Green Jobs and Skills in Central London

Final report

A WPI Economics Report and Institute of Employment Studies report for Central London Forward

James Edgar – Chief Economist – james.edgar@wpieconomics.com

Joe Ahern – Senior Consultant – joe.ahern@wpieconomics.com

Christina Bovill Rose – Junior Consultant – christina@wpieconomics.com

Matthew Williams - Senior Research Fellow – matthew.williams@employment-studies.co.uk

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About WPI Economics

WPI Economics is an economics, data insight and public policy consultancy that specialises in conducting research, analysis and modelling that makes an impact on important social and economic policy debates, such as health and wellbeing, poverty and the recovery from pandemic. We are driven by a desire to make a difference, both through the work we undertake and by taking our responsibilities as a business seriously. We work with a range of organisations – from FTSE 100/250 companies to SMEs and charities and Central and Local Government.

About Institute for Employment Studies

The IES mission is to help bring about sustainable improvements in employment policy and human resource management. We achieve this by increasing the understanding and improving the practice of key decision makers in policy bodies and employing organisations. IES was established in the financial year 1968-69 to be an independent, national centre of expertise on productivity, manpower planning and labour market change. Since that time it has expanded and diversified to become a leading UK independent centre for research and evidence-based consultancy in employment, labour market and human resource policy and practice. It is not-for-profit, its activities being funded through research and consultancy commissions, and from its corporate membership programme.

About Central London Forward

Central London Forward (CLF) is a partnership of the 12 central London local authorities. We cover Camden, City of London, Hackney, Haringey, Islington, Kensington and Chelsea, Lambeth, Lewisham, Southwark, Tower Hamlets, Wandsworth and Westminster. We work together with our member authorities and with other stakeholders to support inclusive and sustainable growth in central London; so that our economy thrives, and our residents benefit from the opportunities this creates. CLF supports coordination and collaboration across the sub-region, we conduct research and help shape policy development, and we manage large-scale employment and skills programmes in central London.

Executive Summary

This report examines the potential scale and nature of green jobs across the Central London Forward sub region. This report is accompanied by the Cross London report[i] as well as reports for each of London's three other sub regional partnerships.[1]

Councils in central London will play a vital part in helping to deliver net zero. Boroughs across central London are engaged in a number of crucial activities in relation to decarbonising the energy supply, homes and buildings, and working with businesses. These activities are helping to drive the green economy of the future in the capital, in addition to wider factors such as central Government policy, and economic conditions in central London.

This report takes a mission-based approach to defining the green economy and identifying green jobs in central London, where a job is defined as green if it helps to deliver net zero or environmental goals. This approach builds on UK Government Green Jobs Taskforce definition.[ii] This definition was applied to data from the Low Carbon and Environmental Goods and Services (LCEGS) dataset[iii] and supervised machine learning through The Data City[iv] in order to provide an estimate of the number of green jobs in central London. Further analysis was then conducted based on various datasets, including research commissioned by the Climate Change Committee (CCC) and ONS labour force and business surveys to create a series of projections for future numbers of jobs, as well as to provide additional skills analysis.

Green jobs today in central London

At present our analysis suggests there were 147,000 green jobs in central London in 2020, across the 11 sectors that we identified.

- Green Finance represents 34.1% of central London's green sector jobs, compared to 21.7% in London as a whole. The subregion accounts for almost all of the capital's jobs in this sector, which makes it one of central London's key distinguishing features. This is almost entirely driven by the very substantial number of Green Finance jobs (47,000) in the Square Mile. The sector accounts for a substantially greater share of total central London jobs than of total London jobs (0.9% in London and 1.5% in the central London subregion).
- Power accounts for a little under a third of the jobs in central London's green economy, and the region represents just over half of all of London's jobs in this sector. This sector accounts for 1.4% of the subregion's total employment.
- Homes and Buildings represents just over 1 in 5 of central London's green jobs (20.9%), and 1.0% of total jobs in the subregion. Just over half of London's green Homes and Buildings jobs are in central London.
- Compared to the London-wide picture, Low Carbon Transport accounts for a considerably lower share of the subregion's green jobs, at 5.9% compared with London's 14%, and just 0.3% of total central London employment.

In terms of overall sales, we estimate that the 11 green economy sectors accounted for around £28.6 billion in 2020/21, with Green Finance accounting for around half of this total.

[1] West London Alliance, South London Partnership, Local London

Green skills today in central London

Workers in green jobs in central London are predominantly in higher level managerial, professional and associate professional occupations. Three quarters (75%) are in these three occupational groups, which compares with 70% of all workers in central London, and 53% of green workers across the country as a whole. There is variation by sector, with jobs in power and green finance/consultancy sectors being predominantly professional and associate professional, while the largest group in sectors related to homes, buildings and infrastructure, and reduce, reuse, recycle is skilled craft workers (e.g. electricians, plumbers etc.).

Three quarters of central London residents in green jobs have degrees (above the proportion of graduates in all jobs in central London of 70%, and double the proportion of graduates in green jobs across the UK as a whole of 38%). The vast majority of workers in power and Green Finance/Consultancy sectors are graduates, as are half of those in Homes, Buildings and Infrastructure.

There are higher than average proportions of male workers, and white workers, in green jobs compared with all jobs in central London. However, the green workforce has a much younger than average age profile, in comparison with all workers in central London, and with green workers across the UK.

Analysis at the national level shows that green business tend to draw relatively few workers straight from education, and rely more on workers from other sectors. In central London, the pool of workers likely to have green-related skills but working in other sectors is around twice as large as the number of green workers, although this potential supply is relatively large for Green Finance/Consultancy sectors (3 times as large as current green jobs) and relatively small for Homes, Buildings and Infrastructure (around 70% larger).

There are around 14,000 learners in Further Education (19+) and in apprenticeships (all ages) in relevant subject areas to green jobs. These represent around 9% of the current green workforce, but this is around half the level across the whole of London, indicating a relatively small education and training pipeline at Further Education (FE) level within central London. The Higher Education (HE) institutions in central London produce a relatively large number of engineering and maths/computing graduates in relation to the numbers of graduate workers in green jobs with degrees in these subjects, although a much smaller number of graduates in physical/environmental sciences.

Projections of green jobs in central London

The total number of green jobs in the central scenario is projected to rise from 147,000 in 2020 to 335,000 in 2030 and 732,000 in 2050, representing a near-5-fold increase. Within this scenario, four sectors account for 9 in 10 (91.3%) of Central London's total number of green jobs by 2050:

- Green Finance (382,500), representing 52.3% of total green jobs.
- Power (119,800), representing 16.4% of total green jobs.
- Low Carbon Transport (85,900), representing 11.7% of total green jobs.
- Homes and Buildings (80,000), representing 10.9% of total green jobs.

In addition to the jobs that will be created by the transition to net zero, there will be many jobs lost in carbon-intensive industries. However, we estimate there will be a small positive impact on overall employment in central London due to the shift to net zero, with an increase of around 25,000 jobs in 2030 and around 9,800 jobs in 2050.

Future skills projections

Under the central scenario, the fastest growth rate is projected for skilled craft workers (145% increase to 2030), although the largest increase in numbers of workers is projected among associate professional workers (52,000 increase, or 113%). However, under the high growth scenario, skilled craft workers will experience the largest numerical and percentage increase (89,500, or 331%).

In addition to the growth in numbers, there will be a need to replace workers who retire or leave the labour market. It is estimated that this replacement demand represents one third of the current employment level, with only minor variation across the occupational groups.

These projected total demands for workers in green jobs in the central scenario are very large in relation to the outputs from FE and HE. The annual increase in consultancy-based jobs represents 70% of the annual output from education and training, while the annual increase in craft-based job exceeds the education and training output by around 13%.

Recommendations

The analysis in this report highlights a few areas where there is a potential for central, London, and local Government to work with stakeholders to fully realise the benefits of the net zero transition

- Long term policy certainty and clarity: This has been identified as a key contributor towards green jobs and growth, by providing the long terms signals needed by firms, workers and providers. The Net Zero strategy goes some way to creating this through the high-level signals and intentions, but the CCC has highlighted a range of areas where more concrete actions are required to translate this into delivery.[v] Ultimately this requires leadership from central Government, but London Councils and the Greater London Authority also have a role in stressing the importance of delivering certainty in a jobs and skills context.
- Shape skills provision to equip London's future green workforce: Employers, sector bodies and skills providers need to work together to help shape skills provision so that a pipeline of skilled individuals is available to support delivery plans for net zero and other environmental goals, including reskilling opportunities for existing workers.
- Promote the opportunities of the green economy: The shaping of skills provision needs to be supported by careers information, advice and guidance to promote opportunities in green sectors to learners and increase progression rates to employment within green sectors. Skills providers, schools, employers and industry bodies have a role in delivering this.
- Monitor the growth of the green economy: London government should measure the growth of the green economy over the coming years using a consistent framework, and identify areas where there are challenges in meeting skills needs which are holding back growth and limiting our ability to tackle emissions.

2. Introduction

The transition to net zero is a shared priority for local authorities in central London, the UK government and the Mayor of London.

Policymakers and stakeholders across London have a critical opportunity to put meeting net zero targets at the heart of the capital's economic recovery from the pandemic. Delivering this is a necessity in order to meet the ambitious target of net zero across the capital by 2030.

Furthermore, analysis in the Green Jobs and Skills Cross London report[vi] suggests that this also presents real economic potential for the city; a green economy could provide over a million jobs by 2050 based on a net zero policy pathway.[vii] This would be reflective of a growth rate for the green economy that is unprecedented in recent times, and bigger than the growth rates seen in the digital economy in recent decades. Furthermore, London would see an overall net increase in jobs.

Seizing this agenda, and supporting a just transition to net zero, is vital not just for the capital itself, but also for the whole of the UK. London has a major contribution to make in driving a strong economic recovery across the UK, and in growing and strengthening the industries that will underpin the green economy of the future.

The green recovery in Central London

Central London Forward is the subregional partnership for central London; the member boroughs are Camden, the City of London, Hackney, Islington, Kensington and Chelsea, Lambeth, Southwark, Tower Hamlets, Wandsworth and Westminster Haringey and Lewisham. In this report, 'central London' refers to this group of member boroughs.

Spanning 12 boroughs, the Central London Forward (CLF) economy is formed of diverse clusters of economic activity, ranging from the central activity zone, with its key retail, leisure and cultural destinations and the UK's financial centre, along with local town centres, high streets, and residential neighbourhoods. Previous CLF research[viii] has identified a number of employment hubs[2] within the subregion. The subregion is also home to a third of London's population, with 3.1 million residents and over 1.2 million homes.

The variation between these clusters demonstrates the diversity of economic activity in the sub-region; for example, the City of London's large shares of financial services and legal and accounting jobs contrasts with the next largest employment hub in the sub-region, the West End, which is home to the heart of London's cultural and entertainment scene and a significant night-time economy. Newer hubs have seen considerable jobs growth in recent years, such as Computer Services, HQ and Management and Financial sector-focused Old Street, Hoxton and Shoreditch, and financial services- and legal/accounting-focused Canary Wharf.

Central London's economy was hit hard by the pandemic. Emergency mandates to curb the spread of Covid, the closure of hospitality, cultural and entertainment venues, a long period of enforced working from home led to higher-than-average rates of furlough, with 550,000 jobs in central London under the furlough scheme.[ix] Central London has also seen a larger decline in payrolled employment and a higher increase in claims for unemployment benefits compared with the rest of England in the

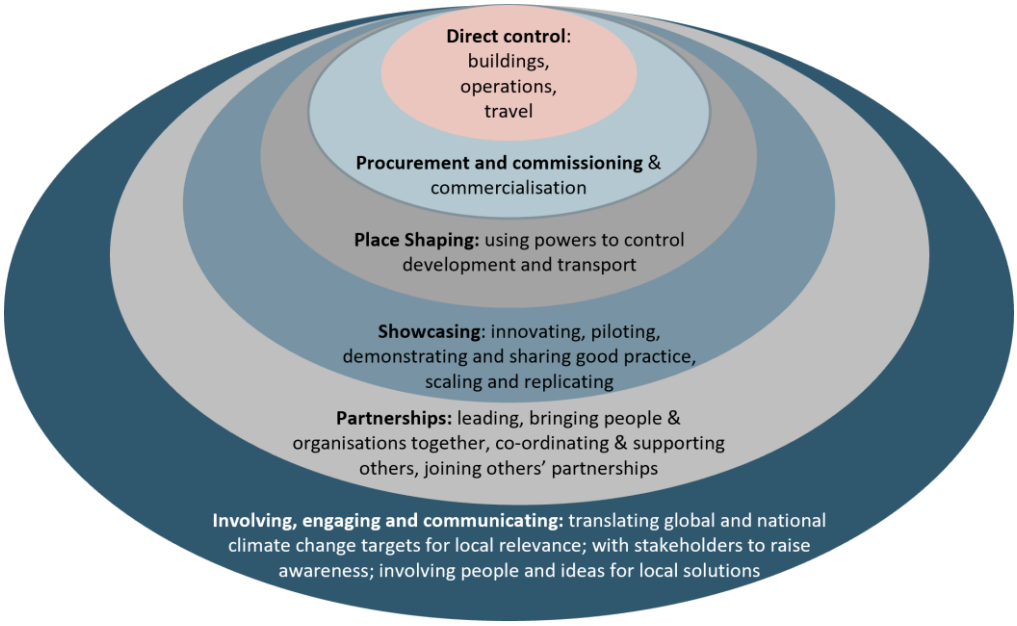
[2] the City of London, the West End, Isle of Dogs, London Bridge, King's Cross and Old Street and Hoxton

fallout from the pandemic.[x] Furthermore, tourism spend in the Central Activities Zone (an area within the central London subregion) fell £10.9 billion compared to the previous year.[xi]

Delivering a green economy at a borough level

Councils in central London will play a vital part in helping to deliver net zero. Although as organisations themselves they are only generally responsible for 2-5% of the emissions of a local area they play an important strategic role, and are well placed to support the transition to net zero in a variety of ways.[xii] These are summarised by the below diagram (Figure 1), which was produced by the Climate Change Committee in a document to support the Sixth Carbon budget.

