



**GREEN
JOBS
TASKFORCE**

Report to Government,
Industry and the Skills Sector

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Ministerial Foreword

As we recover from the Covid-19 pandemic and chart a course towards a brighter future for all, we in government are determined not only to build back better but to build back greener.

Building on the UK's leadership as the first major economy to legislate to end our contribution to climate change by 2050, last November the Prime Minister set out his Ten Point Plan for a Green Industrial Revolution. Spanning energy, transport and industry and mobilising £12 billion of government funding, this Plan is the first step in capturing the once in a lifetime opportunity to lead the charge and pursue a global green recovery, level up the country, and support jobs throughout the UK as we accelerate on our path to reach net zero by 2050.

As we look ahead to publishing our comprehensive Net Zero Strategy and hosting COP26 in the autumn, we must focus on how we invest in the UK's most important asset – our workforce – so that people have the right skills to deliver the net zero transition and thrive in the jobs it will create. We must ensure that green jobs are good quality, that they can be accessed by people of all backgrounds and in all parts of the country, and that workers in sectors and industries undergoing change can re-apply their skills and expertise towards this new challenge.

Last year, we asked 17 brilliant individuals from diverse backgrounds in industry, academia, unions, and the education and skills sector to come together to form the Green Jobs Taskforce and advise government. We would like to thank the members of the Taskforce for the significant time, energy and expertise they have invested since November 2020 to compile this report - assembling the evidence on the skills needed in the green economy and setting out their independent recommendations for how government, industry and a wide range of stakeholders can work together to meet the important challenges and grasp the opportunities they have identified. We will now consider the Taskforce's rich evidence base and comprehensive recommendations ahead of setting out, later in the year, our *Net Zero Strategy*.

In England, the reforms to the skills system set out in the recently published *Skills for Jobs* White Paper provide the foundation on which we can build. This programme of reform, which placed employers at the centre of our technical education system, includes the introduction of new T Levels, flexible apprenticeships, Skills Bootcamps and occupational traineeships. Earlier in the year, we marked a major milestone in the Lifetime Skills Guarantee, with the roll out of almost 400 qualifications which are now available and fully-funded for any adult who has not already achieved a Level 3 (A Level equivalent) qualification.

We will ensure that these programmes are directed to support more people to get the skills they need to move into green jobs and consider where we might need to go further or faster to fill skills gaps identified by the Taskforce. We are already making progress – Skills Bootcamps will, from July this year, support flexible training in key green sectors such as construction and nuclear; a Green Apprenticeship Advisory

Panel is identifying existing apprenticeships that best support green career pathways; our Free Courses for Jobs offer is supporting more adults to study fully-funded qualifications in subject areas crucial for green jobs, such as construction, forestry and engineering; and a new Emerging Skills Electrification Project will foresight cutting-edge skills in the battery/electrification sector, develop short, modular content to meet the needs of employers and upskill the teaching workforce.

We are also pleased to announce the formation of a cross-cutting delivery group to maintain the momentum generated by the Taskforce and drive coherent action across the green skills agenda.

This report also highlights how supporting people to develop the right skills to thrive in this transition cannot be the responsibility of government alone. We want to see businesses step up and invest in training the green workforce, and so we urge them to reflect on the Taskforce's work and use it to inform how they can benefit from and contribute to the green industrial revolution. The government will continue to work closely with industry to ensure the employer-led skills system we are building through our ongoing reforms meets employers' needs and reflects the fast-changing shape of the UK labour market.

The British people drove the first industrial revolution, and we will rise to the challenge to drive the green industrial revolution too. Once more we would like to extend our sincerest gratitude to the Green Jobs Taskforce for the role that they have played in moving us further towards this ambition.



A handwritten signature in black ink that reads "Anne-Marie Trevelyan".

The Rt Hon Anne-Marie Trevelyan MP
Minister for Energy, Clean Growth and
Climate Change



A handwritten signature in blue ink that reads "Gillian Keegan".

Gillian Keegan MP
Parliamentary Under Secretary of State
(Minister for Apprenticeships and Skills)

Executive Summary

Introduction

The urgency of the need to tackle climate change has become increasingly apparent and across the globe popular support for action is growing. In parallel, the potential economic opportunities of the transition to a low carbon economy are becoming clearer, with domestic and global markets in low carbon technologies estimated to be worth billions of pounds to the UK economy over the coming decades. All sectors of the UK will go through a transformation on the journey to net zero and this will impact the workers and communities they sustain.

This transformation is well underway. Across the UK there are already over 410,000¹ jobs in low carbon businesses and their supply chains, with turnover estimated at £42.6 billion in 2019², and the value of goods and services exported by UK low carbon businesses exceeding £7 billion.³



Last year, in the wake of the Covid-19 pandemic, the government set out its *Ten Point Plan for a Green Industrial Revolution*. This plan will support up to 250,000 green jobs in 2030, by seeking to develop long-term advantage for the UK in new low carbon sectors. Investments in these sectors are expected to drive funding and jobs across the UK, from electric vehicle manufacture in the midlands, to construction and installation of offshore wind farms around the coast and the retrofitting of homes across the country.⁴

However, the UK can go much further. The government has set an ambition for two million green jobs in the UK by 2030. The Green Jobs Taskforce (hereafter ‘the Taskforce’) was announced as part of the Ten Point Plan, bringing together industry, academia, trade unions and the skills sector, to independently advise the government, industry and the skills sector on how the UK can deliver this ambition and support our industries and workers in this transition.

The Taskforce worked between November 2020 and July 2021. This report sets out its key findings and recommendations.

A call to arms across the Green Jobs Lifecycle

The opportunity for green jobs and skills should not be considered as niche or restricted to certain sectors of the economy. Every job has the potential to become ‘green’ as the world moves to combat climate change, and there are a huge range of skills which will support the transition to a net zero economy. This report therefore focuses on employment in an activity that directly contributes to, or indirectly supports, the achievement of the UK’s net zero emissions target and helps mitigate climate risks. Chapter 2 sets out how the Taskforce arrived at this conclusion.

Research suggests that one in five jobs in the UK (approximately 6.3 million workers) will require skills which may experience demand growth (approximately 10% of UK jobs) or reduction (approximately 10%) in the transition.⁵ Chapter 3 explores how the transition to net zero could impact the UK labour market in the coming decades and the opportunities and challenges this presents.

The conclusion reached by this assessment of the evidence is that, if the UK is to grasp the opportunities afforded by a green industrial revolution, we must develop a comprehensive and holistic view of the green jobs and skills challenge.

This report therefore represents a call to arms for government, industry and the education sector across all stages of the green jobs life cycle: to invest in delivering net zero and our environmental goals; to build pathways into green careers for people from all backgrounds; and to ensure that workers and communities dependent on the high carbon economy are supported with the transition. This underpins the recommendations set out in chapter 4 (summarised below).

Theme 1: Driving investment in net zero to support good quality green jobs in the UK

To fully capitalise on the significant economic opportunity presented by net zero, the UK needs a comprehensive and ambitious plan which leverages sustained net zero investment across nations and regions to create quality green jobs and drive investment in skills.

