waste Water Treatment and Photovoltaic. The Level 2 tables are located in Appendix 5.

Growth requirements are similar at the sub-sector level of analysis, but it demonstrates more variation in the 'Additional' skills between sub-sectors, for example to reach net zero by 2030, best case scenario, would require growth in:
- Installers: Low Carbon 65.8%; Renewable Energy 67.2% and Environmental 68.9%
- Multi Engineers: Low Carbon 66.2%; Renewable Energy 67.0% and Environmental 68.8%
- Specialist Engineers: Low Carbon 70.8%; Renewable Energy 67.7% and Environmental 67.1%
- Adaptive Process Engineers: Low Carbon 61.0%; Renewable Energy 66.2% and Environmental 69.6%

Table 16: London's LCEGS Current Employment and Net Zero 2030 and 2050 Estimated Employment Requirements – Low Carbon – Additional Skills/Occupations

| Additional Skills | Low Carbon Current Employment | | | | Net Zero by 2030 | | | | Net Zero by 2050 | | | |
| | | | | | Worst Case Scenario | | Best Case Scenario | | Worst Case Scenario | | Best Case Scenario | |
	# Employees 2019/20	Shortage of Employees 2019/20	Shortage as a % of Total Employees	# Employees if Skills Gap Filled	Estimated # Employees Needed to Reach Net Zero by 2030	Growth in Employees Required (assumes no skills gap)	Estimated # Employees Needed to Reach Net Zero by 2030	Growth in Employees Required (assumes no skills gap)	Estimated # Employees Needed to Reach Net Zero by 2050	Growth in Employees Required (assumes no skills gap)	Estimated # Employees Needed to Reach Net Zero by 2050	Growth in Employees Required (assumes no skills gap)
Installers	8,697	368	4.2%	9,065	11,090	22.3%	15,027	65.8%	17,229	90.1%	41,989	363.2%
Multi Engineers	8,611	338	3.9%	8,949	11,166	24.8%	14,875	66.2%	17,232	92.5%	40,983	358.0%
Specialist Engineer	10,270	367	3.6%	10,637	12,979	22.0%	18,173	70.8%	20,975	97.2%	49,196	362.5%
Adaptive Process Engineer	11,887	547	4.6%	12,434	15,309	23.1%	20,018	61.0%	23,704	90.6%	58,217	368.2%
Total	**39,465**	**1,620**	**4.1%**	**41,085**	**50,543**	**23.0%**	**68,093**	**65.7%**	**79,139**	**92.6%**	**190,386**	**363.4%**

Table 17: London's LCEGS Current Employment and Net Zero 2030 and 2050 Estimated Employment Requirements – Renewable Energy – Additional Skills/Occupations

Additional Skills	Renewable Energy Current Employment				Net Zero by 2030 Worst Case Scenario		Best Case Scenario		Net Zero by 2050 Worst Case Scenario		Best Case Scenario	
	# Employees 2019/20	Shortage of Employees 2019/20	Shortage as a % of Total Employees	# Employees if Skills Gap Filled	Estimated # Employees Needed to Reach Net Zero by 2030	Growth in Employees Required (assumes no skills gap)	Estimated # Employees Needed to Reach Net Zero by 2030	Growth in Employees Required (assumes no skills gap)	Estimated # Employees Needed to Reach Net Zero by 2050	Growth in Employees Required (assumes no skills gap)	Estimated # Employees Needed to Reach Net Zero by 2050	Growth in Employees Required (assumes no skills gap)
Installers	3,421	101	3.0%	3,522	4,481	27.2%	5,890	67.2%	6,913	96.2%	16,484	368.0%
Multi Engineers	3,813	97	2.5%	3,910	4,981	27.4%	6,528	67.0%	7,682	96.5%	18,359	369.5%
Specialist Engineer	4,450	106	2.4%	4,557	5,822	27.8%	7,642	67.7%	8,987	97.2%	21,333	368.1%
Adaptive Process Engineer	8,524	231	2.7%	8,755	11,144	27.3%	14,544	66.1%	17,228	96.8%	40,695	364.8%
Total	**20,209**	**536**	**2.7%**	**20,744**	**26,428**	**27.4%**	**34,605**	**66.8%**	**40,810**	**96.7%**	**96,871**	**367.0%**

Table 18: London's LCEGS Current Employment and Net Zero 2030 and 2050 Estimated Employment Requirements – Environmental – Additional Skills/Occupations

Additional Skills	Environmental Current Employment				Net Zero by 2030 Worst Case Scenario		Best Case Scenario		Net Zero by 2050 Worst Case Scenario		Best Case Scenario	
	# Employees 2019/20	Shortage of Employees 2019/20	Shortage as a % of Total Employees	# Employees if Skills Gap Filled	Estimated # Employees Needed to Reach Net Zero by 2030	Growth in Employees Required (assumes no skills gap)	Estimated # Employees Needed to Reach Net Zero by 2030	Growth in Employees Required (assumes no skills gap)	Estimated # Employees Needed to Reach Net Zero by 2050	Growth in Employees Required (assumes no skills gap)	Estimated # Employees Needed to Reach Net Zero by 2050	Growth in Employees Required (assumes no skills gap)
Installers	2,138	31	1.4%	2,169	2,794	28.8%	3,664	68.9%	4,343	100.2%	10,265	373.3%
Multi Engineers	1,909	33	1.7%	1,942	2,496	28.5%	3,279	68.8%	3,862	98.8%	9,178	372.5%
Specialist Engineer	1,823	35	1.9%	1,858	2,392	28.7%	3,104	67.1%	3,671	97.6%	8,775	372.3%
Adaptive Process Engineer	3,135	52	1.7%	3,187	4,121	29.3%	5,405	69.6%	6,337	98.8%	15,068	372.8%
Total	**9,006**	**151**	**1.7%**	**9,156**	**11,802**	**28.9%**	**15,453**	**68.8%**	**18,213**	**98.9%**	**43,286**	**372.7%**

Current Training Provision and Potential for Upskilling of the Current Workforce within each Level 2 sub-sector

In this section we explore both the current training capacity within London and the potential for up-skilling of the workforce.

Current training capacity takes into account the current offerings from local training providers for each sub-sector and is an estimate of the provision of services compared with a national average. It takes into account those training services provided through both the traditional education system and training companies. It does not include training provided in-house by companies using their employees.

The potential for upskilling the workforce refers to the potential for each sub-sector to either upskill their current workforce and/or upskill workers from other sectors to easily move into the sub-sector being measured. It refers to the rate of upskilling potential compared with the rate of increase in demand, combined with the ability of the skill sets to upgrade in line with the rate of increase in demand and the rate of new technology and methods introduction.

Both the current training capacity and the potential for upskilling the workforce of the sector have been calculated by attributing a factor of 'Low', 'Medium' or 'High' per product or service at the Local Authority level, which has been given the corresponding value of 1 = Low; 2 = Medium and 3 = High. We have then taken the average of those values for the products and services grouped together for the Levels to produce an index for both factors.

For example, there are 30 products and services within the Level 3 sub-sector of Windows, within the Building technologies (Low Carbon) sub-sector. For each Local Authority (using Croydon as an example), each product and service was allocated a current training capacity factor:
12 products and services listed as 'High' with a score of 3
18 products and services listed as 'Medium' with a score of 2
0 products and services listed a 'Low' with a score of 1
Calculation:

$$\frac{(12x3) + (18x2) + (0x1)}{30} = 2.40$$

The same process was applied with regards to the potential for upskilling the workforce, with the same example of Croydon scoring:
13 products and services listed as 'High' with a score of 3
17 products and services listed as 'Medium' with a score of 2
0 products and services listed a 'Low' with a score of 1

Calculation:

$$\frac{(13x3) + (17x2) + (0x1)}{30} = 2.43$$

Both the current training capacity and upskilling potential indexes have been calculated for the 2769 products and services at Level 5 of the dataset, for each Local Authority, with the average being used to plot graphs comparing the two factors at Level 2 for London. This allows us to examine which sub-sectors have a current workforce which has a potential for upskilling combined with good current training capacity and which sub-sectors could benefit from additional training capacity.

Figure 53 illustrates the current training capacity compared with the upskilling potential of Level 2 sub-sectors for London, with the bubbles sized by sales in £m. This graph shows how the Level 2 sub-sectors perform *relative to each other* within London. Carbon Finance has very high upskilling potential and average training capacity. Biomass holds the strongest position, with very high upskilling potential with very good training capacity to provide upskilling services. Renewable Energy General Consultancy has a very high upskilling potential, but very low training capacity, which is also seen, to a lesser extent in Noise & Vibration Control. Wind has a relatively low upskilling potential scalability compared with current training capacity, partly attributable to the recent indecision and uncertainty of acceptance of wind installations, which results in reticence to train for new entrants and insecurity of career progression.

Figure 53: London's LCEGS Current Training Capacity against the Potential Upskilling of the Workforce by Level 2 Sub-sector
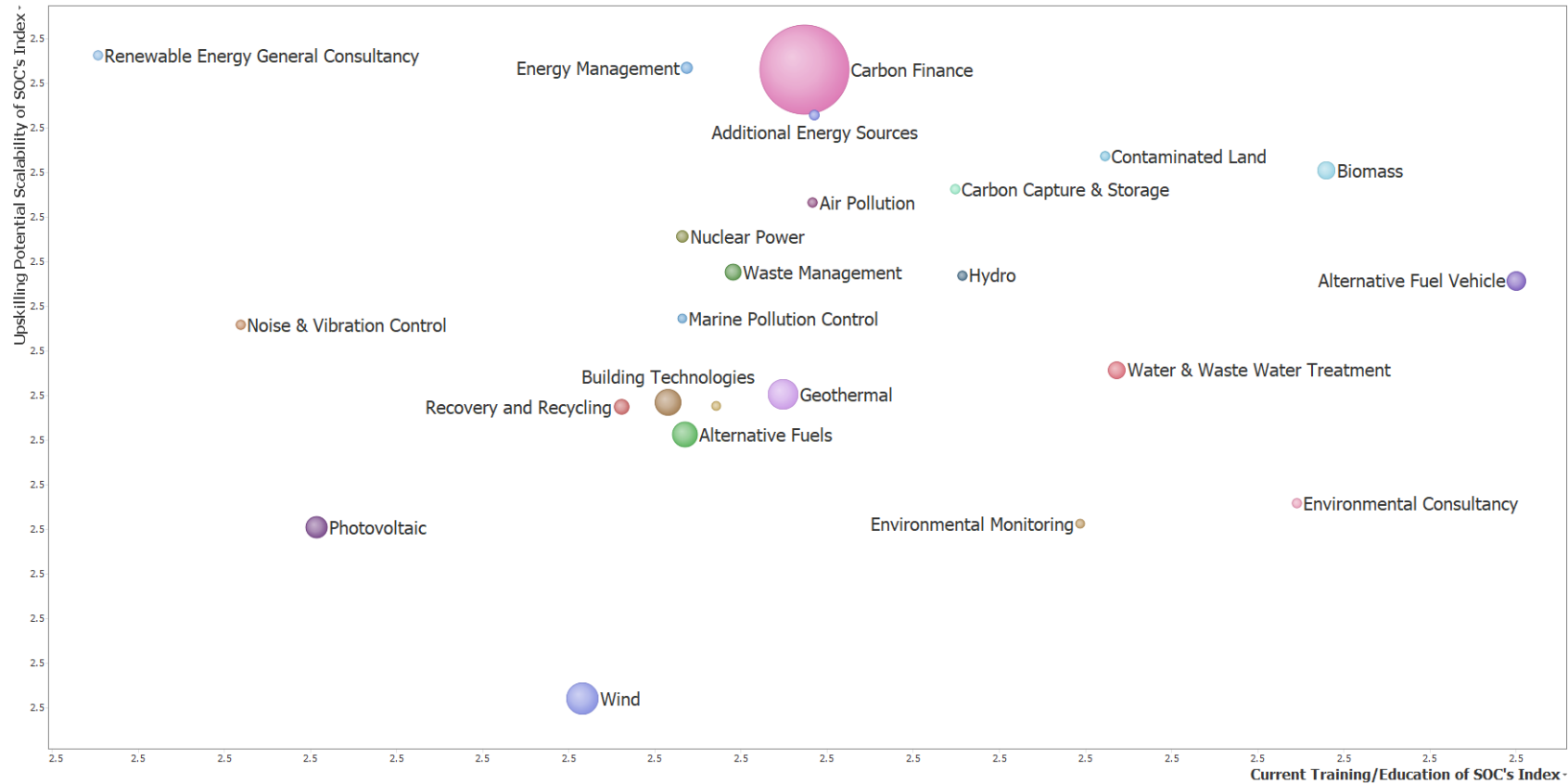
Potential of Level 2 sub-sectors to impact on CO_2 reduction

