London Green Jobs and Skills

Central London final report summary

Prepared by WPI Economics on behalf of Central London Forward

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Contents

This is a summary of the report ***Green Jobs and Skills in Central London*** carried out by WPI Economics and the Institute for Employment Studies for Central London Forward, which, along with all sources and reference for the information in this slidepack, can be found at: http://wpieconomics.com/publications/green-jobs-and-skills-in-londons-sub-regions/ The previous report covering London as a whole can be found here: http://wpieconomics.com/publications/green-jobs-and-skills-in-london-cross-london-report

Key findings

Green jobs today in central London

- The term "green job" is directly related to policies aiming to deliver environmental goals, so we define ***green jobs as those jobs that facilitate meeting net zero and broader environmental goals.***
- We estimate there were some **147,000 green jobs** in central London in 2020, **4.7% of total employment.**
- **Green Finance** represents **more than one third** (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 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 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.
- 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.

Key findings

Green skills today in central London

- Workers in green jobs in central London are predominantly in **higher level managerial, professional and associate professional occupations**, and these occupational categories represent a higher proportion of employment in central London's green jobs (75%) than in the wider subregional economy (70%) and the UK-wide green economy (53%).
- **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%), with **significant sectoral variation** (ranging from above four fifths in power, and consultancy and finance to one quarter in Homes, Buildings and Infrastructure and Reuse, Reduce and Recycle sectors).
- Analysis at the national level shows that **green businesses 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 FE (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 FE level within central London**. The 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.

Key findings

Projections of green jobs and skills 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**. By 2050, **four sectors are projected to account for 9 in 10 of Central London's green jobs**: Green Finance (52%), power (16%), Low Carbon Transport (12%) and Homes and Buildings (11%).
- 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. We identify that **137,000 are in carbon intensive industries** and therefore at highest risk of change, mostly in Construction and Land Transport, presenting a **lower percentage of the total workforce than the rest of the UK and London economies**.
- 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**.
- 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%.

Project goals and method

Project goals

1. Develop a shared definition of green jobs to facilitate collaboration and joint working between London's sub-regional partnerships.
2. Understand demand for green jobs and skills to help member authorities shape employment and skills provision.
3. Develop a shared narrative on green jobs and skills, emphasising the sub-regional partnerships' collective commitment to decarbonisation, to support their public affairs work.

How the project was carried out

Literature review: Review of literature on the definition of green jobs and skills, how to quantify them and sources for projecting growth in green jobs over time

Engagement with boroughs and stakeholders: Extensive engagement with borough Skills Officers and Recovery Leads, range of external public and private stakeholders

Data analysis:

- Mapping of Low Carbon and Environment Goods and Services sector data to jobs in eleven key green policy areas
- Supervised machine learning to understand companies active in the green economy across sectors
- Analysis of Labour Force Survey data on current green skills and flows into and out of relevant occupations
- Analysis of Business Register and Employment Survey data for jobs at high risk from the transition, and the equalities implications

Defining green jobs

Existing definitions

We reviewed six potential approaches:

i. Environmental Goods and Services Sector (EGSS)

ii. Low Carbon and Renewable Economy survey (LCREE)

iii. Low Carbon and Environmental Goods and Services Sector (LCEGS)

iv. International Labor Organization (ILO) definition

v. Task based approach (American examples using O*Net data)

vi. Mission-based approach (Green Jobs Taskforce approach)

Through desk-research and stakeholder engagement we assessed the pros and cons against several criteria – see table overleaf. We concluded that there is no definition of the terms green jobs or the green economy that is divorced from policy goals – the terms exist because of the imperative to deliver on net zero and broader environmental goals.

We therefore recommended a practical "mission-based" definition:

Green jobs are those jobs that facilitate meeting net zero and broader environmental goals.

To decide which activity is likely to facilitate meeting net zero goals we follow the Committee on Climate Change's recommended pathways.