Figure 1: How local authorities control and influence emissions



Source: adapted from CCC Sixth Carbon Budget[xiii]

Based on our extensive stakeholder engagement with central London boroughs, we have identified a broad range of areas in which local authorities and other local entities are undertaking activity to support green growth and develop relevant skills provision, these include:

- Decarbonising council operations and assets, such as buildings and fleets;
- Procurement requirements for contractors and developers to demonstrate sustainability credentials;
- Support for local businesses to adopt approaches consistent with Net Zero, particularly for SMEs;
- Influencing resident actions such as with waste, active travel etc.

Engagement with local authorities across central London has shown that this issue is high on the agenda, with all councils having set a target to reach net zero, and with dedicated resource in place. However, there are lots of programmes currently in the early stages of development or implementation. In large part this is due to the need for more certainty from central Government about net zero policy (at the time of this engagement, key policies such as the Net Zero Strategy and Heat and Buildings Strategy had only recently been released by central Government) and funding to

deliver it; this subsequently impacts on certainty around the future demand for skills and therefore councils' planning for skills provision. In addition, as many councils pointed out, the majority of local emissions are beyond their direct control. Nevertheless, councils have committed to ambitious targets, and proactive approaches to delivering on these are evident.

Given the bounds of local authorities' direct influence, activity from businesses and other local organisations will be key. As well as the clear hub for green finance jobs in the City of London, there are also hubs of commercial green activity elsewhere in the subregion, particularly in the start-up space, such as Hackney Wick's 'Silicon Roundabout'. Though they may not be large in terms of employment numbers, these innovative companies represent considerable value to achieving net zero targets and also present potential for growth as the uptake of innovations increase. Councils are also working in partnership with the private sector and other entities and anchor institutions such as higher and further education to drive forward the green agenda.

We outline some programmes and activities below.

Greener sources of power for the subregion

Councils across central London have committed to using decarbonised energy sources for their operations in the coming decades or sooner. Lambeth council has committed to using renewable energy sources for 100% of energy consumption in the buildings they own and operate by 2030.[xiv] In 2021, Southwark Council confirmed that all of the electricity in its offices and buildings is powered by 100% renewable energy.[xv]

As well as energy consumption, councils are looking to generate more of their own clean energy, for council operations and beyond. For example, Camden Council installed 184 solar panels on the Swiss Cottage Library roof to provide 40,000 kWh of energy; together with two lighting refurbishment projects, this cuts annual greenhouse gas emissions by 79 tonnes CO2e.[xvi] Further examples are outlined below.

Box 1: Hackney Light and Power – Hackney's local energy services company

Hackney Light and Power, a publicly owned energy services company, was formally launched in Spring 2020. It is key in delivering Hackney's transformation of its local energy system and supporting the council's bid to become the most environmentally friendly borough in London.
The company supplies green energy to the borough, as well as delivering the Green Homes Programme – the first borough-wide thermal efficiency housing program in London.[xvii] It is also tasked with overseeing a rapid expansion of EV charging points, and a large-scale rooftop solar programme.[xviii]

Meeting net zero through construction

London's homes and workplaces account for 78% of CO2 emissions in the capital; as such, both improving the energy efficiency of existing buildings – 80% of which are likely to remain in place by 2050 – and ensuring energy efficiency is built into new developments will be critical to meeting net zero ambitions.[xix]

Regeneration and developments

With demand for more housing and projected population growth, there is a considerable level of development across the central London sub region. A range of councils we engaged with are considering how to tackle the climate emergency as they address the housing supply challenges – with emissions reductions requirements being integrated into planned developments. Some councils

are integrating sustainability requirements across planning policies. For example, City of London requires applications for major new developments or refurbishments to include a Sustainability Statement providing detail on the development's planned efficiency measures, technologies and off-setting proposals among other information; proposals should also include a BREEAM[3] pre-assessment aiming to achieve a minimum of BREEAM "Excellent".[xx] Other councils like Haringey and Wandsworth will encourage all new developments to aim for zero- or low-carbon standards.

Low- and zero-carbon developments are in progress. Through the Palmerston Court development in Wandsworth, student accommodation providers Urbanest aim to deliver the most energy efficient mixed-use scheme in the UK, aligning with Passivhaus principles to ensure the development uses as little energy as possible to provide heating and cooling for its users and occupants – Passivhaus-qualifying buildings require 90% less energy for operations compared with a standard residential building.[xxi] This aligns with Urbanest's existing commitment to exclusively procuring electricity from renewable sources. [xxii]

Councils are integrating sustainability into their own development too. in Islington, plans for over 1900 affordable homes (including 550 council homes) include specification requirements for energy efficiency, such as through insulation and efficient hot water and heating systems. [xxiii] Ambitious requirements are being drawn up in the Council's upcoming decarbonising new homes strategy, including setting high expectations at the feasibility design stage and enabling early identification of challenges and the incorporation of passive measures, as well as a commitment to introduce alternatives to gas-fuelled systems and maximisation of renewable options where possible. A monitoring approach will ensure design requirements are met post-construction.[xxiv]

Retrofit

In addition to minimising emissions relating to new buildings, reducing emissions from existing buildings is also crucial if we are to meet net zero targets. Four in five (80%) of the buildings which will be in use by 2050 already exist, and central London in particular is already densely developed.[xxv] It follows that the importance of the homes and buildings sector to the green economy is evident in the projections outlined in this report. One of the challenges highlighted to us was the scale of retrofit needed to meet Councils' net zero targets in central London boroughs, as all but one (Wandsworth) have above-London average of council homes. This is a particular challenge in councils which own all of their housing stock, such as Wandsworth and Hackney.

Retrofit, though a challenge across all buildings, presents different issues in different settings; for example, retrofit of commercial and high-rise property requires specific expertise and significant resource, while retrofit of listed buildings and heritage sites pose additional challenges regarding preservation and cultural significance. Stakeholders told us that while there are pathways for domestic retrofit, there is less certainty around non-domestic retrofit. Activity in central London seeks to build an evidence base to address this (see Box 2).

[3] Building Research Establishment's Environmental Assessment Method – a sustainability rating scheme for the built environment, assessing buildings' sustainability on a range of metrics, from energy use to materials.

Box 2: Skills for a Sustainable Skyline Taskforce

The City of London – home to a disproportionate share of London's tallest office buildings (15 of 33 office buildings over 100m tall are in the City)[xxvi] – faces a particular retrofit challenge in that practically all of the retrofit in the area is commercial retrofit of large buildings. Stakeholders have identified a gap in evidence, collaboration and strategy for non-domestic retrofit, which requires a different skillset and resource from domestic retrofit. In recognition of this gap, the City of London is leading a taskforce on commercial retrofit, which is in the evidence gathering stage and seeks to build a strong foundation for a roadmap moving forward. [xxvii]

Business' role in climate action

It is estimated that business activities are responsible for around half of all emissions in the UK, meaning that businesses are critical in reaching net zero.[xxviii] Large businesses are more likely to have developed decarbonisation policies, while accounting for a greater proportion of the UK's business emissions relative to their number. However, smaller businesses – estimated to be responsible for around half of business emissions – are crucial in the transition. Research from the British Business Bank highlights a range of barriers faced by smaller businesses in decarbonising, including a lack of information, cost, and feasibility, reflected in the finding that 76% of businesses surveyed are yet to implement a decarbonisation strategy.[xxix] However, this is not indicative of complacency, as just under half of businesses stated that carbon reduction was a high or very high priority. [xxx]

Councils in central London are addressing these barriers and helping businesses to act on this priority through a range of programmes. For example, Islington has allocated £200,000 for a training and development programme delivered by ReLondon to help businesses understand how adopting circular economy practices can benefit them commercially and environmentally. The scheme will see at least 10 businesses supported through grants and business support, including building grantee capacity, raising awareness and assessing environmental impact. The Camden Climate Change Alliance – Camden's sustainability network for businesses, the third sector and schools – was founded by the borough and in 2008, to support members to take action to mitigate climate change, improve local air quality and reduce waste. Members measure and report their emissions and can access tailored support and reduced-fee consultancy services, such as supply chain audits, training in corporate social responsibility and carbon management plans.[xxxi]

Box 3: Zero Emissions Network (ZEN)– supporting local businesses to decarbonise

A partnership between Hackney, Islington and Tower Hamlets and supported by the Mayor of London, the Zero Emissions Network is an initiative to help local businesses and residents become more sustainable and decarbonise.

The Zero Emissions Network has over 1500 business and 900 resident members, and has delivered over 800 emission reducing initiatives.[xxxii] Examples of initiatives delivered by ZEN include helping businesses green their fleet, encourage staff to engage in active commuting, and the network offers grants and discounts to support this. [xxxiii]

The initiative's resident offer supports residents to take action to improve local air quality through programmes such as bike maintenance training, emissions free removals services and discounts on Santander Cycles memberships. [xxxiv]

Businesses based in the subregion are also leading action to support net zero ambitions, including through working in partnership with local academic institutions. In engaging with boroughs, we heard that as well as larger, established 'green' employers, the sub-region is home to clusters of innovation (such as Hackney's 'Silicon Roundabout' where tech start-ups have congregated), providing a foundation for future growth in the green economy. The case studies below showcases the role of inter-sector collaboration in central London to drive innovation.

Box 4: Olympic Park Innovation District

The Olympic Park Innovation District is a hub for emerging technologies, including sustainable and clean tech, formed of a partnership between academia (Imperial College London), business (Engie, Intel Labs) and the national and international innovation community (Future Cities Catapult, EIT Climate-KIC).

The Queen Elizabeth Olympic Park is one of the first examples of Climate KIC-sponsored[4] Smart Sustainable Districts. It is a sustainable urban park, presenting digital innovation and data alongside homes, a cultural quarter hosting performing and visual arts, as well as commercial space and innovation. The London Aquatics Centre and Copper Box Arena will be the initial focus of research to increase the resource efficiency of non-domestic buildings to make sure they are future-ready.[xxxv]

Box 5: Climate tech ecosystem in Lambeth

Europe's largest physical green start-up hub has been launched through a £5 million partnership between cleantech investor Sustainable Ventures, Lambeth Council and Big Issue Invest, with headquarters located in County Hall in Lambeth.

Sustainable Ventures provides office space exclusively for green businesses; the third floor of County Hall is already at capacity, hosting 50 innovative companies. The £5 million investment will develop the County Hall site further, expanding to the fifth floor to provide more work space ringfenced for start-ups innovating in climate tech or other green business. It aims to support 1,000 businesses by 2025, with hopes this will create over 4,000 green innovation jobs.

This work being done by local authorities, anchor institutions and other local stakeholders to incubate and strengthen the green economy serves to frame the growth of green jobs in central London that we have identified.

Definition and methodology

As discussed in more detail in the cross-London report, to develop a common definition of 'green jobs' for London, we conducted a review of existing definitions of 'green jobs' – and related concepts, such as the green economy and sectors – from UK statistics, research- or mission-specific uses and academia, and held roundtables and interviews with a range of stakeholders to gather feedback on the potential approaches. With practicality, applicability and political salience in mind, we have adapted the approach employed by the Green Jobs Taskforce to better reflect London's labour market and business makeup, informed by our literature review and stakeholder engagement.

Green jobs are those jobs that facilitate meeting net zero and broader environmental goals. This definition comprises the following sectors, adapted from those of the Green Jobs Taskforce to reflect London's economy.

[4] The EU's main climate innovation initiative

Mission-based definition: proposed sectors for a London based definition

Net zero focus

1. **Homes and buildings:** Including retrofit, building new energy-efficient homes, heat pumps, smart devices and controls, heat networks and hydrogen & electric boilers
2. **Low carbon transport:** Including low or zero emission vehicles, aviation and maritime, rail, public transport and walking or cycling;
3. **Power:** Including renewables (such as wind, solar and hydropower), nuclear power, grid infrastructure, energy storage and smart systems technology;
4. **Business and industry**: including hydrogen production and industrial use, carbon capture, utilisation & storage (CCUS) and industrial decarbonisation
5. **Green Finance:** The concentration of financial activity in Central London means that in our context Green Finance could be a key area to separately identify
6. **Climate change research & development:** Including private sector, academic and public research.
7. **Climate change strategy, policy, monitoring and planning:** Including public, private and NGO sector strategy and policy, outreach to citizens, environmental monitoring and use of planning system to achieve net zero
8. **Climate adaptation:** Including flood defences, retrofitting of buildings to be resilient to extreme weather/climate events, nature-based solutions to reduce climate impacts and civil and mechanical engineering for infrastructure adaptation.

Broader environmental goals (may have some impact on climate change goals)

9. **Reducing localised pollution:** Including air pollution, water pollution and noise; London has ambitious goals across all three of these areas
10. **Reduce, reuse, recycle:** Including waste management and circular economy
11. **Green and blue infrastructure:** Within a London context this will focus on urban green and blue infrastructure, and include activity aimed at increasing biodiversity directly or through offsetting

Source: WPI Economics

The methodology for this report follows that of the cross-London report. To summarise, we use the mission-based definition to examine the number and types of green jobs in the sub-region (figures are for Full-Time Equivalents, but we use the term 'job' for convenience). We use two sources to quantify gross number of jobs in the sectors outlined above:[5]

- **The Low Carbon Environmental Goods and Services (LCEGS) sector dataset**: This dataset is prepared by the consultancy kMatrix and commissioned regularly for London by the Greater London Authority. This dataset includes a broader set of activities than official definitions such as the ONS EGSS and LCREE data,[6] such as green finance, and includes the supply chain for green activities as well as the activities themselves.

[5] A key difference from the cross-London report is the merging of three sectors – climate adaptation, green and blue infrastructure and reducing localised pollution – due to data availability at a subregional level. This difference is the same across all subregional reports.

[6] Environmental Goods and Services Sector and Low-Carbon and Renewable Energy Economy. See cross-London report for an explanation and comparison between these definitions.