The government should publish a detailed net zero strategy before COP26. This strategy should set out the policy measures to be taken over the next five to ten years to create market demand, unlock the public and private investment needed and, open pathways to green skills, education and training. The strategy should contain the government's plan to ensure that green jobs are good quality, regardless of the type of role. There are huge opportunities for the UK to build back greener, including to support the development of competitive supply chains in the green economy using levers such as public procurement policy, funding initiatives and product standards.

While the role of government will be crucial, it will not be able to deliver net zero on its own. A societally inclusive, economy-wide effort will be needed, with coordination of activity at all levels. A UK-wide body, including representation from national government and industry, should therefore be established to maintain momentum and coherence in the workforce transition, supported by action from local bodies.

Theme 2: Building pathways into good green careers

The evidence collated in this report points to significant increases in demand for green skills. All levels of government, the education sector, industry, and unions, must therefore work together to address these longer-term skills gaps to ensure we are building lifelong pathways into good green careers.

The first priority for industry should be to build on existing good practice to ensure people from all backgrounds can access green jobs. There is a unique opportunity to leverage the widespread interest in green jobs to expand the talent pool and bring people with a wider range of experiences into the green economy.

To address future and current skills gaps, the skills, knowledge, and behaviours required for people to move into green jobs should be embedded into the curricula of relevant subjects at all stages in the learning cycle. Developing curricula to reinforce both specialist and transferable skills, aligning existing training systems and capacities, and training people in green skills will all take time, and there will be a lag in the skills pipeline from the time the investment is made. It is vital that action to scale up existing capacity and develop new programmes is both immediate and ambitious.

To complement this and ensure everyone can access the skills they need for a green job, a green careers marketing campaign should be launched, supported by the roll out of a 'Green Careers Launchpad' during the UK's Presidency of COP26 (which extends until November 2022), to provide comprehensive and dynamic green skills and careers advice.



Theme 3: A just transition for workers in the high carbon economy

The 2015 Paris Agreement on climate change stated that countries must “[take] into account the imperatives of a just transition of the workforce and the creation of decent work and quality jobs in accordance with nationally defined development priorities.”⁶ As a signatory to this agreement, the UK must manage the transition to net zero in an inclusive way, so that those affected workers have a voice in shaping the transformation.

From a skills perspective, this means that no worker should be left behind by the training system. Building on the *Skills for Jobs* White Paper, industry, government, and skills providers should together ensure that the adult skills system can meet the challenge of the transition to net zero. This includes being responsive to local demand and supporting workers in high carbon sectors to take opportunities in the new economy.

But it is businesses in the high carbon economy that should continue to take the lead in driving forward decarbonisation, ensuring they engage their workers and supply chains in plans to transition to the new green economy. The government should support businesses to drive this change and support local economies to diversify away from high carbon industry where needed.

Next steps

Given the scale and pace of action required, a sense of priority is important. In chapter 5 we clarify the most important actions for government, industry and the skills sector to take forward in the next twelve months.

Recommendations of the Green Jobs Taskforce

Theme 1: Driving investment in net zero to support good quality green jobs in the UK

1. The government should publish a detailed net zero strategy before COP26 which sets out how the UK will reach its decarbonisation targets for 2035 and 2050, to give industry, workers and skills providers the confidence they need to invest in the transition.
2. The government should use net zero policy and funding to promote good green jobs, skills and competitive supply chains within the scope of international law and trade obligations.
3. The government should work with industry to extend its green recovery programmes to direct spending towards low carbon activities with rapid job creation potential, in areas at risk of unemployment.
4. The government should work with industry, unions and other key stakeholders to actively set out, as part of the net zero Strategy, how it will ensure that the green jobs created by employers are good quality as defined by the *Good Work Plan*, regardless of skills base.
5. The government should establish a UK-wide body with national representation to ensure momentum and coherence on workforce transition, including progress in delivery. The national body should be supported by local transition bodies to ensure effective place-based strategies for the transition.

Theme 2: Building pathways into good green careers

6. To address the skills gap and ensure green jobs are open to all, industry bodies and all employers in the green economy should prioritise the creation of a diverse workforce and should share best practice across the economy.
7. As part of a well-sequenced curriculum, government, employers and education providers should promote the effective teaching of climate change and the knowledge and skills (in science, technology, engineering, and mathematics (STEM) and other key subjects) required for green jobs.
8. Employers and government should work with the skills and education sector to attract and retain talented teachers to teach subjects, including in STEM, which are important for green jobs.
9. Industry, the education sector, and government should work together to ensure green careers advice and pathways are a continuous offer for all.
10. Building on existing work to review green apprenticeships, government should map, review and enhance other training pathways (e.g. traineeships, T-levels, internships and skills bootcamps) to ensure they support a diverse, inclusive and net zero-aligned workforce across the UK.

Theme 3: A just transition for workers in the high carbon economy

11. Building on the *Skills for Jobs* White Paper, industry, government, and skills providers should ensure the adult skills system can meet the challenge of the transition to net zero. This includes being responsive to local demand and supporting workers in high carbon sectors to take opportunities in the new economy.
12. Employers, industry bodies, government and unions should work together to tackle barriers to retraining and upskilling so that no worker is left behind by the transition to net zero.
13. Employers and sector bodies should set out business and skills plans for the net zero transition, engaging unions and workers.
14. To boost private investment and decarbonisation of industry, government should prioritise supporting high carbon sectors to transition and increase productivity and competitiveness, thereby protecting jobs and local economies.
15. Where local economies depend on a source of high carbon employment, government should work with local government, employers and workers to diversify local economies, recognising the safety net that is already in place to support workers.

1. The Green Jobs Taskforce

Introduction

The Taskforce was announced on 12 November 2020 and forms part of the Ten Point Plan for a Green Industrial Revolution.

It was convened by ministers from the Department for Business, Energy and Industrial Strategy (BEIS) and Department for Education (DfE), and is made up of members from industry, trade unions, the skills sector (see box 1).

Green Jobs Taskforce membership

The Green Jobs Taskforce is comprised of a diverse mix of members from across the economy and different institutions, reflecting the diversity of impact and interests in net zero:

- Afsheen Kabir Rashid MBE, CEO, Repowering
- Alan Goundry, Head of Energy Academy, Newcastle College
- Andy George, Head of Talent Management, Barratt Developments Plc
- Angela Francis, Chief Advisor, Economics and Economic Development, World Wildlife Fund for Nature UK
- Prof. Dave Reay, Professor of Carbon Management and Education, Edinburgh University
- Jane Cooper, Member of the Board, Engineering Construction Industry Training Board
- Nick Molho, Executive Director, Aldersgate Group
- Paul Nowak, Deputy General Secretary, Trades Union Congress
- Rhian Kelly, UK Corporate Affairs Director, National Grid Group Plc
- Russell Smith, Managing Director, RetrofitWorks
- Sarah Beale, CEO, Construction Industry Training Board
- Sharon Lane, Tees Valley Local Enterprise Partnership
- Simon Ashley, SVP people & culture - trading, shipping, culture, BP UK
- Sue Ferns, Senior Deputy General Secretary, Prospect
- Tor Farquhar, HR Director, Tata Steel Europe*
- Yvonne Kelly, Principal and CEO, East London Institute of Technology

(Peter Stephens resigned from the Taskforce on leaving his position at Nissan to move to a different sector. The Taskforce continued to engage with the Auto-Sector Skills Council to ensure the views of the sector are represented in the recommendations.)