Summary prioritisation table for definitional approaches

Name	Definition	Government recognised definition?		Comprehensibility & strength of relationship to political narrative	Feasibility		Sector coverage			
							Broader than net zero?	Up to date with modern economy		In London context?
Environmental Goods and Services Sector (EGSS)	*Areas of the economy engaged in producing goods and services for environmental protection purposes, as well as those engaged in conserving and maintaining natural resources*	✓✓✓	National statistic	✓	✓✓	Would require ONS to provide data	✓✓✓	✓	Based on SIC codes	✓
Low Carbon and Renewable Energy Economy estimates (LCREE)	*Economic activities that deliver goods and services that are likely to help the UK generate lower emissions of greenhouse gases, predominantly carbon dioxide*	✓✓✓	National statistic	✓✓	✓✓	Would require ONS to provide data	X	✓✓	Survey updated annually but still misses areas due to SIC code limitations	✓
Low Carbon and Environmental Goods and Services Sector (LCEGS)	*EGSS sectors expanded to include activities that contribute and enable growth in the sector, including value and supply chains*	✓✓	GLA commissioned report	✓✓	✓✓✓	Requires data purchase	✓✓✓	✓✓✓	Approach updated regularly	✓✓✓
Task-based approaches	*Approaches typically from the United States that identify green tasks, and then the proportion of each job type that is spent on green tasks*	X	Current applications US based	✓✓✓	X	Timescale too short	✓✓✓	✓✓✓	Depending on approach	✓✓✓
International Labor Organization	*Jobs which reduce the consumption of energy and raw materials, limit greenhouse gas emissions, minimize waste and pollution, protect and restore ecosystems and enable enterprises and communities to adapt to climate change. In addition, green jobs have to be decent.*	✓	Internationally recognised	✓✓	X	Not operationalised	N/A	N/A		N/A
Mission-based definition following Green Jobs Taskforce	*Employment in an activity that directly contributes to - or indirectly supports - the achievement of the UK's net zero emissions target and other environmental goals, such as nature restoration and mitigation against climate risks. 7 specific policy areas identified*	✓✓	National Government commissioned report	✓✓✓	✓✓✓ ✓✓	With modern methods With publicly available data	✓✓✓	✓✓✓	Can use modern methods	✓✓
Mission-based definition: tailored to London context	*Same as above but tailored to London context - suggested 11 areas including Green Finance, Environmental R&D and Reducing Localised Pollution (air, water and noise)*	✓	Adapting a government recognised approach	✓✓✓	✓✓✓ ✓✓	With modern methods With publicly available data	✓✓✓	✓✓✓	Can use modern methods	✓✓✓

Mission-based definition: sectors for a London based definition

To develop a mission-based definition for London we reviewed three key sources:

- The sectors used by the Green Jobs Taskforce (2020/2021)
- The London Councils and London Environment Director's Network Joint Statement on Climate Change
- The Mayor of London's London Environment Strategy (2018)

Combining these three sources we proposed 11 policy areas that reflect both net zero and broader environmental policy goals, shown overleaf. Although for this analysis it is useful to split these areas, it is important to stress that environmental policy crosses these boundaries – in particular, broader environmental goals and contribute to net zero and vice versa.

Mission-based definition: sectors for a London based definition

Net zero focus

1. **Homes snd Buildings:** Including retrofit, building new energy-efficient homes, heat pumps, smart devices and controls, heat networks and hydrogen 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. **Industrial Decarbonisation, Hydrogen and Carbon Capture and Storage**: 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 identify separately.
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 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)

1. **Reducing Localised Pollution:** Including air pollution, water pollution and noise; London has ambitious goals across all three of these areas.
2. **Reduce, Reuse, Recycle:** Including waste management and circular economy.
3. **Green Infrastructure:** Within a London context this will focus on urban green infrastructure, and include activity aimed at increasing biodiversity directly or through offsetting.

Green jobs and skills in central London now

Quantifying green jobs - sources

To quantify the gross number of jobs in London in the 11 green sectors we use two sources:

1) 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, and includes a broader set of activities than official definitions such as the ONS EGSS and LCREE data. However, we could not map our Climate Adaptation and Green and Blue infrastructure sectors sufficiently well so used the Data City tool discussed below. To allocate the jobs identified within LCEGS to our sectors these results we:

- Mapped data from the 2017/18 LCEGS dataset to our green jobs categories
- 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.

2) The Data City Real-Time Industrial Classification tool

This guided machine learning tool allows us find companies working within specific fields, based on the way companies actually 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 improve 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 and identify a broad range of companies within each sector that are operating within London. As it is a tool ultimately geared towards finding companies, it is limited in its ability identify green jobs within firms that are not fully within our definition of the green economy.

Estimated green jobs in central London, 2020

- Using these two sources gives us these estimates of green jobs in Central London in 2020:

Sector	Central London		
	Numbers of jobs	% of total employment	% of green jobs
Climate adaptation, green infrastructure and reducing localised pollution	3,800	0.1 %	2.6%
Climate change Research and Development	1,800	0.1%	1.2%
Climate change strategy, policy, monitoring and planning	2,300	0.1%	1.6%
Green finance	50,100	1.6%	34.1%
Homes and Buildings	30,700	1.0%	20.9%
Industrial decarbonisation, hydrogen and carbon capture	400	0.0%	0.3%
Low Carbon Transport	8,700	0.3%	5.9%
Power	42,700	1.4%	29.1%
Reduce, reuse, recycle	6,400	0.2%	4.3%
Total	**147,000**	**4.7%**	**100.0%**