- The Data City Real-Time Industrial Classification tool: This guided machine learning tool allows us to find companies working within specific fields, based on the way companies describe themselves on their websites. We worked with the Data City team to provide an initial "training set" of companies and keywords, and then iteratively improved the results by guiding the machine learning algorithm on which companies should be excluded or included. This tool allows us to identify data for the two sectors that the LCEGS data does not (such as Climate Adaptation and Green and Blue Infrastructure) and identify a broad range of companies within each sector that are operating within London. As it is a tool geared towards finding companies, it is more limited in its ability to identify green jobs within firms that are not fully within our definition of the green economy.

To allocate the jobs identified within LCEGS to our sectors we have:

- Mapped data from the 2017/18 LCEGS dataset to our green jobs categories, using "level 3" data from this dataset which looks at 127 distinct industrial activities.
- Estimated 2020 job figures using UK growth rates from the most recent LCEGS estimates. London figures for the period 2018/19 to 2020/21 have not been published yet, so we have currently assumed that growth for London has been in line with UK growth rates.

The results of this approach can be found in the following sections.

3. Green jobs and skills in central London today

Overall, our analysis finds that this Central London Forward subregion has just over 6 in 10 of the capital's green jobs, totalling 147,000 green jobs in 2020. This represents 4.7% of the subregion's total jobs. Within these, the top sectors largely reflect those of London as a whole – Green Finance, Power and Homes and Buildings. These three sectors account for 8 in 10 of green sector jobs in central London.

Table 1: Number of green jobs in Central London, 2020

Sector	Definition	Numbers of jobs	Central London % of total employment	% of green jobs
Homes and Buildings	Retrofit, building new energy-efficient homes, heat pumps, smart devices and controls, heat networks and hydrogen boilers	30,700	1.0%	20.9%
Low Carbon Transport	Low or zero emission vehicles, aviation and maritime, rail, public transport and walking or cycling	8700	0.3%	5.9%
Power	Including renewables (such as wind, solar and hydropower), nuclear power, grid infrastructure, energy storage and smart systems technology	42,700	1.4%	29.1%
Industrial decarbonisation, hydrogen and carbon capture	Including hydrogen production and industrial use, carbon capture, utilisation & storage (CCUS) and industrial decarbonisation.	400	0.0%	0.3%
Green finance	Structured financial activity that's been created to ensure a better environmental outcome	50,100	1.6%	34.1%
Climate change Research and Development	Including private sector, academic and public research	1,800	0.1%	1.2%
Climate change strategy, policy, monitoring and planning	Including public, private and NGO sector strategy and policy, outreach to citizens, environmental monitoring and use of planning system to achieve net zero	2,300	0.1%	1.6%
Climate adaptation, green infrastructure and reducing localised pollution	Including flood defences, retrofitting of buildings to be resilient to extreme weather/climate events, nature-based solutions to reduce climate impacts and civil and mechanical engineering for infrastructure adaptation; Urban green infrastructure, including activity aimed at increasing biodiversity directly or through offsetting; Reduction of air pollution, water pollution and noise	3800	0.1%	2.6%
Reduce, reuse, recycle	Waste management and circular economy	6,400	0.2%	4.3%
Total		**147,000**	**4.70%**	**100.00%**

There are a few interesting data points to consider in relation to present day green jobs in central London:

- Green Finance represents 34.1% of central London's green sector jobs, compared to 21.7% in London as a whole. The subregion accounts for almost all of the capital's jobs in this sector, which makes it one of central London's key distinguishing features. The sector accounts for a

substantially greater share of total central London jobs than London (0.9% in London and 1.5% in central London subregion).

- Power accounts for a little under a third of the jobs in central London's green economy, and the region represents just over half of all of London's jobs in this sector. This sector accounts for 1.4% of the sub-region's total employment.
- Homes and Buildings represents just over 1 in 5 of central London's green jobs (20.9%), and 1.0% of total jobs in the subregion. Just over half of London's green Homes and Buildings jobs are in central London.
- Compared to the cross-London picture, Low Carbon Transport accounts for a considerably lower share of the sub-region's green jobs, at 5.9% compared with London's 14%, and just 0.3% of total central London employment.

The table on the following page sets out these results further broken down on a borough level basis. In order to maintain the robustness and credibility of these figures, we have not represented the specific number in the table where this is under 50. Broadly, the borough level numbers outside the larger sectors (such as Power and Homes and Buildings) should be treated with some caution given their size.

Some key insights to note in relation to the larger sectors include:

- Green jobs are a much higher proportion of overall employment in the City of London (11.7%) than any other borough. This is almost entirely driven by the very substantial number of Green Finance jobs (47,000) in the Square Mile.
- Southwark has a particularly high proportion (0.6%) of Climate Adaptation, Green Infrastructure, Reducing Localised Pollution jobs relative to the other areas.
- Other than these two examples, the biggest sources of green employment across the boroughs are Power and Homes and Buildings.

Table 2: Estimated number of green jobs in central London, by borough and sector 2020

Borough	Climate adaptation, green infrastructure, reducing localised pollution	Climate change Research and Development	Climate change strategy, policy, monitoring and planning	Green finance	Homes and Buildings	Industrial decarbonisation, hydrogen and CCUS	Low Carbon Transport	Power	Reduce, reuse, recycle	All Green Jobs
Camden	310	280	340	<50	5,170	<50	1,120	6,540	930	**14,800**
City of London	700	160	550	47,070	4,120	<50	1,480	6,260	330	**60,700**
Hackney	100	130	130	<50	2,020	<50	290	2,360	620	**5,700**
Haringey	80	<50	<50	<50	630	<50	210	1,050	130	**2,200**
Islington	140	230	210	60	3,420	<50	640	3,720	930	**9,400**
Kensington and Chelsea	210	80	90	<50	1,400	<50	440	2,200	240	**4,700**
Lambeth	60	120	120	<50	2,150	<50	400	2,500	400	**5,800**
Lewisham	<50	<50	<50	<50	710	<50	210	1,230	140	**2,400**
Southwark	1,550	110	100	<50	1,500	<50	580	2,300	440	**6,600**
Tower Hamlets	<50	80	80	<50	1,140	<50	700	2,310	340	**4,700**
Wandsworth	60	110	110	<50	1,560	<50	440	2,320	370	**5,000**
Westminster City	410	400	490	2,720	6,910	80	2,160	9,940	1,530	**24,600**

Source: WPI Economics calculations based on data supplied by kMatrix on their Low Carbon Environmental Goods and Services methodology and The Data City

Table 3: Estimated green jobs as proportion of total employment, by borough and sector 2020

Borough	Climate adaptation, green infrastructure, reducing localised pollution	Climate change Research and Development	Climate change strategy, policy, monitoring and planning	Green finance	Homes and Buildings	Industrial decarbonisation, hydrogen and CCUS	Low Carbon Transport	Power	Reduce, reuse, recycle	All Green Jobs
Camden	0.1%	0.1%	0.1%	-	1.4%	-	0.3%	1.7%	0.2%	**3.9%**
City of London	0.1%	0.0%	0.1%	9.0%	0.8%	-	0.3%	1.2%	0.1%	**11.7%**
Hackney	0.1%	0.1%	0.1%	-	1.6%	-	0.2%	1.9%	0.5%	**4.6%**
Haringey	0.1%	-	-	-	0.9%	-	0.3%	1.4%	0.2%	**3.0%**
Islington	0.1%	0.1%	0.1%	0.0%	1.5%	-	0.3%	1.6%	0.4%	**4.1%**
Kensington and Chelsea	0.1%	0.1%	0.1%	-	1.0%	-	0.3%	1.6%	0.2%	**3.3%**
Lambeth	0.0%	0.1%	0.1%	-	1.4%	-	0.3%	1.6%	0.3%	**3.7%**
Lewisham	-	-	-	-	1.0%	-	0.3%	1.8%	0.2%	**3.4%**
Southwark	0.6%	0.0%	0.0%	-	0.6%	-	0.2%	0.9%	0.2%	**2.7%**
Tower Hamlets	-	0.0%	0.0%	-	0.4%	-	0.2%	0.8%	0.1%	**1.6%**
Wandsworth	0.0%	0.1%	0.1%	-	1.3%	-	0.4%	1.9%	0.3%	**4.0%**
Westminster City	0.1%	0.1%	0.1%	0.4%	0.9%	0.0%	0.3%	1.4%	0.2%	**3.4%**

Source: WPI Economics calculations based on data supplied by kMatrix on their Low Carbon Environmental Goods and Services methodology and The Data City

The value of the green economy in central London

The green economy represents substantial value to the central London economy. Our mapping of the LCEGS dataset to the 11 green economy sectors we have identified allows us to report the total revenue each sector accounts for, in combination with our bespoke Data City company lists for the two sectors not covered by LCEGS. In total we estimate that the 11 green economy sectors accounted for around £28.6 Billion in 2020/21, with Green Finance accounting for around half of this total. Estimates for each sector are presented below.

Table 4: Estimated value of the green economy by sector

Sector	Estimated sales
Climate adaptation, green infrastructure and reducing localised pollution	£0.54 billion
Climate change Research and Development	£0.28 billion
Climate change strategy, policy, monitoring and planning	£0.35 billion
Green finance	£14.0 billion
Homes and Buildings	£4.9 billion
Industrial decarbonisation, hydrogen and carbon capture	£0.05 billion
Low Carbon Transport	£1.4 billion
Power	£6.2 billion
Reduce, reuse, recycle	£0.9 billion
Total	**£28.6 billion**

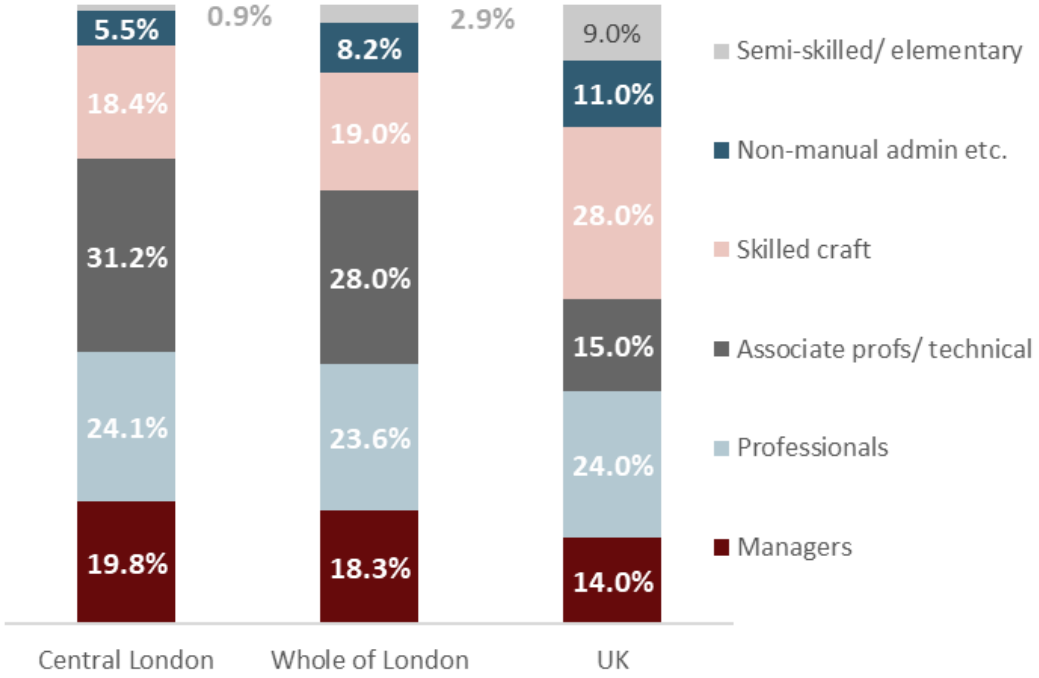
Sources: WPI calculations based on kMatrix Low Carbon and Environmental Goods and Services estimates and Data City calculations for climate adaptation / green and blue infrastructure (allocated proportionately to job estimates in each sub-region). Notes: We have had to project total sales from 2017/18 figures for LCEGS, as more up to date figures for London had not been published by the time of writing. We uprated 2017/18 figures in line with national growth, as reported in kMatrix (2021) – https://kmatrix.co/uk-lcegs/. Numbers may not sum due to rounding.

Occupational patterns of employment

Green jobs in central London are concentrated among the higher-level occupational groups of managers, professionals and associate professionals (see annex for example green occupations by occupational group). Three quarters (75%) of people who live in central London and work green jobs are in these three occupational groups, compared with 70% of green jobs across the whole of London (and 53% of green jobs nationally), with over-representations in managerial, and associate professional/technical employment. There is a slightly smaller proportion of skilled craft jobs in

central London compared with the whole of London (18% and 19% respectively), and these are much lower than the national proportion of 28%.