In this section we estimate CO_2 reduction potential for Level 2 sub-sectors within London for 2019/20. As outlined in the introduction to the Low Carbon Environmental Goods and Services sector of this report, there is a wide range of variance within academia regarding how to accurately measure the CO_2 reduction potential of products and services. As such, the potential reduction in CO_2 has been estimated, considering the activities within each area, the localization of chains and networks of supply and the technologies in use or being produced.

The CO_2 reduction potential has been determined for each Level 2 Sub-sector in each Local Authority, by estimating 'High', 'Medium' and 'Low'.

The 'Low', 'Medium' and 'High' categories have also been allocated a scale of Low = 1, Medium = 2 and High = 3, with the averages across the Local Authorities being used to provide a visual representation of levels of CO_2 reduction potential.

A worked example for Waste Management, for all 33 Local Authorities:
10 Local Authorities estimated as 'High' with a score of 3
10 Local Authorities estimated as 'Medium' with a score of 2
13 Local Authorities estimated as 'Low' with a score of 1

Calculation:

$$\frac{(10x3) + (10x2) + (13x1)}{33} = 1.9$$

Figures 54 shows the estimated CO_2 reduction potential against the sales (£m) for each Level 2 sub-sector, with the bubbles sized for sales and provides a visualization of the relative market sizes and CO_2 reduction potential of the sub-sectors relative to the other sub-sectors.

It illustrates the dominance of the Wind Sub-sector, in terms of estimated CO_2 reduction potential compared with the other Level 2 sub-sectors. Conversely, it also highlights the relatively small size and CO_2 reduction potential of the Environmental Consultancy sub-sector. Carbon Finance has a high estimated CO_2 reduction potential relative to the other sub-sectors on the graph, combined with large market in terms of sales, this is a highly influential sub-sector with regards to CO_2 reduction. Figure 55 provides the same data, with Wind and Environmental Consultancy excluded.

Figure 54: London's LCEGS Estimated CO2 Reduction Potential against 2019/20 Sales (£m) by Level 2 Sub-sector
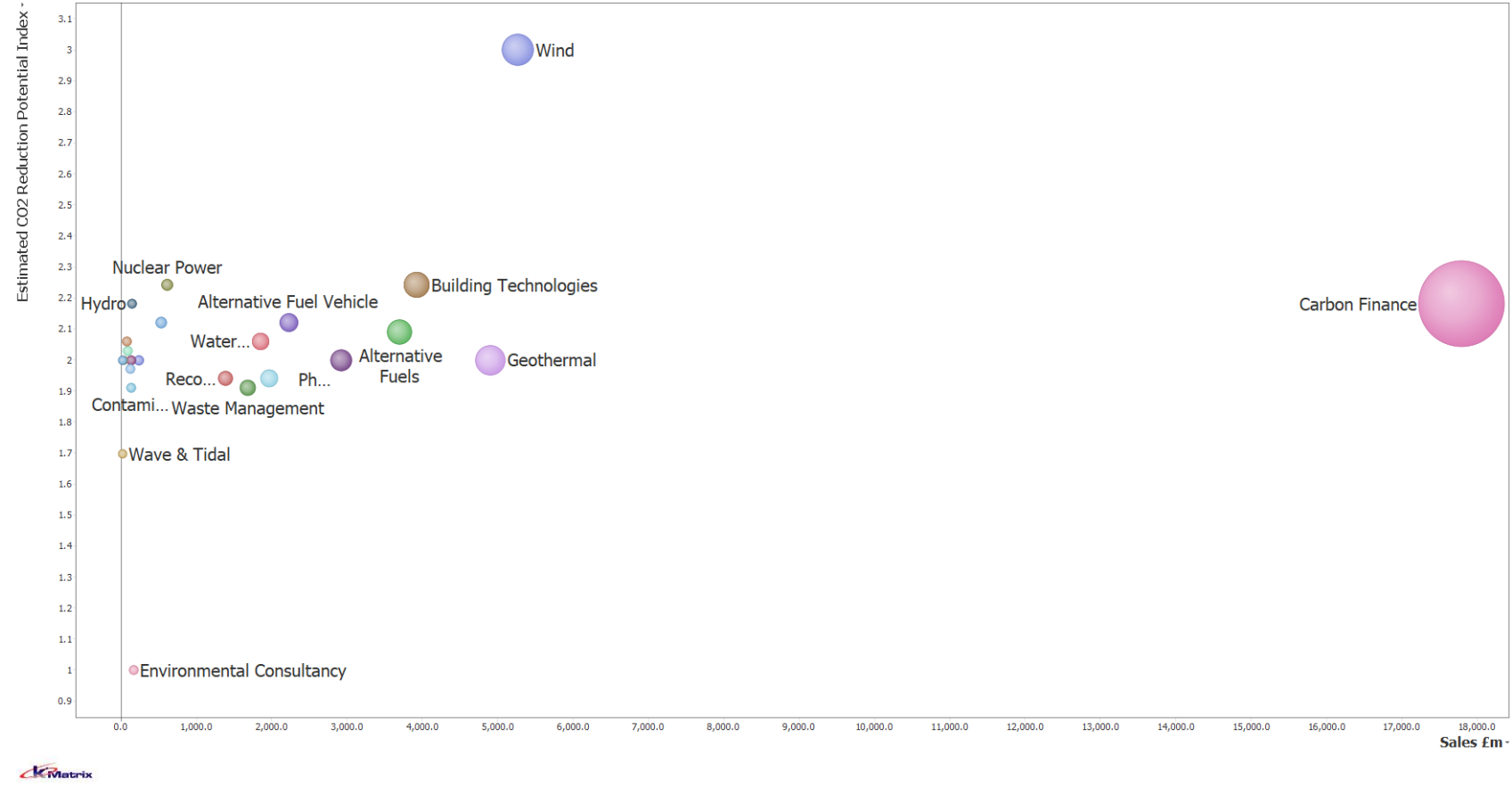
Figure 55 shows the same data as Figure 54, but with the outliers Wind and Environmental Consultancy excluded, to enable analysis of the other sub-sectors. Building Technologies is one of the top 11 sub-sectors in terms of sales and has very high CO_2 reduction potential. The CO_2 reduction potential of Water and Waste Water Treatment is above mid-scale, because it is adopting new technologies with the potential to reduce CO_2, although not adopting these technologies at a high rate, the scale of water being treated causes significant impact. Photovoltaic and Geothermal are mid-scale because they are still evolving both in terms of technology and near-term efficiencies.

Figure 55: London's LCEGS Estimated CO2 Reduction Potential against 2019/20 Sales (£m) by Level 2 Sub-sector – Carbon Finance, Wind and Environmental Consultancy Excluded
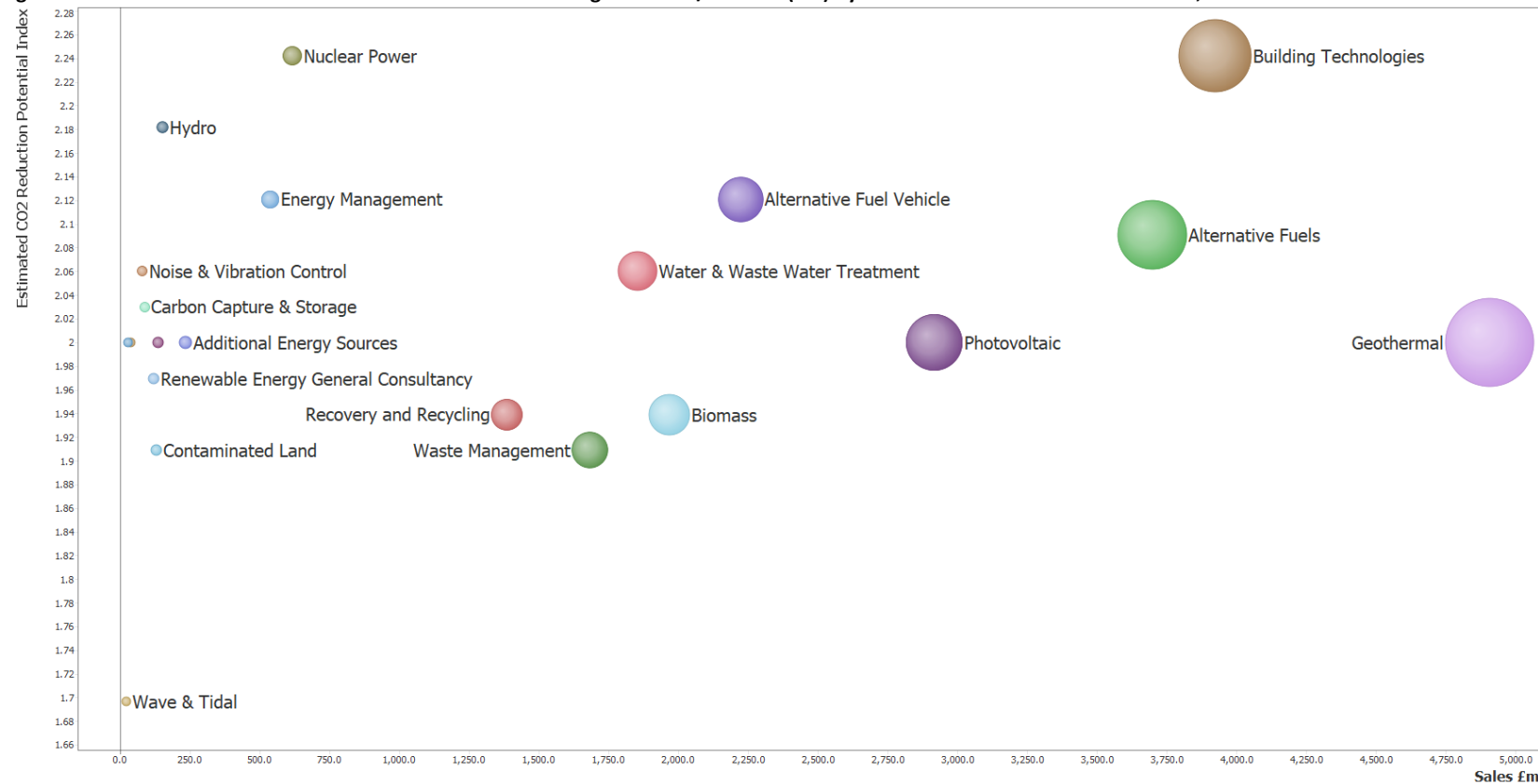
Appendix 6 - LCEGS Current Employment, Skills Gaps and Forecasts for Net Zero 2030 and 2050 Scenarios for Top Level 2 Sub-sectors – by Standard Occupational Classification - New analysis for informing intelligence and future research