Source: WPI Economics calculations based on data supplied by kMatrix on their Low Carbon Environmental Goods and Services methodology and The Data City, and ONS Business Register and Employment Survey for total employment

Estimated green jobs in Central London

Total estimated green jobs by borough, 2020

Note: Analysis relates to the location of the job, not the location of the worker

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**

Note that this borough-level data represents 2017 data uprated by UK growth rate of green jobs to 2020, so will not reflect areas that may have seen growth out of line with national averages due to e.g. the establishment of a large local green employer since 2017. 2020/21 data is expected to be available shortly. As with any data analysis, there is a confidence level around the accuracy of the data. Much of our underlying data is supplied by kMatrix, who monitor the confidence level through a rigorous source selection process. Confidence levels vary by activity, geography and by forecast year. All borough level employment data has a confidence level of over 80%

Source: WPI Economics calculations based on data supplied by kMatrix on their Low Carbon Environmental Goods and Services methodology and The Data City, and ONS Business Register and Employment Survey for total employment by borough.

Estimated green jobs in Central London

Estimated green jobs as a proportion of total employment by London borough, 2020

Note: Analysis relates to the location of the job, not the location of the worker

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%**

Note that this borough-level data represents 2017 data uprated by UK growth rate of green jobs to 2020, so will not reflect areas that may have seen growth out of line with national averages due to e.g. the establishment of a large local green employer since 2017. 2020/21 data is expected to be available shortly. As with any data analysis, there is a confidence level around the accuracy of the data. Much of our underlying data is supplied by kMatrix, who monitor the confidence level through a rigorous source selection process. Confidence levels vary by activity, geography and by forecast year. All borough level employment data has a confidence level of over 80%

Source: WPI Economics calculations based on data supplied by kMatrix on their Low Carbon Environmental Goods and Services methodology and The Data City, and ONS Business Register and Employment Survey for total employment by borough.

Understanding green skills in London

The best place to start in understanding skills needed for green jobs is to consider the skills of those currently in green jobs.

We have used Labour Force Survey data to understand the skills and demographic characteristics of those working in green jobs, through identifying the most common SIC codes within each sector.

The table shows the three most common sector classes (4-digit SIC) within each of our sectors. This illustrates both:

- A good match (e.g. electrical installation in Low Carbon Transport, or plumbing in Homes and Buildings),
- But also a shortcoming of SIC codes in that many green companies fall into 'other activities not elsewhere classified'.

The skills analysis has combined these sectors into four broader ones:

- Power
- Homes, buildings and infrastructure (including transport, industry and localised pollution)
- Reduce, Reuse, Recycle
- Consultancy/Finance (including Climate Adaptation and Strategy)

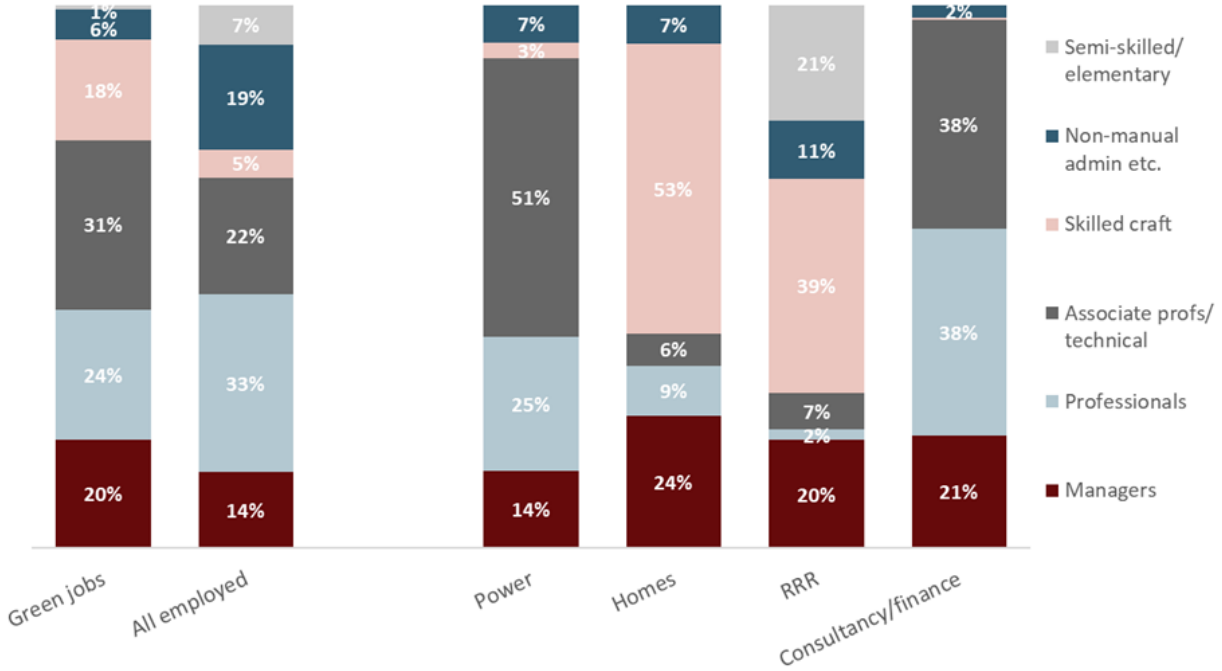
Climate adaptation	
Environmental consulting activities	21
Engineering related scientific and technical consulting	11
Management consultancy activities other than financial	11
Green and blue infrastructure	
Other business support service activities n.e.c.	11
Landscape service activities	8
Environmental consulting activities	8
Low Carbon Transport	
Electrical installation	29
Retail sale via mail order houses or via Internet	19
Other business support service activities n.e.c.	12
Reducing localised pollution	
Environmental consulting activities	37
Other professional, scientific and technical activities n.e.c.	25
Engineering related scientific and technical consulting	16