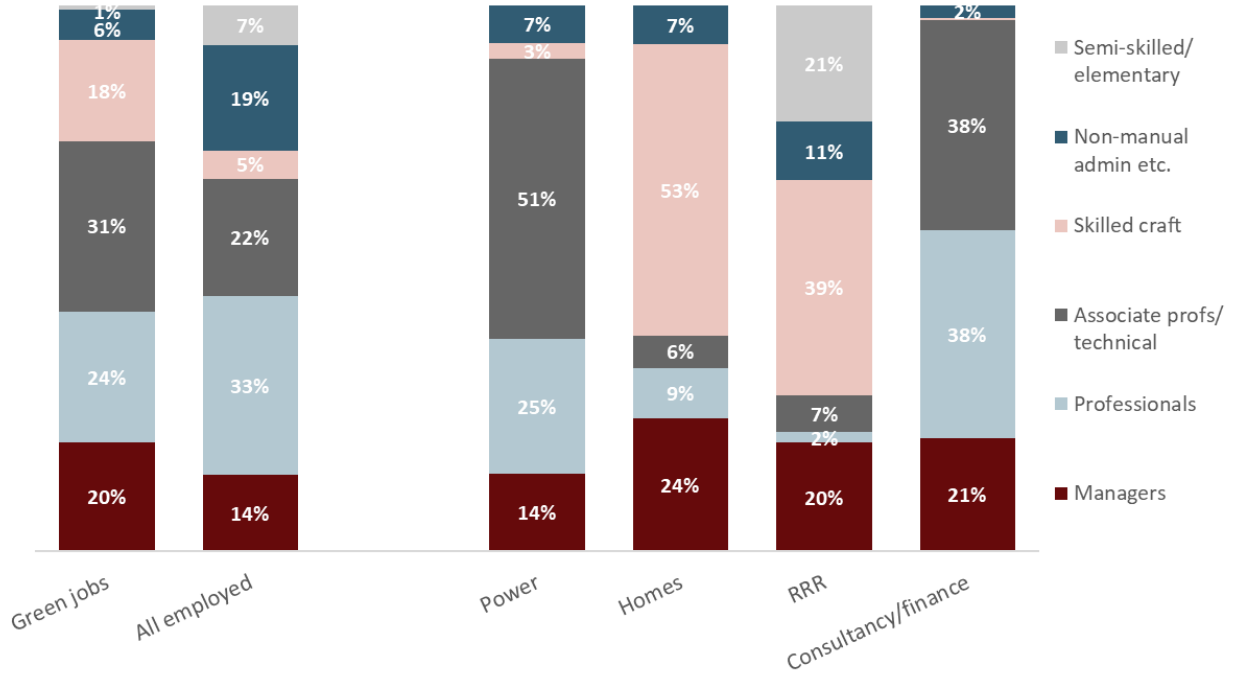
Figure 2: Green workers by major occupational group, central London, whole of London, and UK



Source: Quarterly Labour Force Survey, Jan-Mar 2020 to Oct-Dec 2020 combined

Figure 3 shows the occupational breakdown of green jobs in central London in comparison with all jobs in central London. Managerial and associate professional jobs are over-represented in green sectors, although the proportion of professional occupations in green sectors is below the overall proportion (24% and 33% respectively). There are more than three times as many skilled craft jobs in green sectors compared with all sectors (18% and 5% respectively). Figure 3 also shows the breakdown within each of the four broad sectors within green jobs. Within the power sector, half of all jobs are in associate professional or technical occupations, while in consultancy and finance, 38% of jobs are in associate professional or technical occupations, and a similar proportion are in professional occupations. Within the homes, buildings and infrastructure, and reduce, reuse, recycle (RRR) sectors, the largest occupational group is skilled craft workers, and while these sectors have low proportions of professional and associate professional occupations, there are large proportions in managerial occupations.

Figure 3: Green workers by major occupational group in comparison with all workers, and by green sub-sector, central London, 2020



Source: Quarterly Labour Force Survey, Jan-Mar 2020 to Oct-Dec 2020 combined

Detailed occupations

The sample sizes for the power and reduce, reuse, recycle sectors in central London in the LFS are below the recommended threshold for reliable estimates, and so it would not be safe to draw conclusions for these sectors in central London from the LFS data The cross-London profiles have therefore been used for these two sectors, and so the main detailed occupations in these sectors in central London will be the same as those presented for the whole of London in the cross-London report.

Within the homes, buildings and landscape sector in central London, gardeners and landscape gardeners are the largest group (14% of all jobs in this sector in central London, compared with 17% nationally), closely followed by general construction and building trades (12% in central London compared with 4% nationally), and electricians and electrical fitters (11% compared with 14% in UK). Plumbers and heating engineers, and general electrical trades workers, were the next largest detailed occupations in central London (8% and 7% respectively).

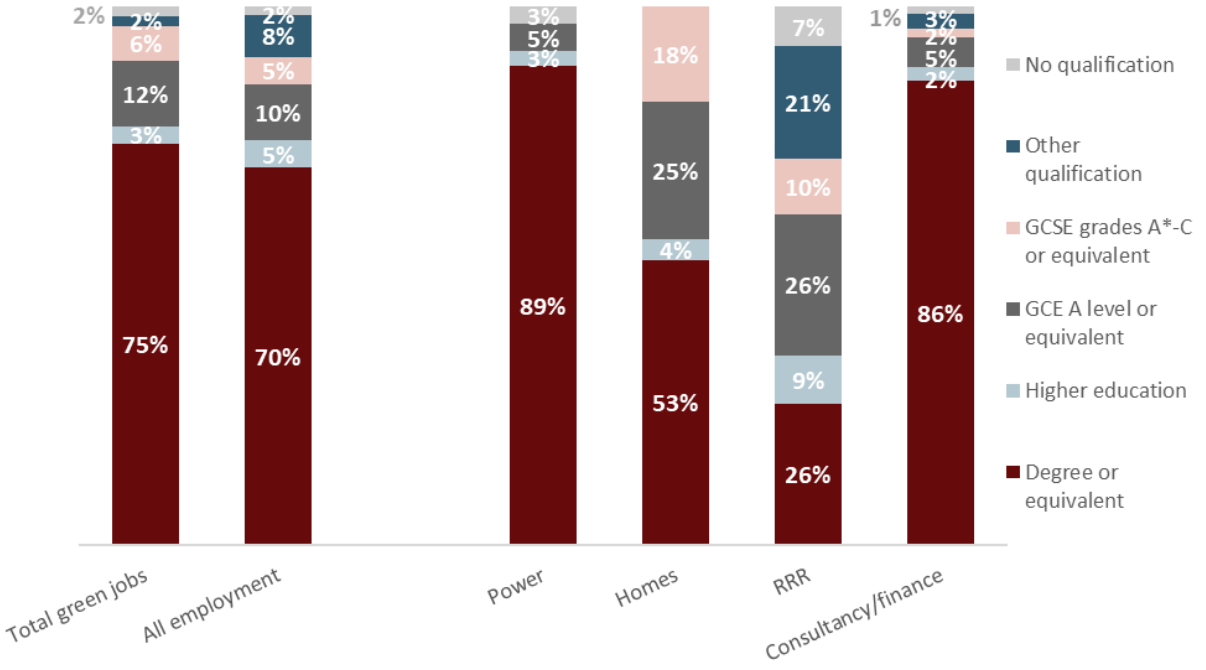
Within the consultancy and finance sector in central London, management consultants and business analysts are the largest group (13% of all jobs in this sector in central London, compared with 8% across the country as a whole), followed by marketing associate professionals (8%, compared with 2% in the UK), while business and financial project management professionals, general business and related associate professionals, and sales accounts and business development managers each make up around 5% of all jobs in the sector.

Qualifications

Central London residents who work in green jobs are very highly qualified. Three quarters (75%) of workers in green jobs in central London hold first degrees or equivalent or higher qualifications. This is above the proportion of all central London workers with qualifications at this level (70%) and above the proportion of green workers across the whole of London with at least a first degree or equivalent (65%). Across the UK, 38% of green workers have first degrees or equivalent or higher qualifications, 8% had HE qualifications below degree level, and 26% had A-levels/Level 3 qualifications as their highest qualifications.

The vast majority of workers in power, and in consultancy/finance, are graduates (89% and 86% respectively), as are half of workers in homes, buildings and landscape (53%, compared with 33% across the whole of London). Around one in four workers in reduce, reuse, recycle are graduates, and a similar proportion have qualifications at NVQ level 3/A-levels or equivalent.

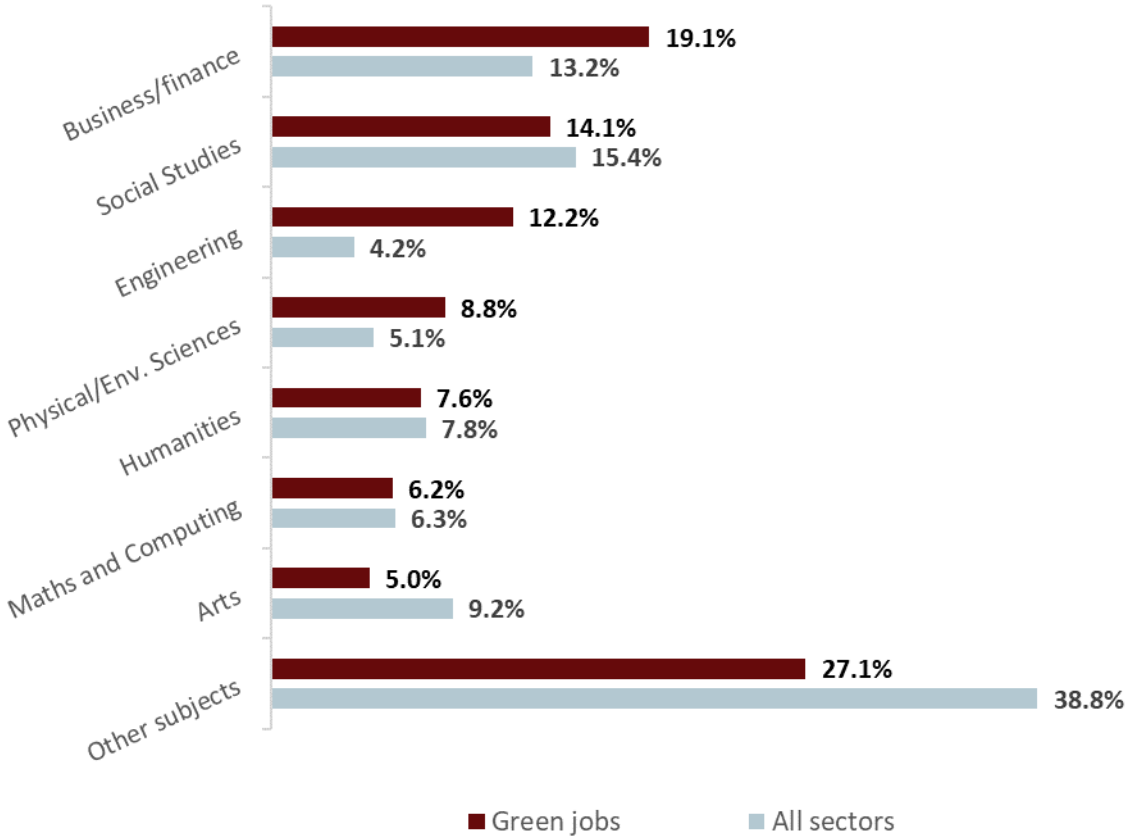
Figure 4: Highest qualification level of green workers in comparison with all workers, and by green sub-sector, central London, 2020



Source: Quarterly Labour Force Survey, Jan-Mar 2020 to Oct-Dec 2020 combined

The most common degree subjects among graduate workers in green jobs in central London are business/finance, and social studies, accounting for 19% and 14% of all graduate green workers respectively – business/finance graduates are over-represented in green jobs compared with all sectors, while the proportion of social studies graduates is the same among green sectors as the overall average. The proportion of graduate workers with degrees in engineering is three times higher among green sectors than across all sectors (12% compared with 4%) and there is also a substantial over-representation of physical/environmental science graduates (9% of green workers compared with 5% of all graduates).

Figure 5: First degree subject of graduates, central London, 2020



Source: Quarterly Labour Force Survey, Jan-Mar 2020 to Oct-Dec 2020 combined

The largest vocational subject areas among workers in green jobs in central London were building and civil engineering, electricity and energy, and engineering and manufacturing trades, each accounting for more than one in ten workers with vocational qualifications and reflecting the prevalence of these skills among the homes, buildings and landscape sector. On the business side, management and administration, and marketing and advertising qualifications were held by 7% and 6% respectively of green workers with vocational qualifications.

Table 5: Proportion of workers in green jobs and in all sectors with vocational qualifications by subject area, central London

	Green jobs	All jobs
Building and civil engineering	13.6%	4.5%
Electricity and energy	12.1%	0.9%
Engineering and manufacturing trades	11.0%	0.7%
Electronics and automation	8.7%	2.3%
Protection of persons and property	7.6%	1.0%
Management and administration	6.8%	6.7%
Marketing and advertising	5.9%	1.8%
Craft skills (Arts)	5.8%	1.3%
Proportion of all workers with one of the above	71.4%	19.1%

Source: Quarterly Labour Force Survey, Jan-Mar 2020 to Oct-Dec 2020 combined

Demographics

The green workforce in central London is male-dominated, and with a higher proportion of white workers than across all sectors. This is in line with the patterns for the whole of London. Only one third of all green workers who live in central London are female. This proportion is higher in consultancy/finance, at 39%, but lower (21-23%) in the other three broad sectors.

Just under one in four green workers across all green sectors (23%) are from Black, Asian and Minority Ethnic backgrounds, compared with around one in three workers overall (32%). The proportion of workers from Black, Asian and Minority Ethnic backgrounds is highest in the reduce, reuse, recycle sector, at 36%, followed by home, buildings and landscape (31%), and lowest in the power sector (6%).

Green workers in central London are younger on average than all workers – nearly half (49%) of green workers are aged under 35, compared with 43% of all workers in central London, and 33% of green workers across the UK, while 37% of green workers are aged between 35 and 54, compared with 43 per cent of all central London workers and 45% of green workers in the UK (the proportion of central London aged over 55 is the same in green jobs in central London as across all jobs, at 14%).

Table 6: Demographic breakdown of green jobs within our definition, central London

	All green jobs	All jobs	Power	Homes	Reduce, re-use and recycle	Consultancy / finance
Male	66%	54%	77%	79%	77%	61%
Female	34%	46%	23%	21%	23%	39%
White	77%	68%	94%	69%	64%	80%
Black, Asian and Minority Ethnic	23%	32%	6%	31%	36%	20%

Source: Quarterly Labour Force Survey, Jan-Mar 2020 to Oct-Dec 2020 combined

Skills supply

The investigation of skills supply for green sectors looked at three topics:

- The current flow of people into green jobs, allowing us to understand where these individuals have come from and the likely scale of future supply from these sources.
- The number of people in other sectors that have the requisite skills and could be attracted to green jobs in the future.
- Current provision of courses in further and higher education, which could provide individuals with the requisite skills.