Alternative Fuel Vehicle

| SOC | Alternative Fuel Vehicle Current Employment | | | | Net Zero by 2030 | | | | Net Zero by 2050 | | | |
| | | | | | Worst Case Scenario | | Best Case Scenario | | Worst Case Scenario | | Best Case Scenario | |
	# Employees 2019/20	Shortage of Employees 2019/20	Shortage as a % of Total Employees	# Employees if Skills Gap Filled	Estimated # Employees Needed to Reach Net Zero by 2030	Growth in Employees Required (assumes no skills gap)	Estimated # Employees Needed to Reach Net Zero by 2030	Growth in Employees Required (assumes no skills gap)	Estimated # Employees Needed to Reach Net Zero by 2050	Growth in Employees Required (assumes no skills gap)	Estimated # Employees Needed to Reach Net Zero by 2050	Growth in Employees Required (assumes no skills gap)
Technicians	744	333	44.7%	1,077	965	-10.4%	1,268	17.7%	1,496	38.9%	3,591	233.4%
Snr Management SME	614	141	23.0%	755	806	6.7%	1,059	40.3%	1,236	63.7%	2,955	291.5%
Supervisory	729	170	23.3%	899	961	7.0%	1,252	39.3%	1,468	63.3%	3,519	291.5%
Middle / Junior Management	732	170	23.2%	901	957	6.2%	1,244	38.0%	1,480	64.2%	3,497	288.0%
Designer / Developer	166	75	45.3%	242	219	-9.3%	284	17.6%	337	39.6%	793	228.2%
Clerical	369	2	0.5%	371	484	30.5%	632	70.4%	747	101.2%	1,780	379.6%
Self Employed	255	60	23.6%	315	332	5.4%	440	39.6%	514	63.1%	1,237	292.3%
Advisor or Agent	50	11	21.9%	61	65	6.7%	86	41.4%	102	67.7%	240	294.0%
Educator	30	4	12.5%	33	43	28.4%	31	-8.0%	52	55.3%	33	-0.7%
Specialist or Consultant	516	38	7.4%	554	680	22.7%	884	59.4%	1,058	90.8%	2,494	349.8%
Editor	0	0	0.0%	0	0	0.0%	0	0.0%	0	0.0%	0	0.0%
Industrial Researchers	313	36	11.3%	349	412	18.1%	538	54.2%	622	78.5%	1,515	334.4%
Scientist	542	254	46.9%	796	704	-11.6%	934	17.3%	1,100	38.3%	2,604	227.2%
Maintenance Engineer	975	136	13.9%	1,110	1,280	15.3%	1,689	52.1%	1,968	77.3%	4,647	318.6%
Civil Engineer	10	5	46.7%	15	13	-10.6%	17	16.5%	20	34.0%	48	227.0%
Production Engineer	473	346	73.2%	819	616	-24.8%	809	-1.3%	963	17.6%	2,293	180.1%
Power distribution Engineer	128	89	69.3%	217	166	-23.6%	219	0.8%	258	18.9%	624	187.1%
Construction Engineer	10	3	34.7%	13	13	-0.3%	17	26.0%	20	46.7%	49	264.5%
Sales Exec	846	197	23.2%	1,043	1,097	5.3%	1,460	40.0%	1,717	64.7%	4,066	290.0%
Marketing Personnel	850	195	22.9%	1,045	1,103	5.5%	1,455	39.2%	1,724	64.9%	4,083	290.6%
General Semi Skilled Worker	963	46	4.7%	1,008	1,247	23.7%	1,650	63.7%	1,940	92.4%	4,641	360.3%
General Labour	1,333	0	0.0%	1,333	1,738	30.3%	2,297	72.3%	2,715	103.6%	6,489	386.7%
Other Employees	853	98	11.5%	951	1,112	17.0%	1,462	53.8%	1,730	82.0%	4,081	329.3%
Administrative workers	496	23	4.6%	519	648	24.9%	848	63.4%	996	92.1%	2,393	361.4%
Total	**11,996**	**2,430**	**20.3%**	**14,426**	**15,661**	**8.6%**	**20,573**	**42.6%**	**24,264**	**68.2%**	**57,673**	**299.8%**

Alternative Fuels

SOC	Alternative Fuels				Net Zero by 2030				Net Zero by 2050			
	Current Employment				Worst Case Scenario		Best Case Scenario		Worst Case Scenario		Best Case Scenario	
	# Employees 2019/20	Shortage of Employees 2019/20	Shortage as a % of Total Employees	# Employees if Skills Gap Filled	Estimated # Employees Needed to Reach Net Zero by 2030	Growth in Employees Required (assumes no skills gap)	Estimated # Employees Needed to Reach Net Zero by 2030	Growth in Employees Required (assumes no skills gap)	Estimated # Employees Needed to Reach Net Zero by 2050	Growth in Employees Required (assumes no skills gap)	Estimated # Employees Needed to Reach Net Zero by 2050	Growth in Employees Required (assumes no skills gap)
Technicians	3,335	1,292	38.7%	4,627	4,328	-6.5%	5,756	24.4%	6,768	46.3%	16,074	247.4%
Snr Management SME	1,688	299	17.7%	1,986	2,193	10.4%	2,930	47.5%	3,441	73.2%	8,106	308.0%
Supervisory	1,510	264	17.4%	1,774	1,978	11.5%	2,570	44.9%	3,021	70.3%	7,282	310.5%
Middle / Junior Management	1,498	278	18.5%	1,776	1,957	10.2%	2,549	43.5%	3,004	69.1%	7,176	304.1%
Designer / Developer	387	146	37.9%	533	507	-4.9%	665	24.7%	784	47.2%	1,838	244.9%
Clerical	783	3	0.4%	786	1,014	29.0%	1,328	69.0%	1,569	99.6%	3,756	377.9%
Self Employed	651	118	18.2%	769	848	10.3%	1,117	45.3%	1,299	68.9%	3,198	315.8%
Advisor or Agent	2	0	17.5%	3	3	13.3%	4	43.7%	5	72.1%	11	306.3%
Educator	230	22	9.4%	252	333	32.4%	244	-3.2%	403	60.0%	266	5.7%
Specialist or Consultant	502	30	5.9%	532	654	23.0%	868	63.2%	1,025	92.8%	2,436	358.1%
Editor	11	0	3.8%	11	14	26.6%	19	67.4%	22	91.3%	52	359.8%
Industrial Researchers	306	28	9.2%	334	396	18.6%	521	56.1%	626	87.4%	1,504	350.5%
Scientist	72	27	38.0%	99	94	-5.0%	125	25.6%	143	44.0%	346	248.6%
Maintenance Engineer	1,806	182	10.1%	1,987	2,356	18.5%	3,121	57.0%	3,642	83.3%	8,597	332.6%
Civil Engineer	283	108	38.2%	390	375	-3.9%	484	23.9%	581	48.9%	1,357	247.4%
Production Engineer	1,228	703	57.2%	1,931	1,630	-15.6%	2,088	8.1%	2,479	28.4%	5,887	204.9%
Power distribution Engineer	976	524	53.7%	1,500	1,305	-13.0%	1,673	11.6%	1,998	33.2%	4,724	215.0%
Construction Engineer	559	150	26.7%	709	733	3.3%	962	35.6%	1,116	57.4%	2,664	275.8%
Sales Exec	827	152	18.3%	978	1,098	12.3%	1,405	43.6%	1,700	73.8%	3,983	307.2%
Marketing Personnel	822	155	18.8%	976	1,073	9.9%	1,391	42.5%	1,669	71.0%	3,920	301.6%
General Semi Skilled Worker	2,104	73	3.5%	2,178	2,738	25.7%	3,592	64.9%	4,222	93.9%	10,193	368.1%
General Labour	3,842	0	0.0%	3,842	5,009	30.4%	6,585	71.4%	7,664	99.5%	18,555	383.0%
Other Employees	1,990	191	9.6%	2,180	2,581	18.4%	3,433	57.4%	4,030	84.9%	9,651	342.7%
Administrative workers	1,084	40	3.7%	1,124	1,417	26.1%	1,854	64.9%	2,205	96.2%	5,224	364.7%
Total	26,495	4,783	18.1%	31,278	34,634	10.7%	45,281	44.8%	53,416	70.8%	126,801	305.4%