* Tor Farquhar left his employment with Tata Steel but remained a member of the Taskforce.

The group was asked to look at the following challenges and advise government, industry and the skills sector on how to realise the UK's ambitions for green jobs:

- the skills needed to drive a green recovery from the Covid-19 pandemic;
- the skills needed to reach net zero greenhouse gas emissions by 2050;
- how the UK can ensure green jobs are good jobs, and open to all; and
- how workers in high carbon-sectors can be supported to transition to the new green economy.

The Taskforce was supported by a secretariat comprised of civil servants from the Department for Business, Energy & Industrial Strategy (BEIS) and the Department for Education (DfE). This secretariat facilitated the Taskforce to draw together its evidence review, and develop its recommendations, though the recommendations represent the views of the Taskforce alone.

How the Taskforce carried out its work

The Taskforce carried out its work between November 2020 and July 2021.

Supported by the secretariat, we reviewed over 200 reports published by industry, academia, and government to form a robust evidence base upon which to build recommendations.

Over the course of February and March, the secretariat and Taskforce facilitated four workshops with stakeholders from industry, academia, the skills sector, trade unions and community groups. This led to the development of over 300 policy ideas across the four challenges.

Over the following months, we developed and distilled these ideas into 15 recommendations split across the three themes of the 'green jobs lifecycle'. These recommendations were tested at multiple workshops with a wider set of stakeholders, including the energy industry, automotive industry, industry bodies, trade unions and equality, diversity and inclusion champions within the energy sector organisations and representatives of community-based organisations.

This report brings together our key findings and recommendations for government, industry, and the skills sector. Views and recommendations expressed here are those of the Green Jobs Taskforce and do not represent government policy.

The Taskforce met with ministers four times to update on progress and to discuss the findings and recommendations as they emerged.

The devolved administrations

The government's net zero target covers the whole of the UK, and we have therefore looked at green skills needs from a UK-wide perspective.

We have set out several recommendations for the UK Government. Since education and training are devolved, where the recommendations make direct reference to

policy in this area they should be understood as being directed at the UK Government for England only. However, the Devolved Administrations may also find the fuller set of recommendations useful when considering how best to meet the challenge of delivering a skilled workforce for net zero as well as supporting workers and industry as part of the transition in their respective countries. Similarly, recommendations directly linked to energy policy will not apply to Northern Ireland, though may contain ideas the Northern Ireland Executive might wish to consider within its own context.

Although the scope of this report crosses devolved policy areas, net zero is, nonetheless, an endeavour that needs intergovernmental cooperation. The Taskforce and secretariat have engaged with stakeholders across government, but this report is solely a first step in what is a complex challenge. It will require an all-nations effort to ensure widespread access to high-quality training opportunities linked to good quality green jobs, and a just transition for all.

Next steps

We are pleased to present these recommendations to government, industry and the skills sector. The government has committed to ensuring that these recommendations will be considered in the development of the UK's first *Net Zero Strategy*, to be published before COP26.

2. What is a green job?

There has been an increasing focus on the ‘green economy’ and ‘green jobs’ as governments across the world have moved to tackle climate change, and the global ‘low carbon’ economy has grown. However, there is no universal definition of a green job and the green economy. The Taskforce reviewed several definitions of green jobs, including those examined by the **Office for National Statistics (ONS)** recently.⁷

The United Nations System of Environmental Accounting defines the **Environmental Goods and Services Sector (EGSS)** as “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”.⁸ In the UK, the ONS uses the EGSS definition as one way to estimate the green economy. These estimates cover a wide range of activities, from the production of renewable energy to waste removal and recycling to the protection of biodiversity and landscapes.

The **International Labour Organization (ILO)** defines green employment more broadly and considers ‘green jobs’ as also those involving activities such as community adaptation to climate change.⁹ The ILO broadens the definition of a green job, including the attributes of ‘decent work’¹⁰, for a job to be considered green.

In the UK, the ONS produces the annual **Low Carbon and Renewable Energy (LCREE)** survey, covering “economic activities that deliver goods and services that are likely to help the UK generate lower emissions of greenhouse gases, predominantly carbon dioxide”.



There has also been work using **O*NET**¹¹, an occupational classification database in the United States which looks at ‘green transition’. Three categories of occupations, which are expected to change or emerge in their green economy sectors, have been created. These are ‘Green Increased Demand’, ‘Green Enhanced Skills’ and ‘Green New and Emerging’ and are an alternative way to view the changing landscape of jobs and skills needs within occupations as the transition progresses.¹²

A previous UK government report¹³ defined the green economy as “one in which value and growth are maximised across the whole economy, while natural assets are managed sustainably. Such an economy would be supported and enabled by a thriving low carbon and environmental goods and services sector. Environmental damage would be reduced, while energy security, resource efficiency and resilience to climate change would all be increased”.

Setting a single definition of a ‘green job’ that can be applied to the whole economy is a complex task. Whilst the Taskforce has not intended to suggest the creation of a new statistical definition, it is therefore important to be clear about what is meant by a ‘green job’ in this report.

It is our view that taking a broad approach, which goes beyond simply looking at low carbon sectors, would be important for taking into account the full range of economic transformation needed to deliver the UK’s environmental goals, and the evolving nature of the transition to net zero.

As such, in this report the term a ‘green job’ is used to signify **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.**

To support the practical task of reviewing evidence, and developing recommendations, this report focuses on identifying ‘green sectors’. The merits of taking a sectoral approach are discussed by the ONS in an article on the challenges of defining green jobs.¹⁴

We have prioritised sectors where change will be crucial to meeting net zero and on account of where the clearest and most evidence gathering has been conducted to able to draw concrete conclusions. Specifically, we focus on the following sectors¹⁵:

- **Power** – including renewables (such as wind, solar and hydropower), nuclear power, grid infrastructure, energy storage and smart systems technology;
- **Business and industry** – including hydrogen production and industrial use, carbon capture, utilisation & storage (CCUS) and industrial decarbonisation;
- **Homes and buildings** – including retrofit, building new energy-efficient homes, heat pumps, smart devices and controls, heat networks and hydrogen boilers;

- **Transport** – including low or zero emission vehicles, aviation and maritime, rail, public transport and walking or cycling;
- **Natural resources** – including nature restoration, tree planting and decarbonising agriculture, waste management and recycling;
- **Enabling decarbonisation** – including science and innovation for climate change, green finance, circular economy and energy networks;
- **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.



Achieving net zero by 2050 will require a system-wide transformation of the economy; most occupations, to varying extents, will become green.