Flows of labour/skills into green sectors

This analysis, conducted at a national level rather than local level because of sample size issues in the LFS, found that the bulk of new entrants to green jobs came from those working in other sectors, and that relatively few new entrants came straight from education. Of the total workforce in green jobs in London, only 1% had been in full-time education in the year before; this compares with the average across all sectors of 3%. This suggests that green sectors tend to draw staff primarily from those already in employment, who may have developed appropriate transferable skills through their initial employment, rather than directly recruiting those straight from education. To meet the rapid growth projected in green jobs (presented below), it is likely that employers will continue to draw staff from other sectors, at least in the short term while the education and training sector and green employers forge closer links to meet employers' needs for green skills, and also to meet their needs for experienced/mid-career staff as it would take time for the education and training sector to produce them.

In terms of where new entrants from other sectors come from, entrants from manufacturing are a major source for all four broad sectors, while construction was a key source for homes, buildings and landscape, and ICT and professional services sectors were important for consultancy and finance. (Full details of the results are presented in the cross-London report.)

Workers with potential green skills outside of green sectors

The second of the skills supply topics examined is an investigation of the potential supply of skills that is currently in the central London labour market but working in non-green sectors. This analysis identifies the number of workers in the key occupations for each of the four broad green sectors who are working in non-green sectors, to quantify the number of people with potentially relevant skills for green jobs who are working in non-green jobs, and to understand the potential pool of labour that green sector employers could draw on. As an example, for the homes, buildings and landscape sector we estimate the number of workers in the key occupations for the sector (electrical and plumbing trades, production managers in construction etc.) who are currently employed outside of the homes, buildings and landscape sector. This would include for example other non-green parts of construction or in other sectors. Given that the low level of entrants straight from full-time employment, in-flows from other sectors are the main source of new labour and skills for green sectors.

Table 7 shows that overall, the size of this potential supply is nearly twice the number of green jobs, and there is substantial variation between the four sectors. The potential supply for consultancy and finance, and for reduce, reuse, recycle, is around three times as large as the current size of the sector, while the potential supply for homes, buildings and landscape is only two thirds of the size of the current workforce. This suggests that skills shortages are much more likely to emerge within homes, buildings and landscape than in the other three broad sectors. Other research has identified that there are current skills shortages for many of the key roles needed to meet demand in some green sectors, notably electricians and plumbers in the Homes, Buildings and Infrastructure sector and engineers and technicians in Power.[xxxvi] Combined with the relatively smaller pools of potential labour in these sectors, means that employers in these sectors face the "double whammy" of current shortages and a relatively small pool of skills to draw on.

Table 7: Number of green jobs and workers in key occupations for each sector that are currently working in other sectors, central London

	Power	Homes	RRR	Consultancy/ finance	Total green
Green jobs estimate	42,700	43,520	6,400	54,180	146,800
Workers in key occupations in other sectors	75,300	29,400	18,700	162,900	286,300
Potential supply / current jobs	176%	68%	292%	301%	195%

Source: Quarterly Labour Force Survey, Jan-Mar 2020 to Oct-Dec 2020 combined

- In the power sector, the bulk of the potential supply is among associate professional occupations (which make up 73% of the total workforce in the sector), and these are concentrated in the financial services, IT, and professional services sectors.
- Just under half of the potential supply for the home, buildings and landscape sector is currently working elsewhere in the construction sector, in skilled craft occupations and in managerial occupations, while there is also potential supply at managerial level in the real estate and administration/support services sectors.

- The main areas of potential supply for the reduce, reuse, recycle sector are managers in the manufacturing and IT sectors, and skilled craft workers in manufacturing.
- The financial services sector is major source of potential skills at managerial, professional and associate professional level for the consultancy/finance sector, accounting for one third of the total potential supply, and three quarters of the potential supply of associate professional skills. Professional workers with relevant skills can also be found in the public administration and ICT sectors, while managers can be found across most service sectors, particularly ICT, professional services, administrative and support services, and wholesale and retail.

Current provision in Further Education (FE) in central London

Table 8 shows trends in numbers of adult (19+)[7] learners studying for qualifications at Level 2 and above in curriculum areas associated with green skills[8] in central London from 2014/15 to 2018/19 (the most recent full academic year for which data are available by location and subject area).

Despite the growing demand for green jobs in central London, total provision has declined somewhat over the last five years, from 9,500 to 8,300; representing just over 5% of the current employment level in green jobs, below the average across the whole of London of almost 10%. Thus the size of the FE pipeline relative to the number of green jobs is much smaller in central London than it is in the outer London area.

Looking in more detail, there has been a shift from Level 2 provision to Level 3 provision, as there has been across the whole of London. Level 2 provision has fallen by 24% in the last five years, while Level 3 provision, which is smaller in size, has risen by 26%. However, there has been an expansion in Level 2 provision in building and construction, of 51%, while provision above Level 2 has fallen slightly over the period, although there have been large fluctuations from year to year in numbers of learners in building and construction at all levels. The only other curriculum area which has experienced growth has been Level 3 provision in business management (89% increase).

The flows analysis of new entrants to the sector found that nationally, only one per cent of workers in green sectors had entered from full-time education in the previous year into the sector. Applying that proportion to the London workforce suggests that the sector recruits around 1,400 workers from full-time education, which is around equivalent to one sixth of the relevant provision in FE each year, although across the whole of London this proportion was lower at around one tenth. It should be remembered that new entrants to green sectors from full-time education will include some people who studied subjects outside of these core areas in the definition of relevant provision.

[7] The analysis in this report covers 19+ learners, as these are the data available that can be split by location / provider. In addition to these learners, there will be some 16-18 learners in FE colleges studying subjects relevant to green courses (and not on apprenticeships, where data is also presented). The size of this group (in terms of relevance for our analysis) will be relatively small, as it is likely that a high proportion will progress to study either at 19+ in FE, or in HE, for which we present the data. Thus, while our estimates will be a lower bound on the relevant FE learners, this will not fundamentally change our view of the mismatch between supply and demand.

[8] These curriculum areas are based on the main vocational qualification subjects of green workers across the whole of London, presented in the cross-London report.

Table 8: Numbers of Further Education learners in qualifications associated with green skills, central London

	2014/15	2015/16	2016/17	2017/18	2018/19	% change 2014/15-2018/19
			Level 2			
Accounting and Finance	1,194	1,164	938	812	800	-33.0
Building and Construction	1,190	844	1,884	2,009	1,794	50.8
Business Management	3,271	2,625	3,053	2,577	2,426	-25.8
Engineering	225	36	150	131	71	-68.4
Environmental Conservation	12	0	0	5	0	-100.0
Manufacturing Technologies	1,036	359	199	259	253	-75.6
Transportation Operations and Maintenance	419	193	188	333	223	-46.8
			Level 3			
Accounting and Finance	433	439	354	237	165	-61.9
Building and Construction	570	749	537	609	550	-3.5
Business Management	848	1,569	1,626	1,109	1,599	88.6
Engineering	140	141	174	152	87	-37.9
Environmental Conservation	0	0	0	0	0	-
Manufacturing Technologies	1	10	80	178	124	-
Transportation Operations and Maintenance	38	40	26	24	24	-36.8

			Above Level 3			
Accounting and Finance	106	174	172	124	75	-29.2
Building and Construction	11	37	14	6	6	-45.5
Business Management	28	18	71	93	125	346.4
Engineering	23	0	1	1	0	-100.0
Environmental Conservation	0	0	0	0	0	-
Manufacturing Technologies	0	0	11	15	5	-
Transportation Operations and Maintenance	0	0	0	0	0	-
Total	**9,545**	**8,398**	**9,478**	**8,674**	**8,327**	**-12.8%**

Source: Department for Education, Education and Training by Sector Subject Area

Table 9 below shows the proportion of total provision in the largest publicly-funded FE providers. Key points to note are:

- The WKCIC Group/Capital City Colleges Group serves learners across the CLF sub-region, particularly Camden and Haringey, where it accounts for 63% and 51% respectively of all learners in these subject areas, but also Islington (30%), City of London (24%), Hackney (23%) and Westminster (14%). It accounts for half of all provision in engineering, and also has a high proportion of provision in accounting and finance, and business management.
- South Thames Colleges Group is the main provider in Wandsworth, accounting for 72% of all learners in these subject areas, and also serves Southwark (11%) and Westminster (9%). Its main areas of green-related provision are building and construction, and business management.
- South Bank Colleges is the main provider in Lambeth (34%) and also serves Southwark (19%) and Tower Hamlets (12%). Its provision in green-related subjects is focused on building and construction, engineering, and manufacturing technologies.
- NCG – which runs Lewisham College and Southwark College – accounts for more than four fifths of learners in Lewisham (83%) and also serves Southwark (14%). It accounts for nearly one third of total provision in central London in manufacturing technologies, and also has a large share of courses in accounting and finance provision.
- United Colleges Group accounts for half of all learners in these subjects in Westminster (50%), and its main green-related provision is in accounting and finance, engineering, and transportation operations and maintenance.
- New City College is in Hackney and accounts for 24% of all learners in these subjects in the borough, specialising in provision in transportation operations and maintenance.

Table 9: Provision in publicly funded FE providers located in central London

	Accounting and finance	Building and Construction	Business Management	Engineering	Manufacturing Technologies	Transportation Ops and Maintenance	Total
The WKCIC Group	22.1%	6.8%	18.8%	51.9%	6.8%	0.0%	15.3%
South Thames Colleges Group	2.4%	13.0%	11.5%	0.0%	0.0%	0.0%	9.7%
South Bank Colleges	8.1%	22.0%	1.2%	16.5%	10.5%	1.6%	8.6%
NCG	10.5%	5.3%	1.3%	0.0%	29.6%	8.9%	5.1%
United Colleges Group	15.1%	3.8%	2.1%	7.0%	0.0%	0.8%	4.2%
New City College	5.7%	5.4%	0.5%	0.0%	2.9%	11.3%	3.0%
All providers above	63.8%	56.3%	35.4%	75.3%	49.7%	22.7%	45.9%
Total leaners	1,040	2,350	4,150	158	382	247	8,327

Source: Department for Education, Education and Training by Sector Subject Area

Detailed data on courses directly related to green jobs was obtained from some colleges within central London (covering all 16+ provision). These data showed that provision in electrical installation and plumbing/heating within the building and construction subject area was relatively small, accounting for around 30% of the total provision within these colleges in building and construction at Level 2 or above, and was all at Level 2. However, numbers were increasing in the current academic year over the 2020/21 data, by around one third, so provision is on an upward trajectory albeit from a low base. There is also provision below Level 2 at these colleges, which was around twice the size of Level 2 provision in 2020/21, but has fallen in this academic year as provision at Level 2 has expanded. If this pattern is similar across the other colleges, there might be around 400 learners in electrical/plumbing/heating courses at the major colleges, and nearly 800 in total across all providers in central London.

Apprenticeships

In addition to the potential supply of new labour market entrants from the FE sector, there is the pool of apprenticeship learners combining on-the-job training with study at college. Table 10 shows the latest apprenticeship starts and achievements in sector subject areas that are relevant for green jobs in central London.

Across the three relevant sector subject areas there were 6,000 starts in 2018/19, representing 4% of the current employment level in green jobs compared with the cross-London figure of just over 8%, and smaller than the number of learners in FE at Level 2 and above. The number of FE learners and apprenticeship learners combined represents 9% of the green workforce in central London, around half the size across the whole of London. Green employers in central London therefore have a relatively small pool of FE and apprenticeship learners to draw on to meet their current, and rapidly growing future needs.

Apprenticeship starts in ***construction, planning and the built environment*** accounted for 3% of all apprenticeship starts (compared with 4% for whole of London), although a slightly higher proportion of intermediate apprenticeships (i.e. at Level 2). The number of starts at intermediate and advanced level are lower than the number of learners studying in FE at those levels (Level 2 and 3), while the number of higher apprenticeship starts is substantially higher than the number of FE learners above Level 3; thus provision above Level 3 is mostly in apprenticeships whilst provision at Levels 2 and 3 is mostly in FE. Starts in ***engineering and manufacturing technologies*** are higher than in construction, accounting for 6% of all apprenticeship starts, although there are no starts for higher apprenticeships in this sector subject area. By contrast, ***business, administration and law*** accounts for two fifths all higher apprenticeship starts, and nearly two fifths of all starts.

Table 10: Numbers of Apprenticeship starts and achievements in qualifications associated with green skills, central London, 2018/19

	Starts		Achievements	
	Number	% of all starts at that level	Number	% of all achievements at that level
Construction, Planning and the Built Environment				
Intermediate Apprenticeship	210	5.9	80	4.7
Advanced Apprenticeship	110	3.9	40	1.9
Higher Apprenticeship	90	2.7	0	0.0
All levels	410	3.3	120	2.9
Engineering and Manufacturing Technologies				
Intermediate Apprenticeship	410	11.5	200	11.8
Advanced Apprenticeship	380	7.6	100	4.8
Higher Apprenticeship	0	0.0	0	0.0
All levels	790	6.4	300	7.2
Business, Administration and Law				
Intermediate Apprenticeship	760	21.4	470	27.6
Advanced Apprenticeship	1,950	14.0	540	25.8
Higher Apprenticeship	2,040	60.7	230	59.0
All levels	4,750	38.5	1,240	29.7

Source: Department for Education, Apprenticeship Data Pack 2018/19

Current provision in Higher Education (HE) in central London

Turning to ***HE provision***, London has a large student population, and central London universities teach more than half of all HE students in London.

Table 11 presents data on the estimated numbers of workers in green jobs with degrees in the main subject areas related to green jobs (based on the data presented above of qualifications of green workers), along with data on undergraduate student numbers in those same broad areas in central London HE institutions. Nearly one in five graduate workers in green jobs (19%) have degrees in business and finance, and 14% have degrees in social studies, while these subject areas account for lower proportions of undergraduate provision in central London HE institutions, of 13% and 8% respectively. The proportion of students in engineering (11%) is close to the proportion of all graduate workers in green sectors with engineering degrees (12%), although provision in physical/environmental sciences is around half the relative size of the graduate workforce (4% and 9% respectively). However, maths and computing accounts for a higher proportion of HE provision than graduates in green jobs.