KMatrix

Biomass

| | Biomass | | | | Net Zero by 2030 | | | | Net Zero by 2050 | | | |
| | Current Employment | | | | Worst Case Scenario | | Best Case Scenario | | Worst Case Scenario | | Best Case Scenario | |
SOC	# Employees 2019/20	Shortage of Employees 2019/20	Shortage as a % of Total Employees	# Employees if Skills Gap Filled	Estimated # Employees Needed to Reach Net Zero by 2030	Growth in Employees Required (assumes no skills gap)	Estimated # Employees Needed to Reach Net Zero by 2030	Growth in Employees Required (assumes no skills gap)	Estimated # Employees Needed to Reach Net Zero by 2050	Growth in Employees Required (assumes no skills gap)	Estimated # Employees Needed to Reach Net Zero by 2050	Growth in Employees Required (assumes no skills gap)
Technicians	1,001	221	22.0%	1,222	1,311	7.3%	1,715	40.3%	2,022	65.5%	21,703	1676.1%
Snr Management SME	688	78	11.3%	765	901	17.7%	1,173	53.3%	1,388	81.3%	4,810	528.4%
Supervisory	542	61	11.2%	603	712	18.1%	931	54.4%	1,098	82.1%	3,307	448.2%
Middle / Junior Management	546	61	11.2%	607	716	18.0%	948	56.2%	1,104	81.9%	2,583	325.7%
Designer / Developer	218	49	22.3%	267	282	5.7%	372	39.6%	442	65.7%	2,626	885.2%
Clerical	292	1	0.2%	292	380	29.9%	498	70.3%	588	101.1%	1,046	257.8%
Self Employed	147	17	11.7%	164	194	18.1%	253	54.5%	295	80.1%	1,417	764.2%
Advisor or Agent	40	5	11.3%	45	52	17.0%	69	53.6%	81	81.4%	707	1483.6%
Educator	245	25	10.2%	270	356	31.8%	258	-4.4%	428	58.5%	195	-27.9%
Specialist or Consultant	407	14	3.3%	421	533	26.7%	699	66.1%	825	95.9%	283	-32.7%
Editor	47	1	2.3%	48	62	28.8%	80	67.0%	95	99.2%	1,951	3983.9%
Industrial Researchers	42	2	5.9%	44	55	24.7%	72	62.1%	84	90.9%	225	407.6%
Scientist	91	21	23.2%	112	118	5.2%	158	40.8%	185	64.4%	201	79.1%
Maintenance Engineer	548	37	6.7%	585	718	22.8%	946	61.7%	1,113	90.3%	442	-24.4%
Civil Engineer	53	12	22.8%	65	69	6.3%	91	39.5%	107	64.2%	2,651	3965.7%
Production Engineer	659	225	34.2%	885	856	-3.2%	1,137	28.6%	1,340	51.4%	255	-71.1%
Power distribution Engineer	258	86	33.4%	344	337	-1.9%	442	28.5%	520	51.1%	3,188	826.6%
Construction Engineer	46	8	17.3%	54	60	11.5%	79	46.1%	92	71.7%	1,235	2192.6%
Sales Exec	283	32	11.2%	315	368	16.8%	487	54.8%	565	79.7%	221	-29.7%
Marketing Personnel	271	30	11.2%	302	356	17.9%	464	53.7%	549	81.8%	1,354	348.7%
General Semi Skilled Worker	570	12	2.2%	583	744	27.7%	982	68.6%	1,157	98.6%	1,304	123.8%
General Labour	1,350	0	0.0%	1,350	1,764	30.7%	2,317	71.7%	2,729	102.1%	2,737	102.8%
Other Employees	812	46	5.6%	858	1,055	23.0%	1,398	63.0%	1,634	90.5%	6,454	652.2%
Administrative workers	315	7	2.2%	322	411	27.6%	537	66.8%	635	97.3%	3,917	1116.6%
Total	9,472	1,050	11.1%	10,522	12,410	17.9%	16,107	53.1%	19,077	81.3%	1,506	-85.7%

KMatrix

Building Technologies

SOC	Building Technologies Current Employment				Net Zero by 2030				Net Zero by 2050			
					Worst Case Scenario		Best Case Scenario		Worst Case Scenario		Best Case Scenario	
	# Employees 2019/20	Shortage of Employees 2019/20	Shortage as a % of Total Employees	# Employees if Skills Gap Filled	Estimated # Employees Needed to Reach Net Zero by 2030	Growth in Employees Required (assumes no skills gap)	Estimated # Employees Needed to Reach Net Zero by 2030	Growth in Employees Required (assumes no skills gap)	Estimated # Employees Needed to Reach Net Zero by 2050	Growth in Employees Required (assumes no skills gap)	Estimated # Employees Needed to Reach Net Zero by 2050	Growth in Employees Required (assumes no skills gap)
Technicians	1,383	190	13.7%	1,573	1,807	14.9%	2,379	51.2%	2,791	77.4%	6,647	322.6%
Snr Management SME	740	50	6.7%	790	970	22.7%	1,279	61.9%	1,496	89.4%	3,562	350.9%
Supervisory	759	52	6.8%	811	995	22.8%	1,299	60.2%	1,544	90.4%	3,651	350.3%
Middle / Junior Management	720	49	6.8%	769	944	22.8%	1,231	60.1%	1,453	89.0%	3,473	351.6%
Designer / Developer	1,256	164	13.1%	1,420	1,634	15.1%	2,164	52.4%	2,533	78.4%	6,022	324.0%
Clerical	404	1	0.1%	405	528	30.4%	695	71.8%	819	102.4%	1,937	378.3%
Self Employed	1,015	66	6.5%	1,081	1,326	22.7%	1,725	59.6%	2,035	88.3%	4,890	352.4%
Advisor or Agent	487	33	6.7%	519	635	22.3%	832	60.2%	983	89.4%	2,341	350.8%
Educator	323	21	6.6%	344	415	20.8%	549	59.6%	654	90.3%	1,556	352.3%
Specialist or Consultant	1,397	27	2.0%	1,425	1,826	28.1%	2,387	67.6%	2,835	99.0%	6,758	374.4%
Editor	431	6	1.4%	437	568	29.9%	743	69.9%	875	100.2%	2,064	371.9%
Industrial Researchers	538	18	3.3%	555	704	26.7%	922	66.1%	1,090	96.2%	2,588	366.0%
Scientist	804	107	13.3%	911	1,058	16.2%	1,385	52.0%	1,624	78.4%	3,859	323.7%
Maintenance Engineer	726	31	4.2%	757	947	25.2%	1,248	64.9%	1,468	94.0%	3,473	358.9%
Civil Engineer	318	44	13.7%	362	417	15.2%	544	50.2%	642	77.4%	1,530	322.6%
Production Engineer	346	70	20.2%	416	452	8.6%	593	42.7%	696	67.4%	1,669	301.3%
Power distribution Engineer	359	73	20.4%	432	467	8.0%	614	42.0%	723	67.1%	1,724	298.7%
Construction Engineer	301	31	10.3%	331	392	18.2%	513	54.9%	608	83.4%	1,443	335.4%
Sales Exec	461	31	6.7%	492	604	22.7%	793	61.0%	928	88.4%	2,215	349.8%
Marketing Personnel	346	23	6.7%	369	447	21.1%	593	60.8%	698	89.3%	1,654	348.5%
General Semi Skilled Worker	696	10	1.4%	706	913	29.3%	1,191	68.6%	1,403	98.7%	3,355	375.1%
General Labour	1,244	0	0.0%	1,244	1,634	31.3%	2,131	71.3%	2,510	101.8%	5,974	380.3%
Other Employees	881	30	3.4%	910	1,155	26.9%	1,508	65.7%	1,780	95.5%	4,224	364.1%
Administrative workers	607	8	1.3%	615	792	28.7%	1,042	69.3%	1,234	100.6%	2,908	372.6%
Total	16,542	1,133	6.8%	17,675	21,630	22.4%	28,360	60.5%	33,426	89.1%	79,514	349.9%

Carbon Finance – many roles are advisory

SOC	Carbon Finance — Current Employment				Net Zero by 2030				Net Zero by 2050			
					Worst Case Scenario		Best Case Scenario		Worst Case Scenario		Best Case Scenario	
	# Employees 2019/20	Shortage of Employees 2019/20	Shortage as a % of Total Employees	# Employees if Skills Gap Filled	Estimated # Employees Needed to Reach Net Zero by 2030	Growth in Employees Required (assumes no skills gap)	Estimated # Employees Needed to Reach Net Zero by 2030	Growth in Employees Required (assumes no skills gap)	Estimated # Employees Needed to Reach Net Zero by 2050	Growth in Employees Required (assumes no skills gap)	Estimated # Employees Needed to Reach Net Zero by 2050	Growth in Employees Required (assumes no skills gap)
Technicians	5,009	2,634	52.6%	7,643	6,841	-10.5%	8,675	13.5%	10,165	33.0%	25,354	231.7%
Snr Management SME	2,449	466	19.0%	2,916	3,100	6.3%	4,307	47.7%	5,260	80.4%	11,620	298.5%
Supervisory	2,570	538	20.9%	3,108	3,487	12.2%	4,255	36.9%	5,206	67.5%	12,693	308.4%
Middle / Junior Management	2,570	539	21.0%	3,108	3,427	10.3%	4,539	46.0%	5,214	67.7%	11,766	278.5%
Designer / Developer	4,255	1,857	43.6%	6,111	5,569	-8.9%	7,236	18.4%	8,561	40.1%	20,231	231.0%
Clerical	1,344	5	0.4%	1,350	1,841	36.4%	2,308	71.0%	2,798	107.3%	6,360	371.1%
Self Employed	3,775	966	25.6%	4,741	5,065	6.8%	6,313	33.2%	7,586	60.0%	17,970	279.0%
Advisor or Agent	711	103	14.5%	814	940	15.4%	1,244	52.8%	1,491	83.1%	3,253	299.6%
Educator	11	2	22.5%	13	14	1.4%	18	36.9%	21	59.7%	55	308.8%
Specialist or Consultant	4,311	354	8.2%	4,665	5,616	20.4%	7,375	58.1%	9,133	95.8%	21,540	361.8%
Editor	142	7	4.9%	149	181	21.7%	249	67.0%	273	83.3%	691	363.4%
Industrial Researchers	889	86	9.7%	975	1,261	29.2%	1,437	47.3%	1,655	69.7%	4,382	349.2%
Scientist	908	412	45.4%	1,320	1,274	-3.4%	1,681	27.4%	1,862	41.1%	4,634	251.2%
Maintenance Engineer	7,626	1,235	16.2%	8,860	9,800	10.6%	12,724	43.6%	15,919	79.7%	38,237	331.6%
Civil Engineer	2,644	966	36.5%	3,610	3,541	-1.9%	4,683	29.7%	5,268	45.9%	13,045	261.3%
Production Engineer	3,526	2,373	67.3%	5,899	4,584	-22.3%	5,792	-1.8%	7,693	30.4%	17,524	197.1%
Power distribution Engineer	3,785	2,449	64.7%	6,234	5,125	-17.8%	6,601	5.9%	7,459	19.7%	18,270	193.1%
Construction Engineer	2,578	826	32.1%	3,404	3,389	-0.4%	4,406	29.4%	5,398	58.6%	12,173	257.6%
Sales Exec	263	72	27.3%	335	374	11.8%	450	34.5%	519	55.2%	1,281	283.0%
Marketing Personnel	206	40	19.5%	246	278	12.8%	335	36.0%	432	75.3%	928	276.7%
General Semi Skilled Worker	5,172	229	4.4%	5,401	6,620	22.6%	8,681	60.7%	10,504	94.5%	24,092	346.0%
General Labour	3,995	0	0.0%	3,995	5,254	31.5%	6,640	66.2%	8,518	113.2%	19,302	383.2%
Other Employees	3,760	346	9.2%	4,106	4,845	18.0%	6,354	54.7%	7,988	94.6%	17,527	326.9%
Administrative workers	2,670	115	4.3%	2,785	3,443	23.6%	4,461	60.2%	5,582	100.4%	12,725	356.9%
Total	65,169	16,620	25.5%	81,789	85,868	5.0%	110,763	35.4%	134,506	64.5%	315,654	285.9%