Research shows that not all sectors will be impacted in the same way, or at the same time, in terms of skill demands.^{16,17} We look at the following sectoral groupings in this report: (a) existing and well-established green sectors which will experience significant growth; (b) emerging green sectors, predicted to grow throughout the transition; (c) sectors experiencing significant transformation.

Accordingly, the above list will need regular review as the economy evolves through the transition.

3. The context: the impacts of the transition to net zero on the demand for skills in the UK

Introduction

Reaching net zero by 2050 and delivering the UK's broader environmental goals will have a transformative impact on the economy, shifting the demand for goods, services and skills over the next thirty years and beyond. This section sets out the evidence on the opportunities and risks from the transition globally, before discussing the impact on the UK's workforce, sectors, and regions that will likely be most affected.

The economic impact of the transition to net zero

The UK's climate ambition will entail an economy-wide transformation. This offers significant economic opportunities, as low carbon sectors and nascent technologies are set to grow both in the UK and globally. The transition will also present risks, especially in those sectors that are particularly carbon-intensive, difficult to decarbonise, or that are projected to become smaller due to reduced reliance on fossil fuels across society.

The Paris Agreement commitments require long-term decarbonisation strategies, which will require significant levels of investment in areas such as clean electricity and green hydrogen. BloombergNEF estimates the 1.5 degrees commitment would require around \$64 trillion global investment in power and grid infrastructure, and between \$13 trillion and \$66 trillion in hydrogen manufacturing, transport, and storage.¹⁸ The International Energy Agency (IEA) has indicated that policymakers globally need to "make the 2020s the decade of massive clean energy expansion", noting that "reaching net zero by 2050 requires further rapid deployment of available technologies, as well as widespread use of technologies that are not on the market yet", especially after 2030.¹⁹ This transformation will involve trillions of dollars of investment²⁰ and significant greening of the global economy, with a necessary fall in the energy intensity of Gross Domestic Product (GDP) from 2020 to 2030.²¹

In the UK, this transformation has already started. Between 1990 and 2019, the UK reduced emissions by 44% while growing the economy by 78%.^{22 23} However, net zero requires a faster sector-wide emissions reduction. Specific sectors including transport and buildings will need to accelerate their emission reductions and decarbonise to meet the UK's climate targets.²⁴

A crucial aspect of this transition is centred on people. IEA modelling suggests it will bring substantial new employment opportunities, supporting about 14 million jobs globally by 2030 in the IEA's pathway for decarbonising the global energy system. This is due to an expansion of new low carbon activities and investment in clean energy.²⁵ The IEA considers that the transition will likely involve some job losses,

primarily in fossil fuel technologies, and notes that “it will be vital to minimise hardships associated with these disruptions, such as by retraining workers, locating new clean energy facilities in heavily affected areas wherever possible, and providing regional aid”.²⁶



But this shift also brings about substantial economic opportunities for the UK. For example, the *Energy Innovation Needs Assessment (EINA)* identifies £27bn of Gross Value Added (GVA) opportunity in 2050 from decarbonising the UK domestic market by 80% compared to 1990 emissions levels, supporting around 300,000 jobs. The EINA suggests that the UK could also capture export-related opportunities, potentially adding £26 billion to UK GVA and supporting approximately 200,000 jobs in 2050. Nuclear, road transport, and CCUS have the largest job opportunities, with offshore wind already demonstrating potential for creating green jobs.²⁷

Some key drivers of these opportunities are the size of the market, the UK’s comparative advantage in low carbon technologies, employment characteristics,²⁸ and the degree to which a technology or service can be traded internationally. The EINA does not account for impacts in related industries (e.g. manufacturing of internal combustion engine vehicles), which may shrink as demand for low carbon alternatives increases.²⁹

More recently, the Climate Change Committee (CCC) commissioned research that modelled economic opportunities emerging from accelerating the pace of emissions reduction to meet the UK’s sixth carbon budget and net zero. The research found that this will result in an increase of UK GDP of around 2 to 3%, and about 300,000 additional jobs by 2050. These opportunities are linked to investment in green

technology stimulating the use of spare capacity, reduced leakage from ongoing spending on imported oil and gas in favour of low carbon domestic investments, and dynamic innovation – as low carbon technologies are invested in at scale the costs fall significantly.³⁰

The impact of the transition on the demand for skills in the UK

According to the Place-based Climate Action Network's Just Transition Jobs Tracker³¹, one in five jobs in the UK (approximately 6.3 million workers) will require skills which may experience demand growth (approximately 10% of UK jobs) or reduction (approximately 10%) as a result of the transition to net zero. The latter will likely need reskilling, upskilling³², or to use their current skills differently.³³

These impacts will vary across the economy. Research by the European Centre for the Development of Vocational Training suggests that the greening of our economy will influence skills demand in three main ways: structural changes that will lead to increased demand for some occupations and decreases for others; new economic activity that will generate new occupations, with a subsequent need for new skills, qualifications and training frameworks; and, many existing occupations and sectors that will experience 'greening' changes within their jobs, which should require adjustments to current training and qualification frameworks.^{34,35}

A. Well-established green sectors which will experience significant growth

The UK holds a leading global position in **offshore wind** capacity, and the sector is expected to continue to experience significant growth, with an uptick in the demand for workers and skills ahead of the government's goal of 40 gigawatts (GW) of offshore wind by 2030.^{36,37,38}

According to industry estimates, by 2026 the sector could employ around 70,000 workers (40,000 direct jobs and 30,000 jobs in the supply chain). This compares to around 26,000 presently (15,000 direct jobs and 11,000 jobs in the supply chain).³⁹ By the 2030s, employment should grow in all phases of the project lifecycle, but particularly in construction and installation, and in operations and maintenance. Demand should be strongest for technicians and engineers as a result.⁴⁰

However, the continued development of the sector will require a broad range of skills, including asset management, project management, engineering and technical skills (e.g. mechanical, electrical and control & instrumentation, blade and turbine technicians), science (e.g. marine biology, geophysics, hydrography, oceanography), advanced first aid and rescue, and offshore-specific skills (e.g. confined spaces, working at heights).⁴¹ Many of these skill gaps could be covered by workers currently in the oil and gas sector, given the transferability of their skills to offshore wind.⁴²

To reach net zero, our **electricity networks** must also be upgraded and expanded to handle this boost in renewable generation, and the country-wide deployment of low carbon technologies that it makes possible. Peak demand could rise to 96GW by 2050, with total annual demand reaching as much as 637 terawatt-hours (TWh).⁴³ As the nation's demand for electricity grows, a larger workforce – with skills in both smart and traditional networks engineering – needs to rise to meet the challenge. A recent report by the National Grid estimates a need to recruit for 400,000 energy jobs between now and 2050 to get to net zero - 260,000 will be new roles, while 140,000 will be replacing those who have left the workforce due to natural attrition.⁴⁴ We expect to see substantial job growth in a variety of fields, ranging from cutting edge roles in software design, cybersecurity and artificial intelligence (AI), to skilled jobs in electrical engineering, green construction, biodiversity and habitat management.