The table also presents the size of the annual cohort in each subject area (assuming three years of first degree undergraduate study) in relation to the size of the graduate workforce with degrees in that subject area. This gives an indication of the ratio of new graduates to current green workers within each subject area, albeit bearing in mind that a large proportion of graduates in these subjects will not necessarily go into green jobs, and that green employers recruit relatively few staff straight from education. The flows of graduates with engineering degrees into the labour market is just over one third of the size of the green workforce with engineering degrees, while in business and finance, and social studies/sciences, the flow of graduates is relatively smaller, at around a quarter of the employed graduate population. In maths and computing there is the largest relative annual supply of graduates, at around half of the employed graduate population. Thus the flow of maths/computing and engineering graduates from central London HE institutions is much larger in relation to the number of graduate workers in green jobs with maths/computing and engineering degrees, than is the case for business/finance and particularly physical/environmental sciences.

Table 11: Undergraduate student enrolments in London Higher Education providers in relation to workforce size for selected broad subject areas, central London

	Green jobs		HE provision			HE Cohort as % of employ-ment
	% of graduate workers	Estimated number	Total first degree enrolme-nts	Estimated annual cohort	% of total	
Business/finance	19.1	20,900	17,000	5,700	12.9	27.1
Social Studies	14.1	15,400	10,700	3,600	8.1	23.1
Engineering	12.2	13,400	14,700	4,900	11.1	36.7
Physical/Env. Sciences	8.8	9,600	5,700	1,900	4.3	19.7
Humanities	7.6	8,300	800	300	0.6	3.1
Maths and Computing	6.2	6,700	10,300	3,400	7.8	51.2

Source: Quarterly Labour Force Survey, Jan-Mar 2020 to Oct-Dec 2020 combined

Imperial and UCL have the largest numbers of undergraduate students in engineering (4,000 and 2,000 respectively), and in physical sciences (1,700 and 1,500 respectively), while the University of Westminster has the largest number of business and management students (3,700), followed by City, University of London (2,400), London Metropolitan University (2,100) and London South Bank University (2,100).

Responses to a bespoke data request for data on provision in specific detailed courses related to green jobs were received from some central London universities. These responses suggest that around half of engineering provision is in areas directly related to green jobs – electrical and mechanical engineering – which would result in around 2,500 green-related engineering graduates leaving central London universities each year. However, architecture and environmental design makes up only a small proportion of total provision in architecture, around 5%. The responses also identified postgraduate provision in environmental sciences and applied environmental sciences, building technology, and energy resources in central London.

4. Projecting green jobs and skills in central London in the future

The methodology for projecting the number of green jobs in the coming decades combines a range of sources estimating the future growth of the green economy and specific sectors within it. We map the growth rate on the assumption that the fastest growth will occur in the next decade and somewhat slower approaching 2050 as net zero targets begin to be met and the green sector matures. Further details of our approach can be found in the cross-London report.[xxxvii]

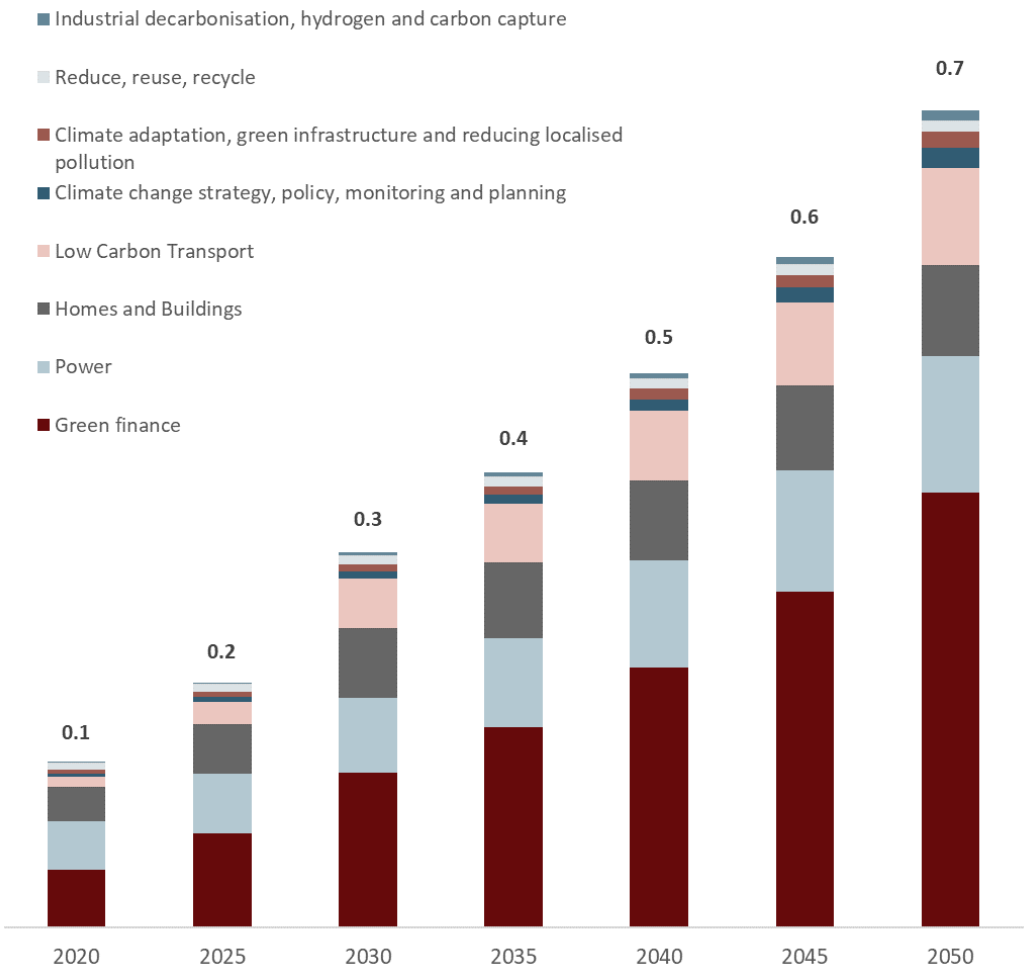
Sub-regional results

The total number of jobs in the central scenario is projected to rise from 147,000 in 2020 to 335,000in 2030 and then 732,000 in 2050, representing a near-5-fold increase over the next three decades. Within this scenario, four sectors account for 9 in 10 (91.3%) of central London's total number of green jobs by 2050:

- Green Finance (382,500), representing **52.3%** of total green jobs.
- Power (119,800), representing **16.4%** of total green jobs.
- Low Carbon Transport (85,900), representing **11.7%** of total green jobs.
- Homes and Buildings (80,000), representing **10.9%** of total green jobs.

The dominance of the Green Finance sector, representing more than half of central London's green jobs, remains one of the subregion's distinguishing features.

Figure 6: Projections of green jobs: central scenario (millions)



Source: WPI Economics analysis: see cross-London report for methodology[xxxviii]

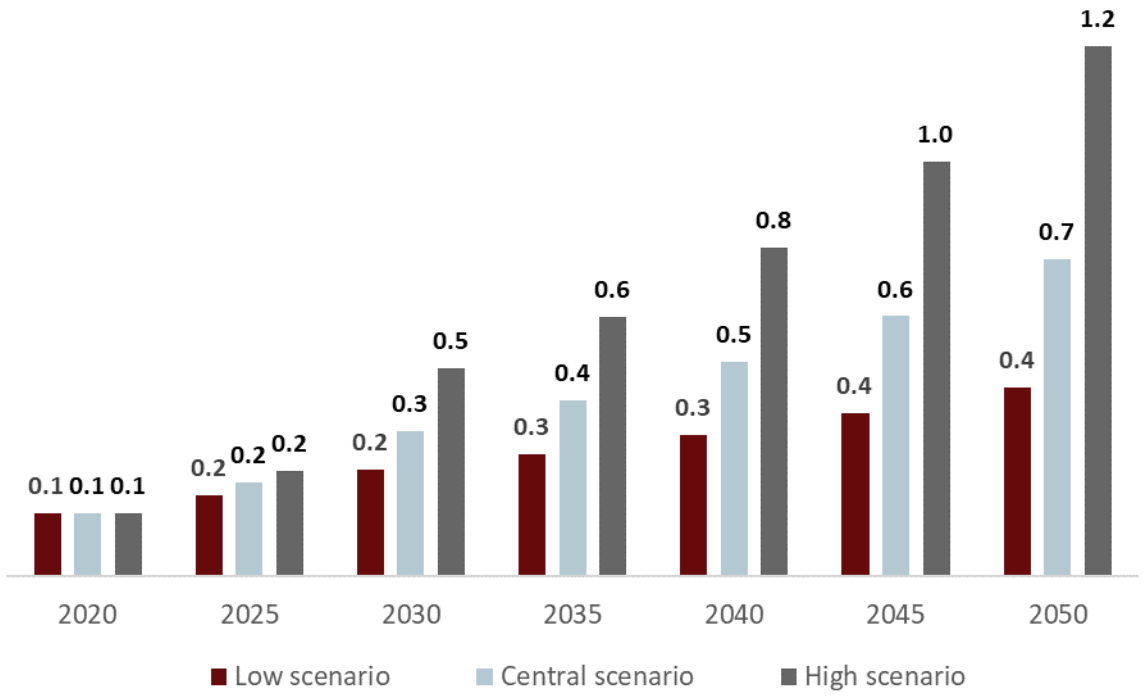
We present different scenarios (low, central, high) to account for uncertainty and different variations in policy and activity in the green economy. Whether scenarios are met in each sector will depend on a number of complex and interrelated factors, including policy action from national and local government around innovation, skills, trade and regulation. The Climate Change Committee[xxxix] considers the broad factors which could influence how the green economy evolves, and, taking a range of analyses into account, outline two key determinants:

- Engagement and behaviour change – To what extent do members of the public and businesses adopt low carbon options and behaviours (such as installing energy efficiency measures in homes)?
- Innovation – How does technology which helps to replace fossil fuels to reduce energy consumption evolve over the coming decades (such as through the scaling of heat pumps, hydrogen or CCUS)?

Government policy such as the recently announced £5000 grant to encourage households to retrofit their homes is an example of how government decisions, intervention and guidance may influence the above.

The different scenarios are presented below. The low scenario for the number of green jobs by 2030 is 246,000, while the high scenario projects there to be 481,000. For 2050, the low scenario projects 437,000 jobs in the green economy, while the high scenario puts this figure at 1.2 million.

Figure 7: Scenarios for projections of total green jobs in central London (millions)



Source: WPI Economics analysis: see cross-London report for methodology[xl]

Table 12: Low, central and high projections of green jobs in central London in 2030 and 2050

Sector	2020	2030			2050		
		Low	Central	High	Low	Central	High
Climate adaptation, green infrastructure and reducing localised pollution	3,800	4,700	**5,900**	6,800	7,300	**14,200**	21,200
Climate change Research and Development	1,800	3,900	**4,900**	6,100	9,000	**13,700**	20,700
Climate change strategy, policy, monitoring and planning	2,300	4,900	**6,200**	7,800	11,500	**17,500**	26,500
Green finance	50,100	108,200	**136,000**	170,100	250,500	**382,500**	579,800
Homes and Buildings	30,700	43,900	**62,000**	103,600	49,900	**80,000**	80,000
Industrial decarbonisation, hydrogen and carbon capture	400	1,000	**2,600**	6,100	1,900	**8,600**	35,800
Low Carbon Transport	8,700	20,200	**43,800**	89,900	28,300	**85,900**	244,900
Power	42,700	52,900	**65,300**	80,100	71,900	**119,800**	197,900
Reduce, reuse, recycle	6,400	6,700	**8,000**	10,200	6,900	**10,000**	16,200
Total	**147,000**	**246,000**	**335,000**	**481,000**	**437,000**	**732,000**	**1,223,000**

Source: WPI Economics analysis: see cross-London report for methodology[xli]

Overall, these figures represent very fast growth of central London's green economy over the next three decades. Some important observations about the central scenario can be found below:

- Green Finance remains the largest sector in the subregion throughout the projection timeline, ranging between 34.1% and 52.3%. This sector is projected to increase 7.6-fold from 2020 to 2050.
- Low carbon transport grows from 5.9% of the subregion's green sector jobs to 11.7% in 2050, with a faster rate of growth between 2020 and 2030 where it peaks at 13.9% of the subregion's green sector employment.
- Other sectors also see considerable growth over the period, though occupying a smaller share of total green sector jobs; these include Industrial Decarbonisation, Hydrogen and Carbon Capture (which, although accounting for a small share of employment, undergoes a 21.5-fold increase, the biggest sector growth in our projections), Climate Change Research and Development and Climate Change Strategy, Policy, Monitoring and Planning (both of which see a 7.6-fold increase between 2020 and 2050).

- Jobs in **Power** more than double from 42,700 to 119,800 between 2020 and 2050. As a share of central London's green jobs however, this sector sees a 9.5 percentage point decrease to 2030 (from 29.0%), accounting for just over 16% of the subregion's green sector jobs by 2050.
- **Homes and Buildings** jobs more than double between 2020 and 2030 to 62,000, and subsequently reach 80,000 by 2050.

Implications of the scenario results for skills provision

In the context of the focus of this report, skills provision and associated policy responses are a vital part of getting that policy landscape right.

The central employment projections suggest an increase in the green-jobs workforce of around 19,000 per year to 2030. Overall, this represents an increase in the total green workforce of 128% from its current level. The key issue is how this increase compares with the current level of skills provision, and how easy it will be for green businesses to meet their future skills needs.

The first thing to note is that there are markedly different rates of increase across the different sub-sectors. The increases are broadly similar to those projected for the whole of London, with reduce, reuse, recycle increasing by 25%, power increasing by just over 50%, homes, buildings and landscape increasing by around 160%, and consultancy and finance increasing by around 170%.