K Matrix

Geothermal

SOC	Geothermal Current Employment				Net Zero by 2030				Net Zero by 2050			
					Worst Case Scenario		Best Case Scenario		Worst Case Scenario		Best Case Scenario	
	# Employees 2019/20	Shortage of Employees 2019/20	Shortage as a % of Total Employees	# Employees if Skills Gap Filled	Estimated # Employees Needed to Reach Net Zero by 2030	Growth in Employees Required (assumes no skills gap)	Estimated # Employees Needed to Reach Net Zero by 2030	Growth in Employees Required (assumes no skills gap)	Estimated # Employees Needed to Reach Net Zero by 2050	Growth in Employees Required (assumes no skills gap)	Estimated # Employees Needed to Reach Net Zero by 2050	Growth in Employees Required (assumes no skills gap)
Technicians	2,952	1,355	45.9%	4,307	3,879	-9.9%	5,079	17.9%	5,952	38.2%	14,202	229.7%
Snr Management SME	1,368	309	22.6%	1,677	1,791	6.8%	2,352	40.2%	2,768	65.0%	6,599	293.4%
Supervisory	1,556	358	23.0%	1,914	2,033	6.2%	2,671	39.5%	3,146	64.3%	7,444	288.8%
Middle / Junior Management	1,550	359	23.2%	1,909	2,025	6.1%	2,651	38.8%	3,128	63.8%	7,435	289.4%
Designer / Developer	1,301	589	45.3%	1,890	1,693	-10.4%	2,233	18.2%	2,631	39.2%	6,257	231.0%
Clerical	793	4	0.5%	797	1,042	30.8%	1,365	71.3%	1,601	101.0%	3,837	381.6%
Self Employed	1,236	281	22.8%	1,517	1,613	6.3%	2,125	40.1%	2,502	65.0%	5,974	293.8%
Advisor or Agent	764	172	22.5%	936	997	6.6%	1,303	39.3%	1,538	64.4%	3,676	292.9%
Educator	737	68	9.2%	805	1,070	33.0%	775	-3.7%	1,289	60.2%	849	5.6%
Specialist or Consultant	1,230	84	6.9%	1,314	1,603	22.0%	2,112	60.8%	2,482	88.9%	5,916	350.2%
Editor	491	22	4.4%	512	641	25.1%	846	65.2%	994	94.0%	2,358	360.3%
Industrial Researchers	371	43	11.5%	414	484	16.8%	637	53.8%	747	80.4%	1,788	331.5%
Scientist	534	244	45.7%	778	703	-9.7%	922	18.5%	1,079	38.6%	2,549	227.4%
Maintenance Engineer	2,878	395	13.7%	3,274	3,774	15.3%	4,950	51.2%	5,791	76.9%	13,885	324.1%
Civil Engineer	1,009	452	44.8%	1,460	1,309	-10.4%	1,736	18.9%	2,038	39.6%	4,857	232.6%
Production Engineer	1,623	1,121	69.0%	2,744	2,118	-22.8%	2,772	1.0%	3,272	19.2%	7,766	183.0%
Power distribution Engineer	1,284	857	66.8%	2,141	1,676	-21.7%	2,208	3.1%	2,601	21.5%	6,161	187.8%
Construction Engineer	1,005	346	34.4%	1,352	1,319	-2.4%	1,733	28.2%	2,033	50.4%	4,817	256.4%
Sales Exec	1,378	312	22.6%	1,690	1,793	6.1%	2,357	39.5%	2,777	64.4%	6,521	286.0%
Marketing Personnel	1,129	260	23.1%	1,390	1,479	6.4%	1,940	39.6%	2,279	64.0%	5,414	289.6%
General Semi Skilled Worker	2,406	109	4.5%	2,516	3,148	25.1%	4,110	63.4%	4,853	92.9%	11,541	358.7%
General Labour	4,011	0	0.0%	4,011	5,270	31.4%	6,895	71.9%	8,125	102.6%	19,341	382.1%
Other Employees	2,423	276	11.4%	2,699	3,171	17.5%	4,147	53.6%	4,893	81.3%	11,622	330.6%
Administrative workers	1,265	57	4.5%	1,322	1,659	25.5%	2,178	64.7%	2,565	93.9%	6,088	360.4%
Total	**35,295**	**8,075**	**22.9%**	**43,370**	**46,289**	**6.7%**	**60,098**	**38.6%**	**71,084**	**63.9%**	**166,895**	**284.8%**

KMatrix

Photovoltaic

SOC	Photovoltaic Current Employment				Net Zero by 2030				Net Zero by 2050			
					Worst Case Scenario		Best Case Scenario		Worst Case Scenario		Best Case Scenario	
	# Employees 2019/20	Shortage of Employees 2019/20	Shortage as a % of Total Employees	# Employees if Skills Gap Filled	Estimated # Employees Needed to Reach Net Zero by 2030	Growth in Employees Required (assumes no skills gap)	Estimated # Employees Needed to Reach Net Zero by 2030	Growth in Employees Required (assumes no skills gap)	Estimated # Employees Needed to Reach Net Zero by 2050	Growth in Employees Required (assumes no skills gap)	Estimated # Employees Needed to Reach Net Zero by 2050	Growth in Employees Required (assumes no skills gap)
Technicians	545	50	9.2%	595	714	20.0%	937	57.4%	1,101	84.9%	2,601	336.9%
Snr Management SME	362	16	4.5%	378	472	24.9%	621	64.1%	732	93.4%	1,746	361.5%
Supervisory	263	12	4.6%	275	341	24.3%	449	63.7%	530	92.9%	1,273	363.5%
Middle / Junior Management	265	12	4.6%	277	346	24.9%	454	63.8%	536	93.6%	1,278	361.5%
Designer / Developer	312	29	9.3%	341	406	18.8%	538	57.7%	630	84.6%	1,495	338.0%
Clerical	163	0	0.1%	163	213	30.4%	279	71.0%	330	101.9%	783	379.4%
Self Employed	198	9	4.7%	207	259	25.3%	342	65.1%	398	92.1%	951	359.4%
Advisor or Agent	239	10	4.4%	250	312	24.9%	413	65.5%	487	95.2%	1,153	361.6%
Educator	159	16	10.2%	175	229	30.6%	167	-4.8%	278	58.6%	184	5.1%
Specialist or Consultant	270	4	1.4%	273	353	29.0%	464	69.7%	542	98.1%	1,296	374.0%
Editor	57	0	0.9%	58	75	31.0%	97	67.8%	115	100.4%	274	376.7%
Industrial Researchers	311	7	2.3%	318	407	27.8%	529	66.3%	629	97.7%	1,501	371.8%
Scientist	303	28	9.1%	331	395	19.5%	518	56.7%	611	84.8%	1,467	343.7%
Maintenance Engineer	375	10	2.7%	385	490	27.4%	644	67.4%	759	97.3%	1,785	364.1%
Civil Engineer	155	14	9.1%	169	200	18.4%	264	55.9%	314	85.4%	739	336.9%
Production Engineer	152	20	13.4%	173	199	15.2%	261	51.1%	307	77.9%	732	324.2%
Power distribution Engineer	201	27	13.7%	228	261	14.4%	342	50.1%	405	77.5%	968	324.5%
Construction Engineer	167	11	6.9%	178	218	22.1%	288	61.3%	338	89.4%	800	348.3%
Sales Exec	204	9	4.6%	213	266	24.8%	350	63.8%	412	92.9%	983	360.6%
Marketing Personnel	176	8	4.6%	185	232	25.8%	303	64.2%	359	94.4%	842	356.1%
General Semi Skilled Worker	417	4	0.9%	421	542	28.6%	713	69.3%	836	98.6%	2,002	375.3%
General Labour	916	0	0.0%	916	1,202	31.1%	1,575	71.9%	1,853	102.3%	4,415	381.8%
Other Employees	387	9	2.3%	396	502	26.9%	662	67.3%	783	97.9%	1,865	371.5%
Administrative workers	262	2	0.9%	264	341	29.2%	446	69.1%	530	100.8%	1,255	375.5%
Total	6,859	311	4.5%	7,170	8,976	25.2%	11,655	62.6%	13,815	92.7%	32,389	351.8%

Recovery and Recycling

SOC	Recovery and Recycling — Current Employment				Net Zero by 2030 — Worst Case Scenario		Net Zero by 2030 — Best Case Scenario		Net Zero by 2050 — Worst Case Scenario		Net Zero by 2050 — Best Case Scenario	
	# Employees 2019/20	Shortage of Employees 2019/20	Shortage as a % of Total Employees	# Employees if Skills Gap Filled	Estimated # Employees Needed to Reach Net Zero by 2030	Growth in Employees Required (assumes no skills gap)	Estimated # Employees Needed to Reach Net Zero by 2030	Growth in Employees Required (assumes no skills gap)	Estimated # Employees Needed to Reach Net Zero by 2050	Growth in Employees Required (assumes no skills gap)	Estimated # Employees Needed to Reach Net Zero by 2050	Growth in Employees Required (assumes no skills gap)
Technicians	1,080	388	35.9%	1,468	1,421	-3.2%	1,854	26.3%	2,184	48.7%	5,197	253.9%
Snr Management SME	526	96	18.3%	622	685	10.2%	905	45.5%	1,061	70.7%	2,522	305.6%
Supervisory	558	102	18.3%	660	730	10.6%	952	44.3%	1,124	70.4%	2,671	304.9%
Middle / Junior Management	555	101	18.2%	656	727	10.8%	948	44.6%	1,117	70.4%	2,665	306.4%
Designer / Developer	895	325	36.4%	1,221	1,173	-3.9%	1,535	25.8%	1,812	48.4%	4,301	252.4%
Clerical	279	1	0.4%	280	366	30.6%	478	70.6%	564	101.4%	1,337	377.5%
Self Employed	305	56	18.4%	362	399	10.3%	527	45.6%	618	70.9%	1,465	305.0%
Advisor or Agent	87	17	19.2%	104	116	11.1%	150	43.9%	177	70.5%	421	304.7%
Educator	3	0	18.6%	3	3	9.5%	5	44.3%	5	73.0%	13	305.2%
Specialist or Consultant	716	38	5.4%	754	936	24.1%	1,224	62.2%	1,446	91.6%	3,443	356.4%
Editor	56	2	3.8%	58	74	26.7%	96	65.5%	113	95.1%	266	357.5%
Industrial Researchers	227	21	9.1%	247	296	19.8%	389	57.4%	459	85.6%	1,093	341.9%
Scientist	253	91	36.1%	345	331	-3.9%	436	26.4%	512	48.6%	1,214	252.1%
Maintenance Engineer	881	97	11.0%	977	1,149	17.5%	1,510	54.5%	1,779	82.1%	4,242	334.0%
Civil Engineer	482	176	36.5%	657	632	-3.9%	826	25.6%	975	48.3%	2,311	251.6%
Production Engineer	587	320	54.4%	907	771	-15.0%	1,004	10.7%	1,186	30.8%	2,824	211.4%
Power distribution Engineer	511	282	55.2%	793	669	-15.6%	877	10.5%	1,036	30.6%	2,466	211.0%
Construction Engineer	477	128	26.8%	604	622	2.9%	819	35.5%	960	58.9%	2,286	278.2%
Sales Exec	731	134	18.3%	865	957	10.5%	1,258	45.3%	1,478	70.7%	3,500	304.4%
Marketing Personnel	512	94	18.4%	607	670	10.5%	878	44.7%	1,034	70.6%	2,459	305.5%
General Semi Skilled Worker	1,390	50	3.6%	1,440	1,817	26.2%	2,386	65.8%	2,806	94.9%	6,695	365.0%
General Labour	1,955	0	0.0%	1,955	2,551	30.5%	3,348	71.3%	3,946	101.9%	9,444	383.2%
Other Employees	662	61	9.2%	722	864	19.6%	1,134	57.0%	1,337	85.0%	3,175	339.4%
Administrative workers	514	19	3.7%	533	673	26.1%	883	65.5%	1,040	95.1%	2,468	362.9%
Total	**14,241**	**2,599**	**18.3%**	**16,841**	**18,630**	**10.6%**	**24,421**	**45.0%**	**28,770**	**70.8%**	**68,478**	**306.6%**