Smart systems technologies, including energy storage and demand-side response, will be critical to integrating renewables and low carbon heat and transport onto the system. Battery storage is already being deployed across the system but will need to expand significantly. There is currently around 1GW⁴⁵ of battery storage deployed in Great Britain, with around 8GW⁴⁶ in the planning pipeline. Other forms of storage, particularly long-duration storage, are more nascent. By 2050, the domestic market for smart systems and flexibility solutions could be worth as much as £1.3 billion to GDP supporting around 10,000 jobs, while the export potential in 2050 could be worth as much as £2.7 billion and 14,000 jobs.⁴⁷

Similarly, the UK-wide **buildings retrofit sector** is expected to grow in the short to medium term. To meet net zero, most buildings in the UK must be retrofitted in the next three decades, and people need to be recruited and trained to do so across the country. Furthermore, due to climate change, buildings are already being challenged with weather conditions for which they were not originally designed. This means that building a net zero retrofit sector will require a continuous need for adaptations to be taken into account in the long run.⁴⁸

According to the Construction Industry Training Board (CITB), improving the **building fabric energy efficiency** of every building in the country in need of retrofit will require 12,000 workers to be trained every year for about the next four years, before the need to ramp up annual recruitment by up to 30,000 workers between years 2025 and 2030.⁴⁹ This implies an increased trained workforce of up to 230,000 by the end of the decade, and a resulting need to urgently prioritise new recruitment and retraining.⁵⁰

Currently, there is a critical shortage of retrofit designers and co-ordinators, coupled with education and training being mostly focussed on new-build using traditional on-site techniques, and insufficient emphasis on low carbon systems.⁵¹

Integration of low carbon thinking across the board will be critical to delivering the transition. Training on **modern methods of construction for retrofit and especially new build** will be required to ensure that all new homes built meet the

Future Home Standard to avoid the need for retrofitting in the future. Specific low carbon training is required across all roles, with a focus on systems design and implementation, inter-trade issues, and competence and quality. This includes every part of the construction supply chain - from planners, architects, engineers, construction workers, supervisors and auditors, to occupiers.⁵² The emergence of new technologies may also impact the skills requirements across both new-build and retrofit.



B. Green sectors that are predicted to grow ahead of the transition

Net zero will require wide-scale deployment of new low carbon technologies, and emerging sectors such as **hydrogen** and **CCUS**⁵³ will be crucial enablers of deep cross-sectoral decarbonisation.⁵⁴ Industry is expected to be the largest single consumer of hydrogen by 2050, with most technologies being deployed in industrial sites and clusters.⁵⁵ The government aims to have two operational industrial clusters by the mid-2020s, a further two clusters operational by 2030, and at least one of them fully net-zero by 2040, with hydrogen and CCUS being central to these plans.⁵⁶

According to research, between 2020 to 2029, the growth of these industries is expected to be centred on the early deployment of hydrogen production technologies, CCUS, and emission mitigation measures in the oil and gas sector. This should lead to a new demand for workers - and the tight timeframes associated with the establishment of the industrial clusters may make recruiting and training sufficient new talent challenging. These skill gaps could however be partly covered by the current energy workforce, such as those in oil and gas, which already have many of the key skills needed. For example, pipe fitters and designers, leak test technicians, and offshore barge operators in oil and gas could – with some retraining - move to CCUS.⁵⁷ On the other hand, many of the roles that will be needed already exist in other sectors, and could easily be transferred (e.g. project managers,

administrative functions, operations & maintenance, health & safety, and regulatory experts).⁵⁸

In the medium (2030 - 2039) to long-term (2040 - 2050), we might see the development of more technologically advanced concepts, such as hydrogen storage in salt caverns, synthesis of fuels from captured carbon dioxide, or direct air carbon capture and storage. These have not yet been deployed at scale and the full extent of the skills required is currently unknown.⁵⁹ To secure the sustainable growth of these sectors, there is a need to make them appealing to younger generations to continuously attract new entrants, especially given the ageing workforce in the engineering and energy sectors.⁶⁰

As we accelerate action towards net zero, we must also continue to prepare for the impacts of climate change. In leading that transition there may be new opportunities for certain sectors including engineering for resilient infrastructure, construction and environmental monitoring, or an increased demand for adaptation finance including in insurance products and green bonds⁶¹. The **climate resilience market** is rapidly growing, with sectors such as housing and construction, water, infrastructure, local government, and nature conservation, among others, requiring adaptation skills⁶².

C. Sectors experiencing significant transformation

The **automotive** and **heating and cooling** sectors are experiencing growth associated with fast approaching climate targets and legislation, and an increasing consumer demand for greener products and services.

The government has announced the end of the sale of new petrol and diesel cars and vans in the UK by 2030, and all new cars and vans must be zero emissions from 2035.⁶³ To achieve this and enable the transition to electric vehicles (EVs), there are gaps in the **automotive sector** workforce that will need to be overcome at a relatively fast pace, with a focus on retraining and upskilling of the current workers, and a push in new recruitment.⁶⁴

The sector is expected to go through significant transformation, with the Faraday Institute's modelling providing an insight on what that could look like. In its central growth scenario⁶⁵ - in which the UK automotive sector remains stable and at pace with global EV market trends - it estimates that the UK could produce around 1.6 million EVs per year by 2040 and establish seven gigafactories in national territory.⁶⁶ These gigafactories could create up to 78,000 new jobs (both direct and in the supply chain), with 24,500 in battery manufacturing, 43,500 in the battery supply chain, and around 10,000 in EV manufacturing. In terms of skills, production operators and equipment technicians would account for 75% of a gigafactory's workforce - requiring level 2-3 qualifications in courses such as Advanced Manufacturing Engineering.⁶⁷ The remaining 25% would need higher-level qualifications, such as graduate level skills (e.g. systems engineer, database development engineer and thermal management engineer). Battery production should also increase green employment across the gigafactories supply chain - for example, battery cell manufacturing could support highly skilled jobs in the chemical sector.⁶⁸



More broadly, as it currently stands, the Faraday Institution estimates that of the current 182,000 vehicle technicians, about 21,000 are already EV qualified, and about 50,000 workers in automotive manufacturing will need retraining or upskilling by 2025.⁶⁹ Beyond the current workforce, an additional 7,500-10,000 workers will also be needed in battery cell manufacturing by 2030 – reinforcing the speed of change expected in the sector within the next years, and how quickly its workforce will have to adapt and transform.⁷⁰

A similar transformation is expected in **heating and cooling**. At present, approximately 85% of heating in the UK is from natural gas, with about 26 million domestic boilers currently in place.⁷¹ These heating systems are installed at a rate of 1.7 million a year and are maintained by around 120,000 qualified gas engineers.⁷² With the growing need for low carbon alternatives, the Heat Network Industry Council estimates that by 2050 the heat network sector could create between 20,000 and 35,000 direct jobs.⁷³

However, as we look to net zero, heat pumps are expected to play a growing role in decarbonising the built environment, and more so since the announcement of the government's *Ten Point Plan*, which sets out an ambition of 600,000 heat pump installations per year by 2028.