Climate change strategy, research & monitoring	
Environmental consulting activities	75
Management consultancy activities other than financial	59
Other business support service activities n.e.c.	38
Homes and Buildings	
Plumbing, heat and air-conditioning installation	59
Other business support service activities n.e.c.	27
Electrical installation	16
Power	
Production of electricity	409
Other business support service activities n.e.c.	140
Management consultancy activities other than financial	82

Green Finance	
Management consultancy activities other than financial	20
Other business support service activities n.e.c.	14
Financial intermediation not elsewhere classified	12
Industrial decarbonisation, hydrogen and CCUS	
Engineering related scientific and technical consulting	11
Other business support service activities n.e.c.	8
Management consultancy activities other than financial	8
Reduce, re-use and recycle	
Collection of non-hazardous waste	34
Recovery of sorted materials	31
Treatment and disposal of non-hazardous waste	30

Occupational patterns of employment

- 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.
- There are more than three times as many skilled craft jobs in green sectors compared with all sectors (18% and 5% respectively)
- Professional, technical and managerial occupations are most prominent in the power and consultancy/finance sector, whereas skilled craft workers are the largest occupational group in the homes, buildings and infrastructure and reduce, reuse and recycle sectors.



The detailed occupations reflect the main activities within each sector, for example:

- Electricians, gardeners and plumbers in homes, buildings and landscape
- Management consultants and other finance, sales and marketing professionals and managers in consultancy/finance

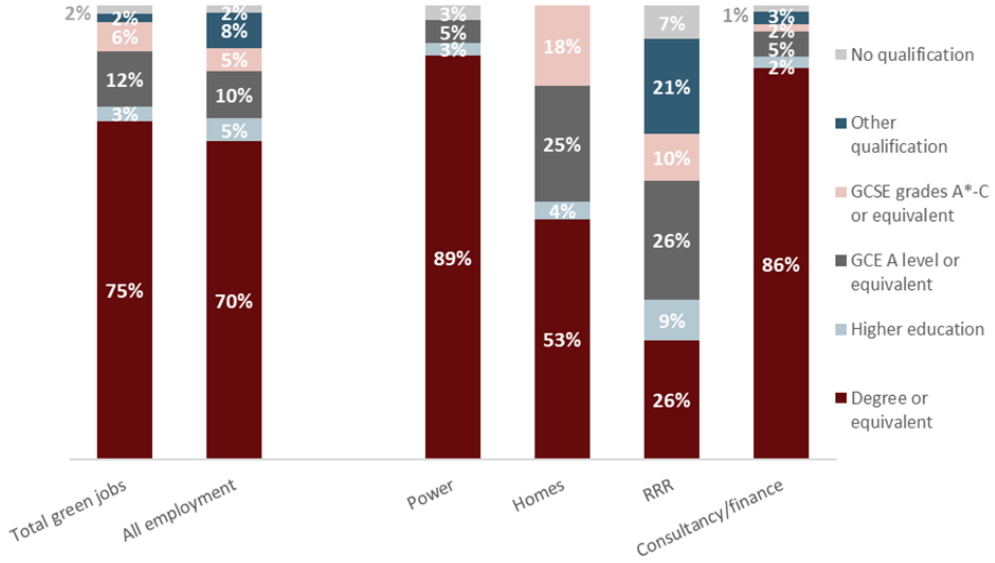
Source: Quarterly Labour Force Survey, Jan-Mar 2020 to Oct-Dec 2020 combined