KMatrix

Waste Management

| | Waste Management | | | | Net Zero by 2030 | | | | Net Zero by 2050 | | | |
| | Current Employment | | | | Worst Case Scenario | | Best Case Scenario | | Worst Case Scenario | | Best Case Scenario | |
SOC	# Employees 2019/20	Shortage of Employees 2019/20	Shortage as a % of Total Employees	# Employees if Skills Gap Filled	Estimated # Employees Needed to Reach Net Zero by 2030	Growth in Employees Required (assumes no skills gap)	Estimated # Employees Needed to Reach Net Zero by 2030	Growth in Employees Required (assumes no skills gap)	Estimated # Employees Needed to Reach Net Zero by 2050	Growth in Employees Required (assumes no skills gap)	Estimated # Employees Needed to Reach Net Zero by 2050	Growth in Employees Required (assumes no skills gap)
Technicians	1,085	147	13.5%	1,231	1,412	14.6%	1,875	52.3%	2,191	78.0%	5,145	317.8%
Snr Management SME	467	32	6.9%	499	610	22.1%	805	61.3%	937	87.8%	2,248	350.5%
Supervisory	510	34	6.7%	544	663	21.8%	871	60.0%	1,030	89.2%	2,455	350.9%
Middle / Junior Management	505	34	6.8%	539	662	22.8%	865	60.5%	1,026	90.4%	2,422	349.3%
Designer / Developer	324	44	13.5%	368	426	15.7%	557	51.3%	660	79.1%	1,555	322.2%
Clerical	265	0	0.1%	265	346	30.7%	450	69.7%	531	100.3%	1,270	379.2%
Self Employed	394	27	6.8%	421	517	22.8%	676	60.7%	796	89.0%	1,888	348.7%
Advisor or Agent	169	11	6.7%	180	221	22.6%	288	60.2%	339	88.4%	812	351.4%
Educator	29	2	6.6%	31	38	21.4%	50	60.8%	59	88.6%	142	355.7%
Specialist or Consultant	315	6	2.1%	321	411	28.1%	537	67.2%	635	97.9%	1,499	366.7%
Editor	84	1	1.4%	85	108	27.6%	144	69.2%	170	100.4%	404	375.8%
Industrial Researchers	185	6	3.4%	191	241	25.8%	317	65.7%	374	95.4%	889	364.4%
Scientist	162	22	13.6%	184	213	16.0%	278	51.3%	326	77.6%	779	324.2%
Maintenance Engineer	914	38	4.1%	952	1,196	25.7%	1,558	63.7%	1,842	93.5%	4,398	362.1%
Civil Engineer	258	34	13.2%	292	339	16.3%	442	51.6%	522	78.9%	1,238	324.8%
Production Engineer	428	84	19.6%	512	559	9.2%	731	43.0%	858	67.7%	2,060	302.7%
Power distribution Engineer	431	87	20.2%	518	563	8.7%	741	43.3%	872	68.6%	2,065	299.0%
Construction Engineer	368	37	10.2%	405	482	19.0%	631	55.6%	746	83.9%	1,763	335.0%
Sales Exec	292	19	6.6%	311	381	22.4%	501	60.9%	583	87.3%	1,409	352.4%
Marketing Personnel	253	17	6.8%	270	332	22.9%	432	59.7%	509	88.5%	1,216	349.9%
General Semi Skilled Worker	779	11	1.4%	790	1,016	28.6%	1,346	70.4%	1,574	99.3%	3,725	371.5%
General Labour	1,279	0	0.0%	1,279	1,675	31.0%	2,194	71.5%	2,590	102.5%	6,133	379.6%
Other Employees	790	26	3.3%	817	1,032	26.3%	1,356	66.0%	1,596	95.3%	3,765	360.9%
Administrative workers	438	6	1.3%	444	577	29.9%	756	70.3%	889	100.2%	2,105	374.2%
Total	**10,722**	**727**	**6.8%**	**11,449**	**14,019**	**22.4%**	**18,401**	**60.7%**	**21,655**	**89.1%**	**51,385**	**348.8%**

Water and Waste Water Treatment

SOC	Water & Waste Water Treatment				Net Zero by 2030				Net Zero by 2050			
	Current Employment				Worst Case Scenario		Best Case Scenario		Worst Case Scenario		Best Case Scenario	
	# Employees 2019/20	Shortage of Employees 2019/20	Shortage as a % of Total Employees	# Employees if Skills Gap Filled	Estimated # Employees Needed to Reach Net Zero by 2030	Growth in Employees Required (assumes no skills gap)	Estimated # Employees Needed to Reach Net Zero by 2030	Growth in Employees Required (assumes no skills gap)	Estimated # Employees Needed to Reach Net Zero by 2050	Growth in Employees Required (assumes no skills gap)	Estimated # Employees Needed to Reach Net Zero by 2050	Growth in Employees Required (assumes no skills gap)
Technicians	1,682	154	9.2%	1,836	2,197	19.6%	2,884	57.0%	3,377	83.9%	8,082	340.1%
Snr Management SME	797	36	4.5%	832	1,046	25.7%	1,370	64.6%	1,609	93.3%	3,848	362.4%
Supervisory	834	36	4.3%	869	1,095	26.0%	1,433	64.9%	1,684	93.7%	4,002	360.3%
Middle / Junior Management	831	37	4.4%	868	1,086	25.2%	1,425	64.2%	1,681	93.7%	4,004	361.5%
Designer / Developer	647	57	8.7%	704	841	19.5%	1,114	58.3%	1,308	85.9%	3,098	340.3%
Clerical	425	0	0.1%	425	555	30.6%	730	71.6%	859	102.1%	2,047	381.4%
Self Employed	809	36	4.4%	845	1,051	24.4%	1,391	64.6%	1,636	93.6%	3,890	360.3%
Advisor or Agent	76	4	4.6%	80	100	25.3%	131	63.7%	155	94.7%	368	362.1%
Educator	3	0	4.5%	3	4	25.4%	5	62.5%	5	90.5%	13	361.8%
Specialist or Consultant	676	9	1.3%	685	874	27.6%	1,157	69.0%	1,353	97.6%	3,246	374.1%
Editor	51	0	0.9%	51	67	30.1%	86	68.8%	103	102.0%	242	373.5%
Industrial Researchers	70	2	2.2%	72	91	27.6%	120	67.8%	141	96.9%	339	373.2%
Scientist	54	5	8.7%	59	70	19.8%	94	61.4%	109	85.7%	259	342.2%
Maintenance Engineer	1,907	51	2.7%	1,958	2,496	27.4%	3,286	67.8%	3,875	97.9%	9,199	369.7%
Civil Engineer	522	46	8.8%	568	683	20.3%	895	57.6%	1,055	85.8%	2,517	343.2%
Production Engineer	919	120	13.0%	1,039	1,211	16.5%	1,576	51.6%	1,852	78.2%	4,388	322.2%
Power distribution Engineer	883	118	13.4%	1,001	1,155	15.3%	1,509	50.7%	1,788	78.6%	4,234	322.8%
Construction Engineer	692	46	6.6%	738	908	23.0%	1,188	61.1%	1,400	89.7%	3,332	351.7%
Sales Exec	248	11	4.6%	259	323	24.7%	428	65.2%	501	93.5%	1,190	359.5%
Marketing Personnel	221	10	4.4%	231	289	25.0%	379	63.9%	446	93.1%	1,064	360.5%
General Semi Skilled Worker	1,380	12	0.9%	1,392	1,805	29.6%	2,386	71.3%	2,797	100.9%	6,660	378.4%
General Labour	1,836	0	0.0%	1,836	2,401	30.7%	3,142	71.1%	3,705	101.8%	8,780	378.2%
Other Employees	1,370	31	2.2%	1,400	1,794	28.1%	2,350	67.8%	2,751	96.5%	6,604	371.5%
Administrative workers	729	6	0.9%	735	959	30.5%	1,251	70.2%	1,474	100.5%	3,511	377.7%
Total	17,661	826	4.7%	18,487	23,100	25.0%	30,328	64.1%	35,665	92.9%	84,918	359.3%

KMatrix

Wind

| | Wind | | | | Net Zero by 2030 | | | | Net Zero by 2050 | | | |
| | Current Employment | | | | Worst Case Scenario | | Best Case Scenario | | Worst Case Scenario | | Best Case Scenario | |
SOC	# Employees 2019/20	Shortage of Employees 2019/20	Shortage as a % of Total Employees	# Employees if Skills Gap Filled	Estimated # Employees Needed to Reach Net Zero by 2030	Growth in Employees Required (assumes no skills gap)	Estimated # Employees Needed to Reach Net Zero by 2030	Growth in Employees Required (assumes no skills gap)	Estimated # Employees Needed to Reach Net Zero by 2050	Growth in Employees Required (assumes no skills gap)	Estimated # Employees Needed to Reach Net Zero by 2050	Growth in Employees Required (assumes no skills gap)
Technicians	2,585	362	14.0%	2,947	3,373	14.5%	4,435	50.5%	5,235	77.6%	12,367	319.7%
Snr Management SME	1,312	90	6.9%	1,403	1,712	22.0%	2,259	61.1%	2,640	88.2%	6,303	349.4%
Supervisory	1,343	92	6.8%	1,435	1,760	22.6%	2,292	59.7%	2,709	88.8%	6,501	353.1%
Middle / Junior Management	1,336	91	6.8%	1,427	1,745	22.3%	2,303	61.3%	2,699	89.1%	6,432	350.6%
Designer / Developer	118	16	13.4%	133	153	14.8%	201	50.3%	239	79.1%	569	326.5%
Clerical	692	1	0.1%	693	902	30.1%	1,186	71.1%	1,393	101.0%	3,314	378.2%
Self Employed	401	27	6.8%	428	525	22.7%	689	61.0%	802	87.3%	1,919	348.4%
Advisor or Agent	56	4	7.2%	60	74	23.7%	95	59.4%	115	91.5%	268	347.3%
Educator	308	31	9.9%	338	448	32.3%	324	-4.3%	537	58.5%	354	4.5%
Specialist or Consultant	514	11	2.1%	525	670	27.6%	883	68.1%	1,043	98.7%	2,490	374.2%
Editor	31	0	1.4%	31	40	28.3%	52	67.9%	61	95.7%	148	375.4%
Industrial Researchers	33	1	3.3%	34	44	29.0%	57	66.2%	66	92.0%	159	365.3%
Scientist	48	6	12.7%	55	63	16.4%	84	54.0%	98	79.6%	231	322.5%
Maintenance Engineer	2,063	83	4.0%	2,146	2,701	25.8%	3,546	65.2%	4,189	95.2%	9,851	359.0%
Civil Engineer	222	30	13.7%	253	289	14.3%	381	50.6%	449	77.8%	1,072	324.0%
Production Engineer	1,575	325	20.6%	1,900	2,068	8.8%	2,691	41.6%	3,180	67.4%	7,613	300.7%
Power distribution Engineer	838	172	20.5%	1,010	1,102	9.1%	1,435	42.1%	1,698	68.1%	4,032	299.2%
Construction Engineer	554	58	10.5%	612	723	18.0%	941	53.7%	1,121	83.0%	2,671	336.0%
Sales Exec	540	37	6.8%	576	704	22.1%	931	61.5%	1,092	89.5%	2,586	348.7%
Marketing Personnel	523	36	6.8%	559	686	22.7%	897	60.4%	1,057	89.2%	2,513	349.7%
General Semi Skilled Worker	1,568	22	1.4%	1,590	2,048	28.9%	2,697	69.7%	3,168	99.3%	7,582	377.0%
General Labour	3,225	0	0.0%	3,225	4,215	30.7%	5,520	71.2%	6,522	102.3%	15,538	381.9%
Other Employees	2,378	81	3.4%	2,458	3,111	26.6%	4,057	65.1%	4,803	95.4%	11,380	363.0%
Administrative workers	884	12	1.4%	897	1,151	28.4%	1,516	69.1%	1,786	99.1%	4,239	372.8%
Total	23,148	1,587	6.9%	24,735	30,306	22.5%	39,471	59.6%	46,702	88.8%	110,130	345.2%