In 2019, there were about 900 heat pump installers in the UK, and the CITB estimates that we could see a need for between 7,500 and 15,000 **heat pump installers** a year to be trained just within the next seven years, resulting in around 60,000 workers needed for heat pump installation in domestic and non-domestic buildings, and illustrating the pace of change in this sector and its workforce.⁷⁴

To meet the *Ten Point Plan*'s ambition and respond to a growing consumer demand for greener solutions, the majority of the current heating system installers will need to upskill to be able to install heat pumps. The skills required for this are significantly different from those involved in installing conventional heating systems, and will involve knowledge in heat loss calculations, hydraulic balancing, flow temperature calculations and heating system sizing.⁷⁵ It is more efficient, and sometimes essential, for heat pumps to be installed alongside improved energy efficiency, distribution and management systems, so familiarity with these disciplines among heat pump installers would be an advantage.⁷⁶

Furthermore, the transition to a **circular economy** places a growing focus on waste prevention and resource efficiency across a variety of sectors. This will enable built assets, products and materials to be kept in use for longer, contributing to mitigation and adaptation efforts in the UK, and across the global supply chain. Research suggests that the growth of circular economy sectors such as repair, remanufacture, refill, and servitisation, could create between 54,000 to 102,000 net jobs across all regions in the UK by 2030.⁷⁷ A significant proportion of electrical products (over 80%⁷⁸) consumed in the UK are imported. Shifting towards more circular economy activities has the potential to decrease demand for imported goods and increase jobs locally, especially through repairs. These workers will require skills in repair and manufacturing at levels 3-6 and circular economy business planning at master's level, including engineers, material scientists and managers.⁷⁹

Planned waste reforms from the government – including Extended Producer Responsibility for packaging, and a Deposit Return Scheme for drink containers – are projected to increase demand for domestic reprocessing capacity.⁸⁰ Job creation is expected through the stages of development of reprocessing, including scoping and planning, construction and operations. The Deposit Return Scheme is estimated to create between 3,000 and 4,300 jobs whilst increasing the number of higher-skilled jobs.⁸¹

Sectors such as **oil and gas** will also undergo transformation, but with a likely reduction in demand for their goods or services during the transition. Workers in the sector will need to adapt and potentially transition to new sectors. Between 2014 and 2017, the UK oil and gas sector lost over 70,000 direct jobs as well as those in the supply chain.⁸² Another 80,000 workers are likely to leave the sector between 2018 and 2035 due to natural attrition.⁸³ These figures do not account for the job losses that have occurred as a direct result of the Covid-19 pandemic impact on global oil demand and prices in 2020.

It is estimated that over 90% of the UK's oil and gas workforce have medium to high skills transferability and are well positioned to work in other energy sectors.⁸⁴ For example, there is a high level of transferability from oil and gas to decommissioning and subsea network projects, and medium transferability to offshore wind, CCUS, and blue hydrogen.⁸⁵ Around 100,000 (about 50%) of the jobs in the UK offshore energy sector (including offshore wind, hydrogen, CCUS activities and oil and gas) in 2030 are projected to be filled by workers transferring from oil and gas to offshore renewable roles and by new entrants from outside the sector.⁸⁶

Following the North Sea Transition Deal, the sector has committed to reducing production emissions by 50% in 2030, on the pathway to net zero by 2050. This will likely be achieved through a combination of energy efficiency, electrification, alternative decarbonised energy, and the use of carbon capture technologies. The transition to a net zero North Sea “could generate £20bn per year of investment in coastal regions and could lead to a net increase of 40,000 direct jobs connected to the North Sea energy industry, even after long-term decline in the North Sea oil and gas industry is included”.⁸⁷ According to a recent survey, oil and gas workers show an interest in moving to offshore wind (53%), wider renewables (51%), and decommissioning (38%), given access to the right education and training.⁸⁸ Thus, in addition to attracting new entrants, there is still a need to reskill the existing workforce, with a focus on new skills in areas such as decommissioning, energy diversification, and further digitalisation of the sector.⁸⁹

The importance of ‘cross-cutting’ skills to the transition

Whilst many of the skills required for the net zero transition are specific to certain industries or trades, the transition will require and support an array of skills not unique to green roles. Indeed, a recent study from the World Economic Forum highlighted that in the ‘green economy’, out of the top ten skills identified, only three are industry specific.⁹⁰

With the complexity of work in some sectors, there will be an increased demand for cross-, multi- and interdisciplinary⁹¹ skills such as in whole house retrofitting. This is because the move from traditional natural gas heating and present insulation solutions to low carbon energy efficient houses will mean that retrofitters will need to be able to work across multiple technologies and optimise them. At present, boilers and insulation are installed independently, but in a net zero world there will be multiple technologies that would operate in a home including solar panels, EV chargepoints, heat pumps, batteries, and smart systems to control these interacting technologies. This demonstrates the importance of their materials and skills supply chains working together.

Science, Technology, Engineering and Mathematics (STEM) skills will underpin jobs that are key to taking forward the green recovery and delivering net zero. For example, scientists will be needed to innovate the technologies for the net zero transition as described in the government’s *Energy White Paper* on powering our net-zero future⁹² as well as provide vital research on climate adaptation. Equally, engineers will be needed to utilise systems thinking to approach the complex challenges of decarbonisation,⁹³ and will also have a crucial role to play in enhancing the resilience of infrastructure and buildings to climate change.⁹⁴

Beyond STEM, there are several other areas that are also critical for the workforce to deliver net zero. These include:

- **Digital and data skills:** Skills in digital and data analytics will be required for the net zero energy workforce across all areas.⁹⁵ Renewable electricity generation sources are intermittent and managing this will require storage and flexibility across local and national systems. This will require better use of data and digitisation skills to enable smart grid infrastructure to deliver a reliable system. Other areas for digital skills include EVs, which require efficient digital control of batteries and motors to achieve the required range, and logistics where consolidating deliveries and reducing the number of vehicles on the road maximises emission reductions. Home heating systems are increasingly saving consumer’s money using efficient AI heating controllers, and the increasing use of digital twin technology could help improve efficiencies across many sectors from energy production in wind farms through to understanding the impact of farming on system resilience. The building of energy infrastructure, especially in new technologies involving hydrogen and CCUS, will create demand for improved digital skills in the workforce.

- **Project management:** Project managers will be needed across all industries in the transition to net zero to ensure timescales are managed and budgets are met. This will mean that traditional career pathways for project managers will also need appropriate incentives in the net zero workforce to compete with for example those well-worn routes to the financial services sector.
- **Education communication and change management:** Educators, trainers, and assessors are needed to mainstream green skills provision across both the public and private sector. Expert communicators will be needed to implement rapid change in organisations, inspire green career pathways and job choices, and to facilitate collective technical advancements.
- **Leadership, management, and communication skills:** Leadership skills are needed to drive cultural change for a green economy, while influencing and guiding the transition as ‘new technologies, behaviours and systems need embedding’⁹⁶. Strong communication skills are also required to effectively engage with the general public, build relationships with colleagues and clients, problem solve and provide genuine support as their customers begin transitioning to greener solutions in all aspects of their daily lives.