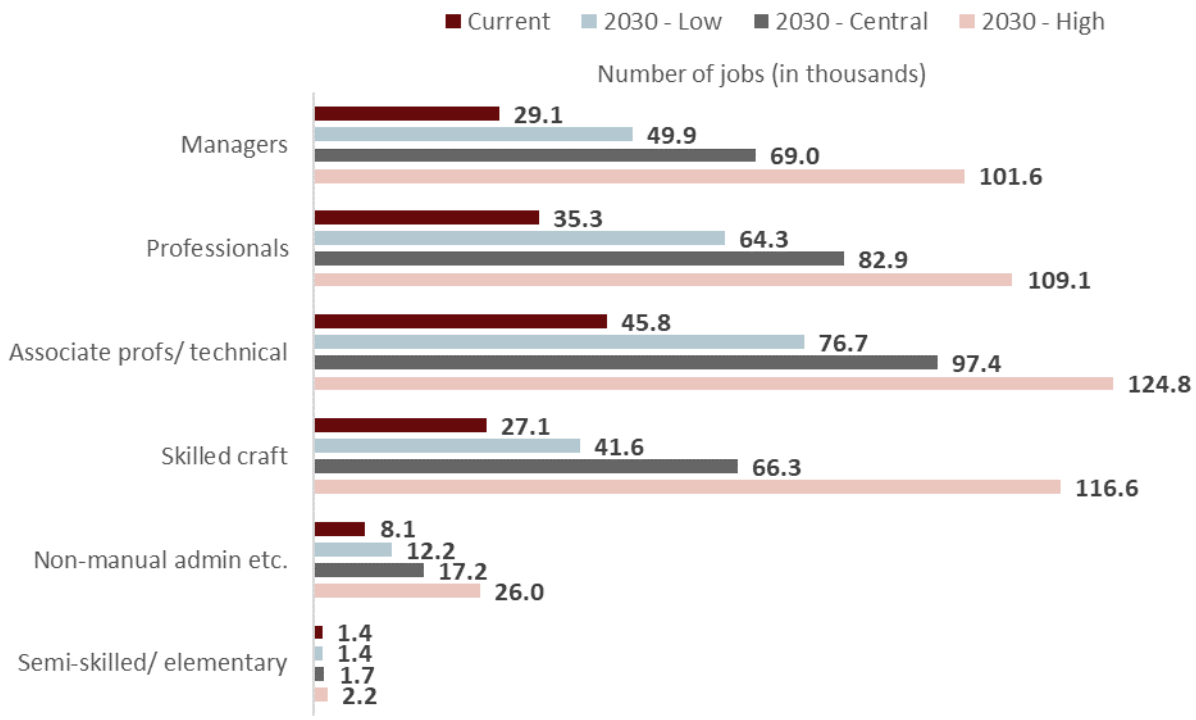
The key questions from a skills point of view are:

- What are the likely occupational changes over this period; and
- How this increase compares with the current level of skills provision, and how easy it will be for green businesses to meet their future skills needs.

Figure 8 shows the projected changes by occupational group to 2030, while Table 13 shows the detail behind the figure. The projections are calculated by applying the growth rate in each of the four broad sectors to the estimated number of current workers in each occupation in that sector, to forecast the number of workers in that sub-sector and occupation in 2030 under the different scenarios. These are then summed to give total for green jobs in the different occupational groups. This method assumes that the skills mix within each of the four broad sub-sectors will be the same in 2030 as it is now, but the mix across all green jobs will change as some sectors are forecast to grow much faster than others.

Considering the central forecast first, the largest increase, in numeric terms, is among associate professional workers, whose numbers are projected to increase by 52,000 to reach 97,000 in 2030, an increase of 113%. The projected increases are larger for the other main occupational groups, at 145% for skilled craft workers, 137% for managerial workers, and 135% for professional workers, but these differences will not change the relative sizes of these groups by 2030.

Figure 8: Future occupational employment levels for scenarios for projections of total green jobs in central London (thousands)



Source: IES calculations from WPI Economics analysis and Quarterly Labour Force Survey data

Under the low jobs forecast, the total number of jobs is projected to rise by 10,000 per year to 2030. Professional workers are projected to experience the largest increase in percentage terms, at 82%, while in numeric terms, the largest increase is among associate professional workers, at 31,000 (68% increase). The increase among managers is projected to be larger than among skilled craft workers (72% and 54% respectively).

The high jobs forecast projects that there will be an average increase of 33,000 workers per year across all green sectors to 2030, with a fourfold increase in the number of skilled craft workers, from 27,000 currently to 117,000 in 2030 (331% increase), almost twice the increase for associate professional workers, but associate professional workers will still be the largest occupational group in 2030 under this scenario.

Table 13: Change in employment by occupational major group

	Current	2030	Change	% change
		Central forecast		
Managers	29,100	69,000	39,900	137
Professionals	35,300	82,900	47,600	135
Associate profs/ technical	45,800	97,400	51,600	113
Skilled craft	27,100	66,300	39,200	145
Non-manual admin etc.	8,100	17,200	9,100	112
Semi-skilled/ elementary	1,400	1,700	300	25
		Low forecast		
Managers	29,100	49,900	20,800	72
Professionals	35,300	64,300	29,000	82
Associate profs/ technical	45,800	76,700	30,900	68
Skilled craft	27,100	41,600	14,500	54
Non-manual admin etc.	8,100	12,200	4,100	51
Semi-skilled/ elementary	1,400	1,400	0	5
		High forecast		
Managers	29,100	101,600	72,500	249
Professionals	35,300	109,100	73,800	209
Associate profs/ technical	45,800	124,800	79,000	173
Skilled craft	27,100	116,600	89,500	331
Non-manual admin etc.	8,100	26,000	17,900	220
Semi-skilled/ elementary	1,400	2,200	800	59

Source: IES, WPI Economics

In addition to the need for workers to meet the expansion demands of the sector to meet the policy goals, there will be a need to replace leavers from the sector, for retirement or other career breaks. Estimates of these replacement demands are taken from the Working Futures employment projections for London for the period 2017 to 2027, for the major occupational groups, and it is

assumed that green workers in each major occupational group will experience the same replacement rates as all workers in that occupational group[9]. Table 14 shows the estimates of the replacement demands for green workers in central London in the major occupations. In total, it is estimated that green sectors will need to recruit 49,000 workers over the coming 10 years to replace leavers – this is around one quarter of the expansion demand under the central scenario of 188,000, although half of the expansion demand under the low growth scenario. Thus the rapid projected growth in the sector means that replacement demand is a relatively small factor in relation to the expansion of the sector.

Table 14: Estimated replacement demand by occupational major group, central London

	Current	10 yr replacement demand rate %	Replacement demand
Managers	29,100	38.5	11,200
Professionals	35,300	34.8	12,300
Associate profs/ technical	45,800	32.8	15,000
Skilled craft	27,100	27.6	7,500
Non-manual admin etc.	8,100	33.0	2,700
Semi-skilled/ elementary	1,400	32.8	500
Total	146,800	-	49,100

Source: IES calculations from Quarterly Labour Force Survey data and IER Working Futures projections

Table 15 shows the detailed occupational unit groups with the largest projected increase in numbers to 2030. The number of business and related associate professionals not elsewhere classified (business systems analysts, data analysts, project coordinators etc.) is projected to increase by 16,200, accounting for nearly one tenth of the total increase; this is the largest numerical increase, although in percentage terms this is the lowest growth rate among the large occupational, at 71%. The number of management consultants and business analysts is projected to increase by 12,500, representing an increase of 171% on current numbers,. Among the craft occupations, there are large projected increases for electricians (9,900, increase of 145%), gardeners and landscape gardeners (7,300, 162%) and plumbers (5,700, 162%). The other occupations with large projected increases in numbers are managers, professionals and associate professionals in finance, marketing and sales, and production managers in construction.

[9] Replacement demands for green jobs may be lower than the Working Futures estimates due to the younger than average age profile of green jobs.

Table 15: Occupations with the largest projected increases in employment to 2030 under central forecast, central London

	Current	2030	Change	% change	% of total increase
3539 'Business and related associate professionals n.e.c.'	22,900	39,100	16,200	70.5	8.6
2423 'Management consultants and business analysts'	7,300	19,800	12,500	171.1	6.7
5241 'Electricians and electrical fitters'	6,800	16,700	9,900	145.5	5.3
5113 'Gardeners and landscape gardeners'	4,500	11,800	7,300	162.2	3.9
3543 'Marketing associate professionals'	4,300	11,400	7,100	165.3	3.8
3545 'Sales accounts and business development mngrs'	3,900	10,400	6,600	168.9	3.5
1131 'Financial mngrs and directors'	3,900	10,300	6,400	167.1	3.4
2424 'Business and financial project mngmnt professionals'	3,700	9,900	6,200	169.6	3.3
5314 'Plumbers and heating and ventilating engineers'	3,500	9,200	5,700	162.2	3.0
1122 'Production mngrs and directors in construction'	3,500	9,100	5,600	162.2	3.0

Source: IES calculations from WPI Economics analysis and Quarterly Labour Force Survey data

Note: "n.e.c" here stands for "not elsewhere classified".

Having looked at the likely occupational changes over the coming decade, we turn to comparing with future increases in demand with the size of the output from education and training provision to provide insights into how easy it may be for employers to meet their future skill needs. It should be remembered that green sectors currently draw very few workers directly from full-time education, with most new entrants coming in from other sectors, although with the rapid projected growth over the coming decade, employers will need to both increase the number of workers attracted from other sectors and draw more new workers straight from education. Under the central scenario, the

expansion demand of 19,000 and replacement demand of 5,000 gives rise to a total annual requirement of 24,000 workers.

The current data on skills provision show that across London there are around 14,000 learners per year in FE and in apprenticeships in relevant subject areas, and around 20,000 HE students each year in relevant subjects, giving an annual output from FE and HE of around 34,000 students.

Thus, if the projected expansion of the sector were to be met solely from new entrants from full-time education (and given the current in-flows from education this is a rather unlikely assumption), green employers would need to attract 70% of all education leavers with potentially relevant skills, and an even higher proportion if FE leavers progress to HE rather than entering the labour market. The current analysis of flows suggests that the sector recruits around 1,400 education leavers per year, so this suggests businesses would need to recruit 17 times as many workers straight from education than they currently do, if the growth in demand was met solely from education leavers and not from those switching sectors/occupations.

The relationships between subject areas and broad sector are such that it is only advisable to look at the balance between future labour demand and current skills provision at a broad level of consultancy-based jobs and skills, and craft-based jobs and skills. The former covers the consultancy and finance sector, and the majority of the power sector, while the latter cover the homes, buildings and landscape, reduce, reuse, recycle, and the rest of the power sector. The balance of future demand and current supply in these under the central scenario in central London are as follows:

- The number of consultancy-based jobs is projected to increase by around 11,000 per year over the coming decade, and with replacement demand of 2,900, giving a total annual requirement of 13,900. Current FE and HE provision is around 18,200 students per year, so future demand equals 72% of the annual output from education.
- The increase in craft-based jobs is projected to be slightly lower, at around 8,900 per year, which with replacement demand of 2,300, gives a total requirement of 11,300 per year. Provision is smaller than this level of increase, at around 10,000, so future demand will exceed the total supply from education by around 13%.

These analyses show that to meet the rapid expansion of the sector over the coming decade there is an urgent need to:

- increase education provision in subjects and courses that are relevant for green jobs;
- increase the proportion of those taking relevant courses who progress to employment within green sectors; and
- increase the flows from other, non-green, sectors into green sectors, including through re-skilling training.

Additionally, in the short-term while education and training providers increase their provision, green employers could look to make increasing use of migrant labour to meet their skills needs, although it is recognised that this would not be as easy as in the past due to the tightening of migration rules as a result of the UK's departure from the EU.

While these are priorities across green sectors as a whole, there is an urgent need for action in the craft-based sectors – homes, buildings and landscape, and reduce, reuse, recycle – as the projected increases are much larger in relation to the size of the education pipeline than is the case for consultancy-based roles. Roles in these sectors/occupation in London have been increasingly filled by

EU nationals in recent decades, and so are vulnerable to shortages as a result of reduced in-migration and increased out-migration post-Brexit.

Given the size of the projected increases in the number of green jobs, and the current low rate of inflow from education into the sector, it is likely that the flows from other sectors will be the main source of new entrants, at least in the short term while green education and training provision increases to meet the needs of the sector.

The green sector currently recruits a far higher proportion of new entrants from other sectors than directly from education, but the skills pipeline also needs to supply replacements for these workers, as well as expand to increase supply directly to the green sector. In summary, the green sector in London will experience large increases in employment, even under the low growth scenario, and employers will face challenges recruiting the skills to meet future needs. They currently source a far higher proportion of new entrants from other sectors than straight from education, and this is unlikely to change in the short term. However, over the medium term, employers and education providers will need to work together to increase provision in current and emerging green areas, and a growing awareness of and interest in sustainability among young people should support this expansion of provision, with a clear steer from government and the funding systems. Consultancy and finance based green sectors may find it easier to meet future needs from the large professional services sector in the capital, and the large output from education providers in these subject areas; however, employers of skilled craft labour may find it much harder to recruit the skills they need, given a much smaller supply in other sectors, much smaller numbers of students taking these courses, and current skills shortages in these occupations (potentially exacerbated by Brexit and the ending of freedom of movement). Across all green sub-sectors there is a need to widen access to groups that are currently under-represented, to maximise the potential skills supply and to reduce existing labour market inequalities.

Barriers, challenges and issues in green skills provision

Interviews were conducted with a range of FE and HE providers across London, including in central London, to explore their perspectives on barriers and challenges to offering (more) green skills provision, and wider issues. Findings specifically related to central London have been highlighted in these findings.

Recruiting FE teachers – mismatches in remuneration between working in construction, engineering and STEM trades, and the salaries of teachers in FE, make it difficult to attract and retain teachers in these subject areas with sufficient industry expertise and experience. This is a general problem across London but felt to be worse in central London due to higher private sector wages, and has been exacerbated in the short-term by the impacts of a surge in activity following lockdowns and staff shortages as a result of Brexit. This has led to large increases in demand for construction courses, but had negative impacts on the ability to get teaching staff. More education-business partnership activity, where employers commit some of their staff to work with providers and deliver training, could be a potential solution to the sector-wide issues.