Demographics and qualifications of the workforce

- The green workforce is male dominated, with a lower proportion of workers from Black, Asian and Minority Ethnic backgrounds in comparison with all sectors in 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



- The green workforce is highly qualified, and three quarters have first degrees or equivalent or higher qualifications (more than four fifths in Power and Consultancy/Finance)
- Engineering graduates, those with physical/environmental science degrees and those with business/finance degrees are over-represented
- Among those with vocational qualifications, building and civil engineering and electricity and energy are the most common subject areas

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

Skills supply considerations

Green sectors tend to draw staff from other sectors, rather than straight from education

- In London, around 1% of the workforce enter straight from full-time education each year, compared with 3% across all sectors.
- Entrants from other sectors to green sectors make up 6% of the current workforce each year
- Manufacturing sectors are a key source of labour and skills

There is a substantial pool of relevant skills in other sectors

- The number of workers in key occupations related to green sectors but working in non-green sectors is around twice as large as the current green workforce
- This additional 'pool' is largest for consultancy/finance, and smallest for homes, buildings and landscape

Provision in the FE sector

- Just over 8,000 learners in relevant courses in FE, having declined more than 10% in recent years.
- Similarly, around 6,000 apprenticeship starts in relevant sector subject areas - mostly in business apprenticeships rather than craft apprenticeships
- Around 1,700 apprenticeship achievements
- Learners in FE/apprenticeships are just under 9% of the size of the workforce, below London-wide averages.

Provision in the HE sector

- More than half of all HE students in London (c. 250,000) study in central London universities.
- The number of business/finance graduates each year is one quarter the size of the workforce with these degrees
- New engineering graduates represent a third of the number of employed in green sectors
- And new graduates in physical/environmental sciences represent under one fifth of the graduate workforce

Green jobs and skills in Central London: the future

Projections for growth in jobs

- We reviewed a wide range of UK based and international literature to gather sources for anticipated growth rates in green employment in each of the policy areas. Where available we have used London specific data
- Key sources include:
  - CCC (2017): UK business opportunities of moving to a low carbon economy
  - LGA / Ecuity (2020): Local green jobs - accelerating a sustainable economic recovery
  - Building the net zero energy workforce (National Grid)
  - Net Zero Housing workforce / London Councils Pathways Report (Parity Projects)
  - ILO (2020) The employment impact of climate change adaptation
  - Vivid Economics and Barton Willmore (2020) Levelling Up and Building Back Better Through Urban Green Infrastructure: An Investment Options Appraisal
  - Green Alliance / Wrap (2015) Opportunities to tackle Britain's labour market challenges through growth in the circular economy
- We constructed a central scenario on the basis of the apparently most likely outcomes, and a low and high scenario that represent issues such as:
  - **Low:** More likely outcome if there are green skills shortages, lower uptake rates of green technology and / or less effective policy
  - **High:** Possible outcome if London captures a greater share of exportable green services and makes fast progress towards the 2030 net zero target that allows London green industry to capture more of the market both in London and outside