The impact of the transition will be different across the UK

The effects of the transition to net zero will differ between the regions of the UK, depending largely on the sectoral makeup of local employment.

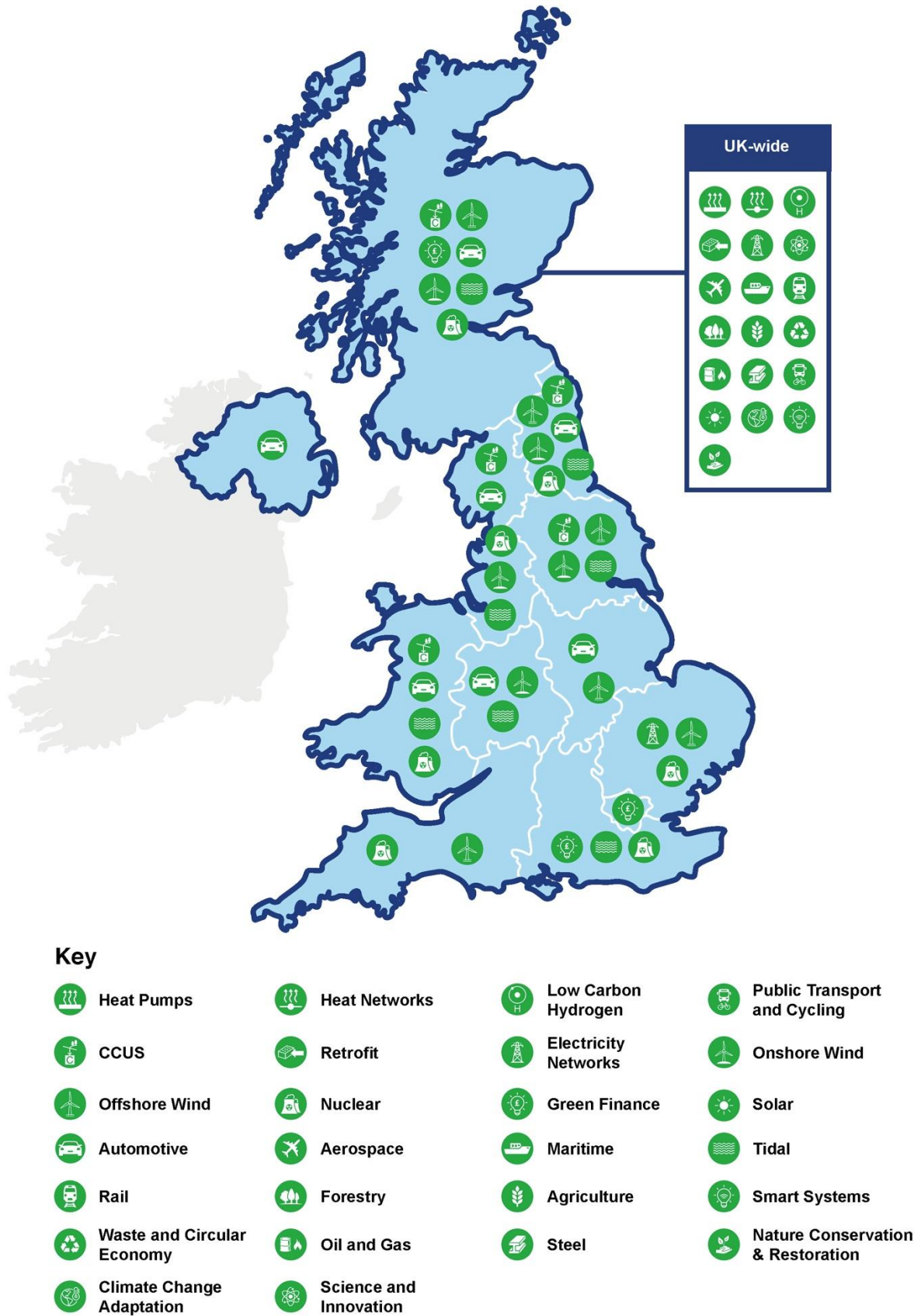
Certain sectors will benefit from a concentration of opportunity in specific areas. The growth of CCUS and low carbon hydrogen will lead to increased employment opportunities within the UK's industrial clusters such as Merseyside, Humberside, Scotland, and south Wales. And as the UK automotive sector transforms as part of the transition, demand for roles in the EVs supply chain will benefit the manufacturing hubs within the midlands and other hubs of EV manufacturing.

Similarly, the impacts of the transition will be unevenly distributed across the country, with sectors most exposed to the transition being concentrated in specific regions, many of them already dealing with other socioeconomic challenges. Analysis shows that the percentage of jobs impacted could vary from 19% in London to 23% in the east midlands.⁹⁷ The highest concentration of construction, transport, and manufacturing employment is in the east midlands, west midlands, and Yorkshire and the Humber⁹⁸ and northeast Scotland is still significantly dependent on the oil and gas industry, with over 10% of workers in Aberdeen being directly employed by the sector. If poorly managed, the transition could have serious impacts on the broader local economy.⁹⁹

There are opportunities in nature-based job creation which could aid the recovery of those communities across the UK already experiencing high unemployment before the pandemic. Three types of environmental development - improving woodland, peatlands, and urban parks – could potentially create over 16,000 jobs in UK constituencies severely impacted by employment challenges.¹⁰⁰ For example, two-thirds of the best land for tree planting is located in constituencies with higher-than-average labour market challenges.¹⁰¹ There are constituencies in the Pennines close to peatland which have both labour market challenges and lower forecast job growth than similar places elsewhere.¹⁰² Likewise, constituencies with potential for seagrass restoration have a higher proportion of people on furlough and poorer employment prospects.

Finally, many of the roles required to support the journey to net zero such as retrofit and rail are in sectors which are not location specific and will be needed across the UK. This suggests that training provision for roles within these sectors needs to be accessible throughout several regions of the UK. However, some sectors will see a concentration of workers and skills needed in specific regions as displayed in Figure 1 below.

Figure 1 illustrates the potential regional employment opportunities and skills needs as UK sectors transition to net zero.