KMatrix

Appendix 7 - LCEGS Current Employment, Skills Gaps and Forecasts for Net Zero 2030 and 2050 Scenarios for Top Level 2 Sub-sectors – by Additional Skills/Occupations - New analysis for informing intelligence and future research

Alternative Fuel Vehicle

Additional Skills	Alternative Fuel Vehicle Current Employment				Net Zero by 2030				Net Zero by 2050			
					Worst Case Scenario		Best Case Scenario		Worst Case Scenario		Best Case Scenario	
	# Employees 2019/20	Shortage of Employees 2019/20	Shortage as a % of Total Employees	# Employees if Skills Gap Filled	Estimated # Employees Needed to Reach Net Zero by 2030	Growth in Employees Required (assumes no skills gap)	Estimated # Employees Needed to Reach Net Zero by 2030	Growth in Employees Required (assumes no skills gap)	Estimated # Employees Needed to Reach Net Zero by 2050	Growth in Employees Required (assumes no skills gap)	Estimated # Employees Needed to Reach Net Zero by 2050	Growth in Employees Required (assumes no skills gap)
Installers	0	0	0.0%	0	0	0.0%	0	0.0%	0	0.0%	0	0.0%
Multi Engineers	194	9	4.5%	203	251	23.9%	333	64.2%	394	94.2%	921	353.7%
Specialist Engineer	646	31	4.7%	677	834	23.2%	1,106	63.5%	1,303	92.5%	3,145	364.8%
Adaptive Process Engineer	0	0	0.0%	0	0	0.0%	0	0.0%	0	0.0%	0	0.0%
Total	840	39	4.7%	880	1,085	23.4%	1,440	63.7%	1,697	92.9%	4,066	362.2%

Alternative Fuels

Additional Skills	Alternative Fuels Current Employment				Net Zero by 2030				Net Zero by 2050			
					Worst Case Scenario		Best Case Scenario		Worst Case Scenario		Best Case Scenario	
	# Employees 2019/20	Shortage of Employees 2019/20	Shortage as a % of Total Employees	# Employees if Skills Gap Filled	Estimated # Employees Needed to Reach Net Zero by 2030	Growth in Employees Required (assumes no skills gap)	Estimated # Employees Needed to Reach Net Zero by 2030	Growth in Employees Required (assumes no skills gap)	Estimated # Employees Needed to Reach Net Zero by 2050	Growth in Employees Required (assumes no skills gap)	Estimated # Employees Needed to Reach Net Zero by 2050	Growth in Employees Required (assumes no skills gap)
Installers	3,020	121	4.0%	3,142	3,897	24.0%	5,217	66.0%	6,109	94.4%	14,325	356.0%
Multi Engineers	1,357	48	3.5%	1,405	1,749	24.4%	2,321	65.2%	2,713	93.0%	6,559	366.7%
Specialist Engineer	1,213	44	3.6%	1,257	1,590	26.5%	2,115	68.3%	2,440	94.2%	5,959	374.1%
Adaptive Process Engineer	3,152	121	3.8%	3,273	4,085	24.8%	5,458	66.7%	6,290	92.2%	15,233	365.4%
Total	8,743	335	3.8%	9,077	11,321	24.7%	15,111	66.5%	17,552	93.4%	42,076	363.5%

Biomass

| Additional Skills | Biomass Current Employment | | | | Net Zero by 2030 | | | | Net Zero by 2050 | | | |
| | | | | | Worst Case Scenario | | Best Case Scenario | | Worst Case Scenario | | Best Case Scenario | |
	# Employees 2019/20	Shortage of Employees 2019/20	Shortage as a % of Total Employees	# Employees if Skills Gap Filled	Estimated # Employees Needed to Reach Net Zero by 2030	Growth in Employees Required (assumes no skills gap)	Estimated # Employees Needed to Reach Net Zero by 2030	Growth in Employees Required (assumes no skills gap)	Estimated # Employees Needed to Reach Net Zero by 2050	Growth in Employees Required (assumes no skills gap)	Estimated # Employees Needed to Reach Net Zero by 2050	Growth in Employees Required (assumes no skills gap)
Installers	477	11	2.3%	488	624	27.8%	817	67.5%	960	96.8%	2,291	369.6%
Multi Engineers	449	10	2.2%	459	584	27.3%	773	68.5%	907	97.7%	2,174	373.7%
Specialist Engineer	643	14	2.2%	658	836	27.1%	1,117	69.9%	1,279	94.4%	3,103	371.7%
Adaptive Process Engineer	1,697	39	2.3%	1,736	2,213	27.5%	2,889	66.4%	3,454	99.0%	8,075	365.2%
Total	3,267	74	2.3%	3,340	4,256	27.4%	5,596	67.5%	6,600	97.6%	15,642	368.3%

Building Technologies

| Additional Skills | Building Technologies Current Employment | | | | Net Zero by 2030 | | | | Net Zero by 2050 | | | |
| | | | | | Worst Case Scenario | | Best Case Scenario | | Worst Case Scenario | | Best Case Scenario | |
	# Employees 2019/20	Shortage of Employees 2019/20	Shortage as a % of Total Employees	# Employees if Skills Gap Filled	Estimated # Employees Needed to Reach Net Zero by 2030	Growth in Employees Required (assumes no skills gap)	Estimated # Employees Needed to Reach Net Zero by 2030	Growth in Employees Required (assumes no skills gap)	Estimated # Employees Needed to Reach Net Zero by 2050	Growth in Employees Required (assumes no skills gap)	Estimated # Employees Needed to Reach Net Zero by 2050	Growth in Employees Required (assumes no skills gap)
Installers	520	7	1.4%	528	680	28.9%	885	67.7%	1,055	99.9%	2,507	375.3%
Multi Engineers	964	13	1.4%	978	1,255	28.4%	1,650	68.8%	1,954	99.9%	4,629	373.5%
Specialist Engineer	1,285	17	1.3%	1,302	1,686	29.5%	2,216	70.2%	2,592	99.0%	6,159	373.0%
Adaptive Process Engineer	508	7	1.4%	515	664	28.8%	872	69.2%	1,041	102.1%	2,457	377.0%
Total	3,278	45	1.4%	3,322	4,285	29.0%	5,622	69.2%	6,641	99.9%	15,752	374.1%

Carbon Finance – many roles are advisory

Additional Skills	Carbon Finance Current Employment				Net Zero by 2030				Net Zero by 2050			
					Worst Case Scenario		Best Case Scenario		Worst Case Scenario		Best Case Scenario	
	# Employees 2019/20	Shortage of Employees 2019/20	Shortage as a % of Total Employees	# Employees if Skills Gap Filled	Estimated # Employees Needed to Reach Net Zero by 2030	Growth in Employees Required (assumes no skills gap)	Estimated # Employees Needed to Reach Net Zero by 2030	Growth in Employees Required (assumes no skills gap)	Estimated # Employees Needed to Reach Net Zero by 2050	Growth in Employees Required (assumes no skills gap)	Estimated # Employees Needed to Reach Net Zero by 2050	Growth in Employees Required (assumes no skills gap)
Installers	4,473	208	4.7%	4,681	5,622	20.1%	7,757	65.7%	8,683	85.5%	21,861	367.0%
Multi Engineers	5,437	239	4.4%	5,676	7,047	24.2%	9,438	66.3%	10,838	90.9%	25,720	353.1%
Specialist Engineer	6,474	246	3.8%	6,720	8,016	19.3%	11,622	72.9%	13,324	98.3%	30,794	358.2%
Adaptive Process Engineer	7,284	375	5.1%	7,659	9,324	21.7%	12,082	57.8%	14,481	89.1%	35,979	369.8%
Total	23,668	1,068	4.5%	24,736	30,009	21.3%	40,899	65.3%	47,326	91.3%	114,353	362.3%

Geothermal

Additional Skills	Geothermal Current Employment				Net Zero by 2030				Net Zero by 2050			
					Worst Case Scenario		Best Case Scenario		Worst Case Scenario		Best Case Scenario	
	# Employees 2019/20	Shortage of Employees 2019/20	Shortage as a % of Total Employees	# Employees if Skills Gap Filled	Estimated # Employees Needed to Reach Net Zero by 2030	Growth in Employees Required (assumes no skills gap)	Estimated # Employees Needed to Reach Net Zero by 2030	Growth in Employees Required (assumes no skills gap)	Estimated # Employees Needed to Reach Net Zero by 2050	Growth in Employees Required (assumes no skills gap)	Estimated # Employees Needed to Reach Net Zero by 2050	Growth in Employees Required (assumes no skills gap)
Installers	1,476	64	4.3%	1,539	1,936	25.8%	2,552	65.8%	2,986	94.0%	7,114	362.1%
Multi Engineers	1,197	55	4.6%	1,252	1,570	25.4%	2,036	62.6%	2,411	92.6%	5,767	360.5%
Specialist Engineer	1,249	55	4.4%	1,304	1,639	25.7%	2,141	64.2%	2,526	93.7%	5,949	356.3%
Adaptive Process Engineer	2,702	123	4.5%	2,824	3,513	24.4%	4,639	64.2%	5,467	93.5%	12,909	357.0%
Total	6,624	296	4.5%	6,920	8,657	25.1%	11,368	64.3%	13,390	93.5%	31,739	358.6%