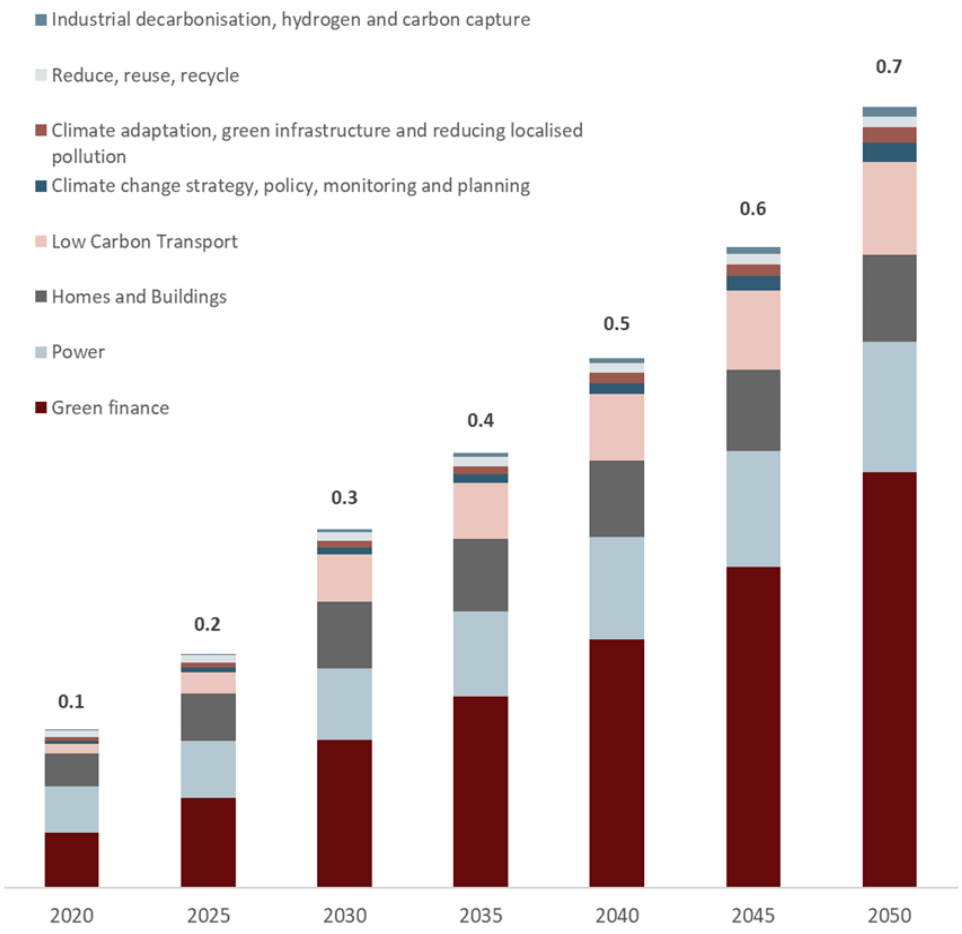
Projections of yearly growth rates of green jobs by sector, central scenario (gross increase)

	2021-2030	2031-2040	2041-2050
Climate adaptation	5%	5%	5%
Climate change Research and Development	11%	5%	5%
Climate change strategy, policy, monitoring and planning	11%	5%	5%
Green and Blue infrastructure	4%	2%	2%
Green finance	11%	5%	5%
Homes and Buildings	7%	1%	1%
Industrial decarbonisation, hydrogen and carbon capture	22%	6%	6%
Low Carbon Transport	18%	3%	3%
Power	4%	4%	2%
Reduce, reuse, recycle	2%	1%	1%
Reducing localised pollution	5%	5%	5%

Source: WPI Economics calculations

Central projection for 0.7 million green jobs by 2050

Projections of green jobs in Central London (millions)