Cost of facilities and equipment – equipment and facilities for practical courses e.g. in construction, engineering and STEM, need to be maintained which is a not inconsiderable expense for colleges. This could lead to this provision being consolidated in the larger colleges, as many colleges that are financially strapped, or do not have the volumes going through on these courses, will not be able to support these facilities. Industry sponsorship can help, but there is still a large outlay for colleges. Other possible solutions are to share facilities across colleges.

Lack of confidence in future demand due to a lack of a long-term strategy for green, and previous short-lived green initiatives – the lack of a clear steer from central government in terms of green/low carbon priorities was raised in the initial scoping stage of the research and again when asking providers about barriers and challenges to provision – "*what are the strategic priorities in the UK? Hydrogen, solar? Where is the investment going to be?*". This lack of clarity means that the typical 'demand-led' skills system, where employers know what their skills needs are, and providers and potential learners pick up those signals and deliver/take courses that will give employers the skills required, does not function effectively – learners do not necessarily know about future career options within green sectors. Some providers gave examples where they invested in facilities to put on courses related to green priorities, prompted by local boroughs highlighting their need to undertake retrofit work, but then had no take up for these courses. There was a feeling that it was falling between the stools of providers, funders and government, without co-ordination to ensure that where provision was put on it was successful. As on respondent said – "*Throwing a bunch of green qualifications at this isn't the right solution because every time we've had green-type qualifications, nobody wants to do them. So just supplying qualifications and saying if we build it, they will come, is not true*". An awarding body commented that there were three necessary conditions for green provision to gain traction – solid demand from employers for staff/consumers for green products; ability of the supply side to respond in a timely way which feeds into the academic cycle in the case of publicly-funded provision; and engagement from awarding organisations to unlock the state funding mechanism. In some cases this does not need to be new courses, but updating or adding to existing courses to make them more related/relevant to green jobs and skills. The changes to funding introduced by the GLA has helped more adults enter courses, including construction and engineering.

There is a clear role for central government in setting out a clear policy framework which gives businesses certainty, and the net zero strategy and homes and buildings strategy should help boost business confidence in investing in green skills. With increased confidence, employers and sector bodies can work together with education and training providers to articulate more clearly their likely future skills needs so that the training sector can respond appropriately, and together with employers/sector bodies can promote opportunities in green jobs via careers information, advice and guidance to young people and adults looking for new opportunities.

One respondent raised the idea of local authorities building up their direct labour departments in construction/engineering workforces, as the high proportion of self-employment and micro-businesses who take on the work as sub-contractors do not have the capacity to take on trainees. Glasgow was cited as an example of this, with the council employing over 2,000 workers with around 60 apprentices a year. Joint initiatives between local authorities and training providers could improve the supply of skills through the training pipeline. The current system with developers or lead contractors building up the labour force on developments through sub-contracting rather than directly-employing workers makes engagement with the training sector more difficult.

Addressing diversity imbalances – there were long-standing and recognised issues about encouraging female students into craft-based courses, which providers were looking to actively address. For example, one respondent reported that they introduced short courses (e.g. 6-week evening course) with "Women" in the title, e.g. "Women in construction", which were very successful at attracting female students and giving them the confidence to go on to longer courses and gain qualifications. In terms of imbalances by ethnicity, the profile of learners was felt to generally reflect that of local populations, so as these learners entered the labour market, and older workers (more likely to be white and male) retired, the ethnic diversity imbalances in the workforce should lessen over time.

Specific provision vs embedding environmentalism – respondents mentioned starting down the road of interweaving sustainability and green issues into all of their qualifications and delivery, although it was not as straightforward as having a generic module on 'sustainability', the input has to be related to the sector/occupation of the qualification. However, gaining the appropriate understanding of how sustainability influences the different sectors was still a work in progress. But one respondent felt that embedding climate and energy literacy into Level 2 courses could be a good springboard to getting learners onto green-specific Level 3 courses or apprenticeships.

Issues specific to central London – two characteristics of the central London 'environment' were raised in the context of green skills. Firstly, ***green finance*** is very specific to central London, as opposed to the outer London SRPs, but in terms of skills provision it was felt that the sector largely looks after itself, with workers in the finance sector evolving into green finance roles, or taking on elements of green finance in their current roles, rather than there being large-scale provision specifically in green finance. The sheer size of the finance sector in central London was seen as indicating that skills needs in green finance could be met organically through the sector rather than requiring substantial intervention by the training sector. Secondly, the prevalence of tall office buildings brought about a need for ***retrofit skills for large buildings***, rather than domestic retrofit, which would require a different focus on insulation and the installation of low carbon equipment. While this was seen as a looming issue (it is estimated that in 2050, 80% of the building stock will be existing buildings), it was not clear to stakeholders where and how these skills were being or would be developed in the future. The City of London is engaging with FE and HE providers regarding retrofit skills for large buildings and additionally, direct labour departments in borough councils (mentioned above) could be a key driver for developing the skills for non-domestic retrofit.

5. Impact on net jobs

The previous chapter considered the impact of transition to net zero on gross jobs in Central London. However, not all of these will be additional jobs to the central London economy because:

i. A non-green job may have become a green job; for example, a fossil-fuel based energy job becoming a renewable energy job; and

ii. Some jobs may cease to exist.

The Committee on Climate Change (CCC) commissioned modelling to look at the impact on the UK economy of the sixth carbon budget,[xlii] which included the policy changes necessary to reach net zero. This analysis modelled the impact on net jobs – i.e. how will overall employment levels be affected by the transition to net zero.

This modelling found that **there will be an increase in the net number of jobs over the next three decades in the UK due to the change to a net-zero carbon economy by 2050, alongside increases in both GDP and incomes.** This is because:

i. The transition to a low carbon economy requires that investment is brought forward into capital-intensive technologies, stimulating economic demand;

ii. The decarbonisation of power reduces the imports of oil and gas, which in turn increases domestic production, leading to increases in GDP and employment; and

iii. Electricity prices are expected to fall, as economies of scale for low carbon energy technologies are substantial. Low electricity prices boost GDP and employment and also reduces consumer prices across the economy.

Table 16 shows our estimate of the impact of net zero on net jobs in the central London economy, based on the methodology set out in the cross London report. This suggests that there will be a small positive impact of a change to net zero policies on London, increasing net employment by around 25,000 jobs in 2030 and around 9,800 jobs in 2050.

Table 16: Estimated impact of net zero policies on net employment in central London

Sector	Jobs in central London, 2019	Estimated jobs in central London, 2030			Estimated jobs in central London, 2050		
	Latest data	Based on current policies	With net zero policies	**Change due to net zero policies**	Based on current policies	With net zero policies	**Change due to net zero policies**
Agriculture	800	700	700	**0**	500	600	**100**
Mining and refinery	1,700	1,600	1,500	**-100**	1,200	1,100	**-100**
Utilities	13,700	12,400	12,900	**500**	9,500	12,900	**3,400**
Manufacturing and construction	114,300	115,300	116,600	**1,300**	112,700	113,300	**600**
Distribution, retail, hotel and catering	535,000	569,000	579,200	**10,200**	596,600	601,900	**5,300**
Transport and communications	397,800	445,000	453,900	**8,900**	511,800	512,300	**500**
Services	2,103,800	2,347,600	2,352,300	**4,700**	2,678,600	2,678,600	**0**
Total - central London	3,167,000	3,492,000	3,517,000	**25,500**	3,911,000	3,921,000	**9,800**
Whole of London	5,368,000	5,853,000	5,900,000	**47,200**	6,443,000	6,462,000	**19,400**

Source: WPI Economics calculations based on Climate Change Committee (2020) and ONS Business Register and Employment Survey

6. Jobs at risk of decarbonisation and equalities impacts

London's high degree of service sector jobs means that it is somewhat less susceptible to the potentially negative effects of job losses due to decarbonisation than other parts of the country. However, ensuring that the transition to net zero does not leave communities behind is rightly part of the subregion's considerations as it embraces the green economy; recent WPI Economics analysis shows that the central London subregion was the most unequal part of the UK before the onset of the pandemic, and that the public health crisis has deepened inequalities.[xliii]

To understand the potential implications of the findings in this report, we have assessed eleven carbon intensive industrial activities as a proxy for those areas likely to undergo the most substantial change in the coming decades. The eleven sectors we look at follow the report *Greening the Giants* (Onward, 2021)[xliv] which identifies sectors that either have emissions above 100tCO_2e per job or which contribute more than 2% of annual total UK emissions as carbon intensive with the exception of retail as a recent LSE study that shows the sector is 91% non-exposed to the transition.

We identify 137,000 of central London's 3.2 million jobs in these sectors, shown in table 17 below. This represents 4% of employment, which is a significantly lower proportion than other sub-regions of London which vary between 9-12% of employment in these sectors. The high proportion of service sector jobs in central London explains this difference, as these tend to be less carbon intensive. In central London the Construction and Land Transport sectors accounted for 86% of all employments in carbon intensive sectors in 2019.

Table 17: Jobs (employments) in carbon intensive sectors - Central London Forward sub-region

	SIC code section	Employment, 2019	Proportion of employees that identify as an ethnicity other than "White"		Proportion of people in employment that identify as female		Proportion of people in employment aged 16-64 that are under 25		Proportion of people in employment aged 16-64 that are over 50	
		Central London Forward	*London*	*United Kingdom*	*London (*)*	*United Kingdom*	*London*	*United Kingdom*	*London*	*United Kingdom*
			NB/ This data is at the SIC code section level only for London and the United Kingdom, not lower level geographies							
Construction	F	78,000	24%	7%	-	14%	4%	10%	35%	38%
Land Transport	H	39,295	55%	18%	39%	22%	4%	7%	22%	31%
Electricity, gas, steam and air conditioning supply	D	8,815	44%	10%	-	23%	8%	8%	19%	31%
Waste and sewerage	E	4,290	56%	7%	-	23%	8%	8%	19%	31%
Shipping and fishing	Mostly H	2,225	55%	18%	39%	22%	4%	7%	22%	31%
Carbon intensive manufacturing	C	1,695	38%	9%	-	27%	10%	9%	35%	36%
Aviation	H	1,175	55%	18%	39%	22%	4%	7%	22%	31%
Oil and gas	B	980	44%	7%	-	23%	8%	8%	19%	31%
Agriculture	A	235	4%	1%	-	26%	N/A	14%	30%	62%
Steel	C	40	38%	9%	-	27%	10%	9%	35%	36%
Coal and lignite mining	B	0	Not applicable as zero jobs in sub-region							
Total in carbon intensive sectors		**137,000**								
All industries		**3,167,000**	**36%**	**13%**	**-**	**48%**	**7%**	**11%**	**27%**	**34%**

Source: ONS Business Register and Employment Survey (BRES) and Annual Population Survey (APS)

Notes: The data on gender breakdown of industries in London for SIC codes A-F is not available; the ONS say the figures are suppressed as they are statistically unreliable. The Onward Greening the Giants report included the Retail sector as it accounts for over 2% of UK emissions, even though it has a relatively low amount of emissions per job. However, they excluded the sector from their cross-sectional analysis as they noted a recent LSE study that shows the sector is 91% non-exposed to the transition. We therefore also exclude the retail sector. We use total Employments from the BRES survey, including self-employed workers.

(*) Note that for London, data on the gender split on industries is only in the public domain for groups of SIC code sectors; in particular for this table SIC code H (Transport & Storage) is combined with SIC code J (Information and communication)

Although it is not possible to get demographic data at a detailed industrial breakdown, we can get some understanding of potential equalities implications using the broad section level SIC codes for each of the eleven areas. However, as sub-regional equalities data is not in the public domain we can only report the London wide equalities data for the relevant industrial groups.

For central London[10] the key findings are that:

- Construction and Land Transport are the key areas of focus
- Construction has a lower proportion of non-white workers than compared to all industries across London (24% versus 36%), and the national data suggests it is male-dominated (14% of workers are women, compared to an average of 48% across all industries). The sector also tends to employ fewer younger workers and a greater number of older workers than other industries.
- Land Transport is part of the Transport and Storage industrial sector. This sector has much higher proportion of non-white workers than compared to all industries across London (55% versus 36%). Data on gender at a London level is only available in the combined Transport and Communication grouping, in which 39% of workers identified as female. This is higher than the Transport and Storage average across Great Britain, but below the all-industry average. The Transport and Storage sector also employs fewer younger workers (under 25), but also fewer older workers (over 50) than the average of all industries.

With the other sectors shown in the table above, the cross-London level equalities data is less likely to be a good guide to central London as these jobs are likely to include a high proportion of head-office jobs with a different demographic and ethnic pattern.

[10] In addition to gender, ethnicity and age, it would be possible to look at these breakdowns on the proportions of jobs at risk of decarbonisation based on income bands. This would be an interesting and useful focus of future research.

Annex

Table A1: Example green occupations within each occupational group

Occupational group	Example green occupations
Managerial occupations	'Production managers and directors in construction' 'Financial managers and directors' 'Property, housing and estate managers'
Professional occupations	'Management consultants and business analysts' 'Business and financial project management professionals' 'Programmers and software development professionals' 'IT business analysts, architects and systems designers' 'Environment professionals' 'Electrical engineers' 'Chartered surveyors'
Associate professional and technical occupations	'Business and related associate professionals not elsewhere classified (business systems analysts, data analysts, project coordinators etc. 'Marketing associate professionals' 'Sales accounts and business development managers'
Skilled craft occupations	'Electricians and electrical fitters' 'Plumbers and heating and ventilating engineers' 'Gardeners and landscape gardeners' 'Vehicle technicians, mechanics and electricians'
Non-manual admin. etc.	Administrative and secretarial occupations Caring, leisure and other service occupations Sales and customer service occupations
Semi-skilled/elementary	Process, plant and machine operatives Elementary occupations

Endnotes

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