Photovoltaic

Additional Skills	Photovoltaic Current Employment				Net Zero by 2030				Net Zero by 2050			
					Worst Case Scenario		Best Case Scenario		Worst Case Scenario		Best Case Scenario	
	# Employees 2019/20	Shortage of Employees 2019/20	Shortage as a % of Total Employees	# Employees if Skills Gap Filled	Estimated # Employees Needed to Reach Net Zero by 2030	Growth in Employees Required (assumes no skills gap)	Estimated # Employees Needed to Reach Net Zero by 2030	Growth in Employees Required (assumes no skills gap)	Estimated # Employees Needed to Reach Net Zero by 2050	Growth in Employees Required (assumes no skills gap)	Estimated # Employees Needed to Reach Net Zero by 2050	Growth in Employees Required (assumes no skills gap)
Installers	381	4	0.9%	384	498	29.7%	654	70.1%	768	99.9%	1,826	375.3%
Multi Engineers	752	7	0.9%	759	984	29.7%	1,292	70.2%	1,521	100.4%	3,602	374.7%
Specialist Engineer	1,012	9	0.9%	1,021	1,330	30.3%	1,732	69.6%	2,045	100.3%	4,862	376.3%
Adaptive Process Engineer	258	2	0.9%	261	338	29.6%	446	71.2%	522	100.2%	1,243	376.7%
Total	**2,402**	**22**	**0.9%**	**2,425**	**3,150**	**29.9%**	**4,123**	**70.1%**	**4,856**	**100.3%**	**11,533**	**375.7%**

Recovery and Recycling

Additional Skills	Recovery and Recycling Current Employment				Net Zero by 2030				Net Zero by 2050			
					Worst Case Scenario		Best Case Scenario		Worst Case Scenario		Best Case Scenario	
	# Employees 2019/20	Shortage of Employees 2019/20	Shortage as a % of Total Employees	# Employees if Skills Gap Filled	Estimated # Employees Needed to Reach Net Zero by 2030	Growth in Employees Required (assumes no skills gap)	Estimated # Employees Needed to Reach Net Zero by 2030	Growth in Employees Required (assumes no skills gap)	Estimated # Employees Needed to Reach Net Zero by 2050	Growth in Employees Required (assumes no skills gap)	Estimated # Employees Needed to Reach Net Zero by 2050	Growth in Employees Required (assumes no skills gap)
Installers	106	4	3.6%	110	138	25.5%	181	65.0%	213	93.8%	507	361.7%
Multi Engineers	132	5	3.6%	137	171	25.1%	228	66.5%	267	95.0%	632	361.2%
Specialist Engineer	163	6	3.5%	168	211	25.4%	277	64.4%	328	94.4%	781	363.4%
Adaptive Process Engineer	362	14	3.8%	376	470	25.2%	625	66.3%	738	96.4%	1,717	356.8%
Total	**763**	**28**	**3.7%**	**791**	**991**	**25.3%**	**1,311**	**65.8%**	**1,546**	**95.4%**	**3,636**	**359.7%**

Waste Management

Additional Skills	Waste Management				Net Zero by 2030				Net Zero by 2050			
	Current Employment				Worst Case Scenario		Best Case Scenario		Worst Case Scenario		Best Case Scenario	
	# Employees 2019/20	Shortage of Employees 2019/20	Shortage as a % of Total Employees	# Employees if Skills Gap Filled	Estimated # Employees Needed to Reach Net Zero by 2030	Growth in Employees Required (assumes no skills gap)	Estimated # Employees Needed to Reach Net Zero by 2030	Growth in Employees Required (assumes no skills gap)	Estimated # Employees Needed to Reach Net Zero by 2050	Growth in Employees Required (assumes no skills gap)	Estimated # Employees Needed to Reach Net Zero by 2050	Growth in Employees Required (assumes no skills gap)
Installers	730	10	1.4%	740	949	28.3%	1,246	68.5%	1,477	99.6%	3,520	375.8%
Multi Engineers	667	9	1.4%	677	871	28.7%	1,148	69.7%	1,352	99.8%	3,204	373.6%
Specialist Engineer	657	9	1.3%	666	864	29.8%	1,124	68.7%	1,325	99.0%	3,172	376.2%
Adaptive Process Engineer	803	11	1.3%	813	1,048	28.9%	1,380	69.7%	1,613	98.3%	3,847	372.9%
Total	2,857	39	1.3%	2,896	3,733	28.9%	4,899	69.2%	5,767	99.1%	13,743	374.6%

Water and Waste Water Treatment

Additional Skills	Water & Waste Water Treatment				Net Zero by 2030				Net Zero by 2050			
	Current Employment				Worst Case Scenario		Best Case Scenario		Worst Case Scenario		Best Case Scenario	
	# Employees 2019/20	Shortage of Employees 2019/20	Shortage as a % of Total Employees	# Employees if Skills Gap Filled	Estimated # Employees Needed to Reach Net Zero by 2030	Growth in Employees Required (assumes no skills gap)	Estimated # Employees Needed to Reach Net Zero by 2030	Growth in Employees Required (assumes no skills gap)	Estimated # Employees Needed to Reach Net Zero by 2050	Growth in Employees Required (assumes no skills gap)	Estimated # Employees Needed to Reach Net Zero by 2050	Growth in Employees Required (assumes no skills gap)
Installers	1,181	11	0.9%	1,191	1,548	30.0%	2,027	70.2%	2,408	102.1%	5,652	374.5%
Multi Engineers	938	8	0.9%	947	1,229	29.8%	1,609	70.0%	1,897	100.3%	4,519	377.3%
Specialist Engineer	804	7	0.9%	811	1,057	30.2%	1,364	68.1%	1,617	99.3%	3,867	376.6%
Adaptive Process Engineer	1,779	16	0.9%	1,796	2,353	31.0%	3,072	71.1%	3,600	100.5%	8,586	378.2%
Total	4,703	42	0.9%	4,745	6,188	30.4%	8,073	70.1%	9,522	100.7%	22,625	376.8%

Wind

Additional Skills	Wind				Net Zero by 2030				Net Zero by 2050			
	Current Employment				Worst Case Scenario		Best Case Scenario		Worst Case Scenario		Best Case Scenario	
	# Employees 2019/20	Shortage of Employees 2019/20	Shortage as a % of Total Employees	# Employees if Skills Gap Filled	Estimated # Employees Needed to Reach Net Zero by 2030	Growth in Employees Required (assumes no skills gap)	Estimated # Employees Needed to Reach Net Zero by 2030	Growth in Employees Required (assumes no skills gap)	Estimated # Employees Needed to Reach Net Zero by 2050	Growth in Employees Required (assumes no skills gap)	Estimated # Employees Needed to Reach Net Zero by 2050	Growth in Employees Required (assumes no skills gap)
Installers	914	12	1.3%	926	1,197	29.2%	1,572	69.6%	1,845	99.2%	4,416	376.7%
Multi Engineers	1,310	18	1.4%	1,328	1,707	28.5%	2,249	69.3%	2,633	98.2%	6,316	375.5%
Specialist Engineer	1,446	20	1.4%	1,466	1,885	28.6%	2,479	69.1%	2,932	100.0%	6,931	372.9%
Adaptive Process Engineer	3,682	51	1.4%	3,732	4,839	29.7%	6,253	67.5%	7,415	98.7%	17,581	371.0%
Total	**7,352**	**101**	**1.4%**	**7,453**	**9,629**	**29.2%**	**12,552**	**68.4%**	**14,825**	**98.9%**	**35,244**	**372.9%**

Appendix 8 – London's overall economy and some selected sectors, all estimated using kMatrix sales methodology, to provide greater context and comparison with LCEGS

This appendix provides detail for London's full economy and some comparator sectors for London, with figures produced using the same kMatrix methodology as the wider LCEGS report. Each sector has been defined and the value calculated using the kMatrix definitions and methodology.

London's Economy measurement is a calculation of the size of London's economy as a whole, including all elements of the economy.

All sectors overlap to some degree, for example, Legal, HR and Maintenance are multi-sector. The LCEGS sector itself is multi-sector, e.g.:
- All sectors require waste management services
- Finance is relevant to all sectors, but is also a sector itself

The measurements for 'pure' Manufacturing (excluding assembly), Construction, ICT and Retail are provided as an indication of the scale of the LCEGS sector, but all are present to some extent within the LCEGS sector and to some extent, all will include LCEGS activities themselves. For example, the 'pure' manufacturing portion of the LCEGS sector, equates to approximately 3% of London's LCEGS sales. Conversely, the LCEGS portion of the Manufacturing sector within London equates to approximately 12% of London's Manufacturing sector. This scenario is similar across numerous sectors within the UK, where the Automotive sector includes Manufacturing, the Space sector includes elements from Manufacturing, Telecommunications, Data Science, Cybersecurity and so on. Cybersecurity is a good analogy to the LCEGS sector, because it is relevant to and used within all elements of the economy, in a similar way that to reach net zero, aspects of the LCEGS sector will be applied across the economy.

This overlap of sectors is normal, and explicitly stated in all kMatrix reporting of the different sectors measured. The purpose of the data is not to act as a national accounting system, the ONS data already provides this, but to offer a flexible, usable model of sectors for market intelligence.

London's Economy

	Sales £m					# Employees					# Companies				
2017/18	Growth %	2018/19	Growth %	2019/20	2017/18	Growth %	2018/19	Growth %	2019/20	2017/18	Growth %	2018/19	Growth %	2019/20
411,415.7	21.2%	498,577.6	10.5%	550,804.7	10,911,555	11.7%	12,183,702	5.5%	12,850,354	1,064,330	-8.8%	970,995	13.1%	1,098,515

London's LCEGS Sector

	Sales £m					# Employees					# Companies				
2017/18	Growth %	2018/19	Growth %	2019/20	2017/18	Growth %	2018/19	Growth %	2019/20	2017/18	Growth %	2018/19	Growth %	2019/20
39,697	11.0%	44,080.7	13.3%	49,958.5	246073	10.5%	271,972	11.0%	302,021	13,906	10.5%	15,364	11.0%	17,054

London's Manufacturing Sector (excludes assembly)

	Sales £m					# Employees					# Companies				
2017/18	Growth %	2018/19	Growth %	2019/20	2017/18	Growth %	2018/19	Growth %	2019/20	2017/18	Growth %	2018/19	Growth %	2019/20
10,430.5	4.4%	10,887.8	7.5%	11,707.3	201,770	4.0%	209,740	3.1%	216,227	7,873	3.5%	8,150	2.0%	8,316

London's Construction Sector

	Sales £m					# Employees					# Companies				
2017/18	Growth %	2018/19	Growth %	2019/20	2017/18	Growth %	2018/19	Growth %	2019/20	2017/18	Growth %	2018/19	Growth %	2019/20
26,172.5	5.3%	27,550.0	6.4%	29,308.5	237,451	4.7%	248,640	4.2%	259,000	30,242	3.8%	31,404	3.1%	32,375

London's ICT Sector

	Sales £m					# Employees					# Companies				
2017/18	Growth %	2018/19	Growth %	2019/20	2017/18	Growth %	2018/19	Growth %	2019/20	2017/18	Growth %	2018/19	Growth %	2019/20
28,864.8	5.3%	30,384.0	7.5%	32,671.0	473,745	4.8%	496,588	5.3%	522,724	30,047	4.4%	31,364	4.2%	32,671

London's Retail Sector

Sales £m					# Employees					# Companies				
2017/18	Growth %	2018/19	Growth %	2019/20	2017/18	Growth %	2018/19	Growth %	2019/20	2017/18	Growth %	2018/19	Growth %	2019/20
88,733.1	6.4%	94,396.9	6.4%	100,422.2	2,747,807	5.9%	2,910,812	4.6%	3,044,782	307,960	5.2%	323,827	3.1%	333,843