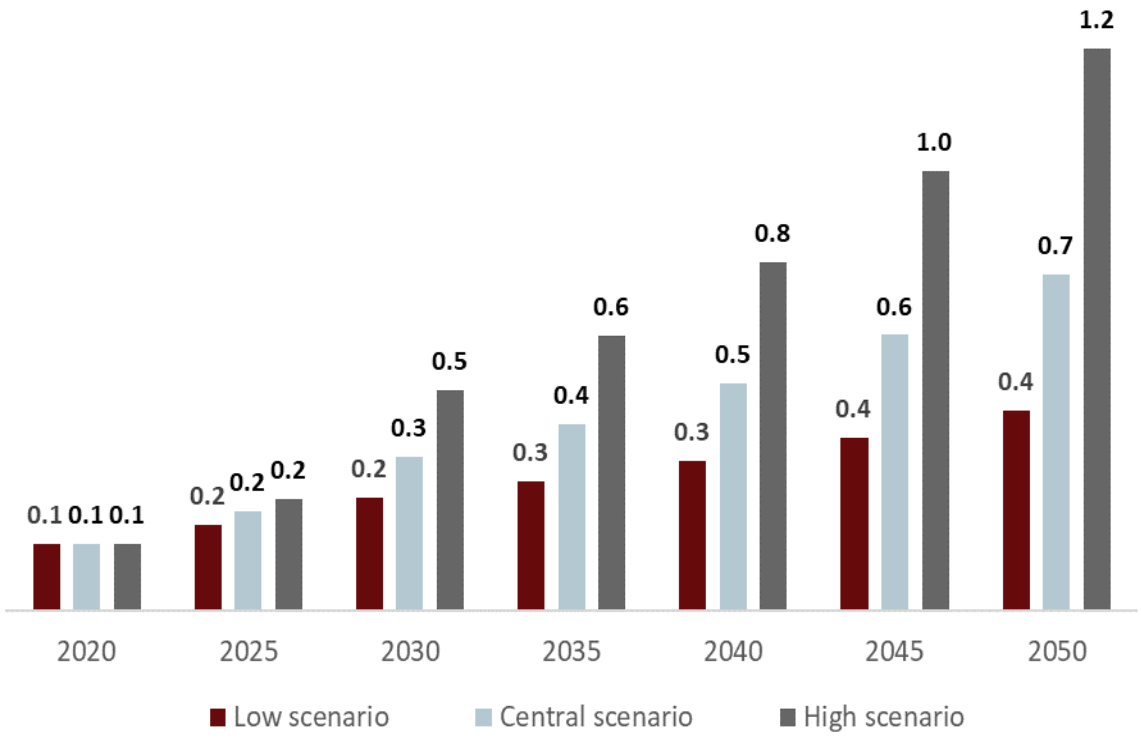


- Our central projection is to **335,000 in Central London by 2030** and then 732,000 in 2050 by 2050.
- By 2050, **four sectors are projected to account for 9 in 10 of Central London's green jobs**:
  - green finance (52%),
  - power (16%),
  - low carbon transport (12%), and
  - Homes and Buildings (11%).
- Across the majority of green sectors, employment is expected to grow faster in the 2020s in comparison to subsequent decades.

Source: WPI Economics calculations

The number of green jobs in the next three decades is highly uncertain

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

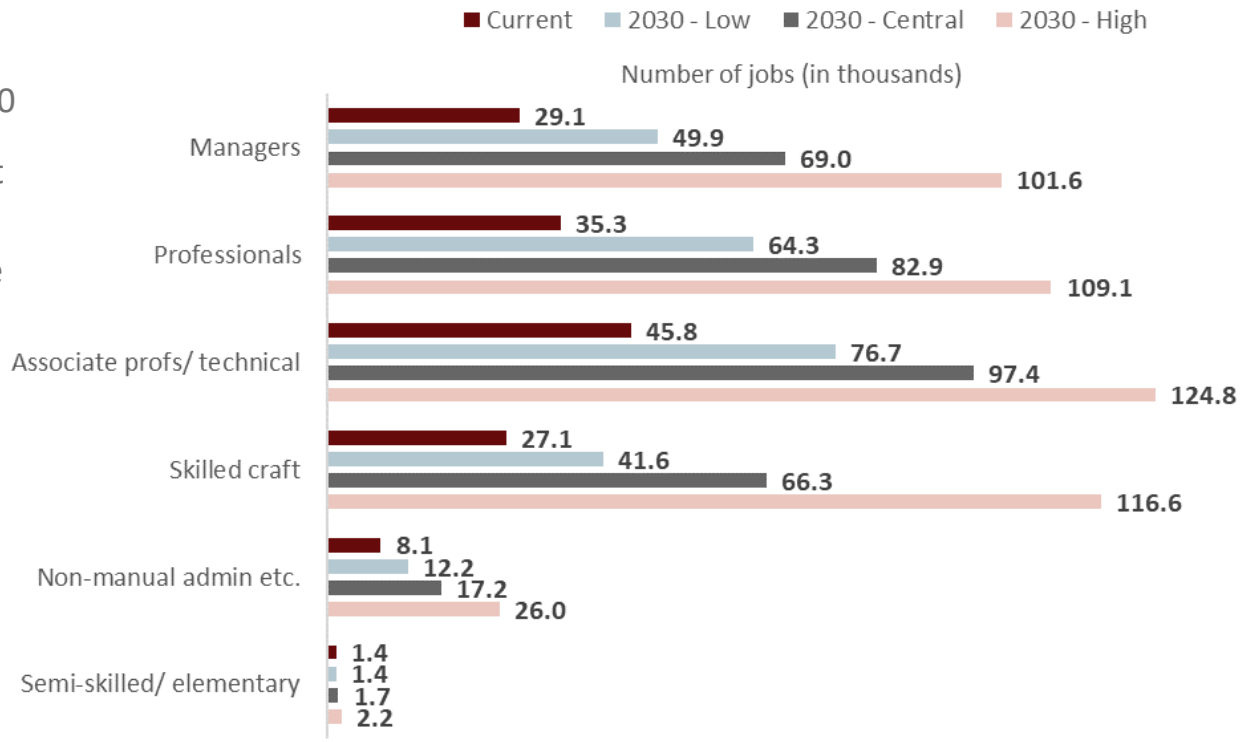


- Our low projection still sees substantial growth, but to only around 400,000 green jobs by 2050 rather than 700,000. This represents the potential impact of skills shortages, lower uptake rates and / or less effective policy
- Our high projection represents the potential for London to capture a greater share of the green services sector globally, and the potential benefit of moving faster to meet the 2030 net zero target – this could lead to up to 1.2 million green jobs by 2050

Source: WPI Economics calculations

Projections of jobs by occupation to 2030

- The implications of the central scenario for employment by occupation to 2030 are an increase of 145% in skilled craft workers, and increases of 137% and 135% in managerial and professional employment respectively; associate professionals are projected to grow more slowly (113%)
- In 2030, there would be 97,000 associate professional workers, 83,000 professionals, 66,000 skilled craft workers, and 69,000 managers
- But under the high growth scenario, the number of skilled craft workers in 2030 would be 116,000, more than four times the current level …
- … with a threefold increase in managers and professionals
- These occupational projections assume the occupational mix within each of the four broad sectors will remain the same over time, but each sector grows at a different rate



Detailed occupational changes, and skills supply implications

Largest increases to 2030 among skilled craft workers under central scenario

- 9,900 more electricians – 145% increase
- 7,300 more gardeners and landscape gardeners – 162% increase
- 5,9700 more plumbers and heating & ventilation engineers – 162% increase

Largest increases to 2030 among man/prof/ technical workers under central scenario

- 16,200 more business associate professionals (business systems analysts, data analysts etc.) – 71% increase
- 12,500 more management consultants – 171% increase
- 6,600 more sales account and business development managers– 169% increase

- Nationally, there are skills shortages currently for many of these occupations – electricians, plumbers, and production managers in construction
- Green sectors currently draw substantially more staff from other sectors, than straight from education – but if all new jobs were filled by entrants from education, the sector would need to attract half of all FE/HE leavers with relevant skills
- To ensure a sufficient supply for these new jobs, 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

Impact of net zero on the total number of jobs in central London

Overall impact on employment

These jobs are not all additional jobs to the London economy because:

- A non-green job may have become a green job;
- Some jobs may cease to exist.

But modelling for the CCC has found that there will be an increase in the **net number of jobs in the UK** due to the change to a net zero carbon economy by 2050 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 reduce consumer prices across the economy.

Employment is projected to be around 1% higher by 2035, equivalent to 300,000 net jobs across the whole of the UK economy.

We have estimated the impact on the central London economy of the move to net zero policies by overlaying these sectoral changes on central London's pattern of sectoral employment.

Estimated impact of net zero policies on net employment in the UK, by sector

Sector	Employment, UK (% change from baseline of current policies rolled forward)	
	2030	2050
Agriculture	4.2%	2.9%
Mining and refinery	-7.8%	-11.0%
Utilities	4.5%	35.5%
Manufacturing and construction	1.1%	0.5%
Distribution, retail, hotel and catering	1.8%	0.9%
Transport and communications	2.0%	0.1%
Services	0.2%	0.0%

Source: Climate Change Committee (2020) Economic Impact of the Sixth Carbon Budget (Cambridge Econometrics)

Estimated impact of net zero policies on net employment in central London

- We find that if central London's sectoral changes are in proportion to the rest of the UK then overall employment in London could increase by around 25,500 by 2030, and 9,800 by 2050 due to the move to net zero policies compared to current policies
- This is positive, although it represents only a small proportion of overall employment (less than 1%)

Estimated impact of net zero policies on net employment in Central London

Sector	Latest data	Estimated jobs in central London, 2030			Estimated jobs in central London, 2050		
		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 calculations based on Climate Change Committee (2020) Economic Impact of the Sixth Carbon Budget (Cambridge Econometrics) and ONS Business Register and Employment Survey

Jobs at risk from decarbonisation

Carbon intensive industries

Following the method in the report *Greening the Giants (Onward, 2021)* we gathered information on "carbon intensive sectors" i.e. those sectors that either have emissions above 100tCO2e per job or which contribute more than 2% of annual total UK emissions. These are:

- Agriculture
- Aviation
- Carbon intensive manufacturing
- Coal and lignite mining
- Construction
- Electricity, gas, steam and air conditioning supply
- Land Transport
- Oil and gas
- Retail*
- Shipping and fishing
- Steel
- Waste and sewerage

*In common with Onward, we exclude retail from the cross-sectoral analysis because the sector has been assessed as having 91% of jobs not exposed to the transition. We also exclude Coal and lignite mining, as there are no jobs in this sector in London in 2019.

Jobs in carbon intensive sectors, Central London

- We identify that 137,000 of central London's 3.2 million jobs (4%) are in carbon intensive industries and therefore at highest risk of change. This is lower than the rest of the economy (11%) and other London subregions (between 9% and 12% of employment).
- Although it is not possible to get demographic data at a detailed industrial breakdown, we can establish the likely picture by using the broad section level SIC codes for each of the ten areas.
- Construction and Land Transport are the key areas of focus by employment size. 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.

Jobs in carbon intensive sectors

	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.

Recommendations and next steps

Report recommendations

The analysis in this report highlights a number of 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 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.
- Employers and sector bodies will need to work effectively with providers 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. This 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.
- 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

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