These anticipated employment impacts will be exacerbated by the fact that skills mismatches are already persistent across the UK, and this may be a particular issue in certain regions. Some areas of the country have a skills surplus while others see a deficit.¹⁰³ For example, recent research estimates that over half of all Local Enterprise Partnerships (LEPs)¹⁰⁴ exist in a low skills equilibrium.^{105,106}

Indeed, some LEPs through their Strategic Economic Plans cite skills issues as a barrier to the growth of local businesses and increasing productivity. In order to expand, businesses need to have access to the appropriate local skills or the ability to attract these skills into the area, for which labour mobility¹⁰⁷ plays a key role. This may be particularly true for small and medium sized enterprises (SMEs), such as those employing plumbers and builders vital for the net zero demands of retrofit and low carbon heating changes. These businesses risk being particularly vulnerable as they rely on local labour supply and can find it difficult to plan for current and future skills needs.¹⁰⁸

Greater labour mobility will contribute to how easy it is to fill labour market skills shortages. Most labour mobility in the UK currently occurs within regions rather than between regions.¹⁰⁹ The Confederation of British Industry (CBI) found that only 3% of the working age population moved to another region in a given year.¹¹⁰ In the construction industry, for instance, motivation for regional mobility has waned in recent years. Despite the benefits offered by many employers (for example, covered expenses for accommodation or relocation expenses) employees are more inclined to place higher value on cultural fit, sustainability of the new role or company and the impact on family life of either a temporary or permanent relocation when making employment decisions.¹¹¹

The impact of the transition will be felt at different times

Participants in the workshops we held noted that employment in transitioning sectors could decline at a faster rate than new green sectors emerge, and/or in different locations, stopping workers from successfully transitioning, in a timely manner, to new green jobs.¹¹² This could lead to a range of important skills being under optimised or lost from our economy.¹¹³ For example, in 2020 Oil & Gas UK estimated that up to 30,000 jobs could be lost within 12-18 months, increasing local unemployment and the risk of capability loss in high-skilled areas.¹¹⁴

Clear direction in government policy is needed to underpin private investment in net zero, the subsequent creation of new jobs, and the ability for businesses to plan for the skills they need in future.¹¹⁵ The timeline below demonstrates a high-level overview of UK net zero policy and targets set out to date. While these provide some added clarity, there are still gaps across a variety of sectors. Further clarity of the UK's decarbonisation pathways, investment timelines and location are required.

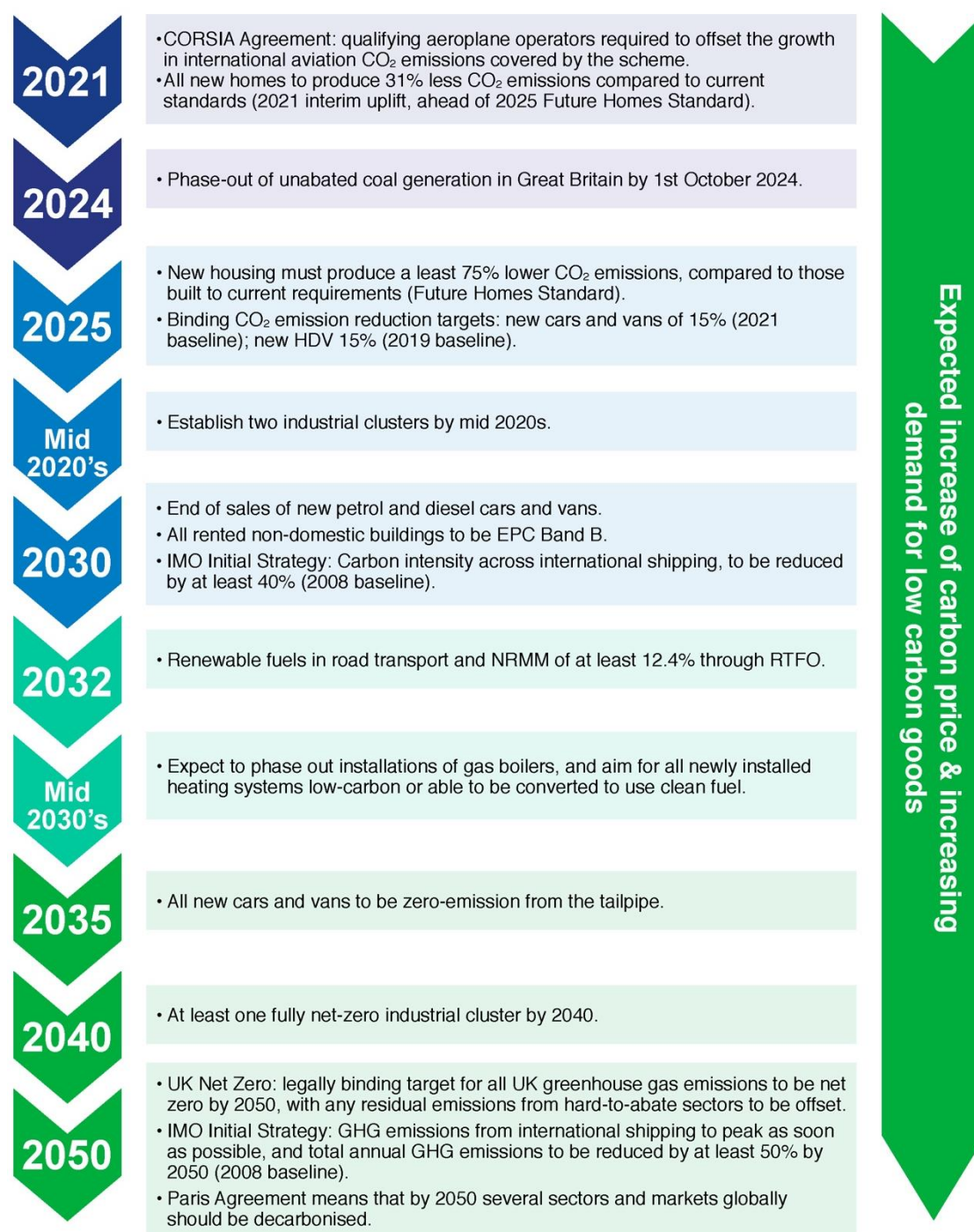


Figure 2: Sectoral policy timelines ahead of Net zero ^{116,117,118,119}

Among the stakeholders we engaged with, there was a broad consensus that this gap can be met. But optimising the skills currently available, and supporting workers to find quality work, requires that the diverse timelines for green job creation and skills demands across the economy and country are matched with those for training and education provision, infrastructure and technology build and roll-out time, the transitioning of the workforce from one sector to the other, and local capacity.¹²⁰

4. Recommendations to government, industry and the skills sector

Introduction

Grasping the huge opportunities from the transition to net zero and managing the potential challenges for businesses, workers and communities in the high carbon economy, as outlined in chapter 3, will require action from government, industry, the skills sector and unions across the lifecycle of green jobs. This must start with the UK's approach to reaching net zero and run through how we build the right pathways for people into green careers and support workers in high carbon sectors to transition.

Theme 1: Driving investment in green jobs and skills in the UK

The previous chapter described the huge potential that exists for the UK to realise the economic benefits of net zero through boosting green jobs and growth. But this will not happen automatically. Businesses and investors will drive green job creation, with much of the investment needed to deliver net zero coming from the private sector. However, a consistent theme coming out of our engagement with industry, workers, and the skills sector has been that government must provide the right framework to underpin future policy, create clear market demand, and inspire the confidence needed to unlock investment from business. This finding is also supported by a recent survey of industry carried out by the CBI¹²¹ and industry bodies, such as the Heat Pump Association.¹²²

To unlock the huge scale of private investment needed to take advantage of this opportunity, the government must publish a clear, sufficiently detailed, and long-term plan for the UK's transition to net zero, setting out key policy measures to be taken over the next five to ten years to ensure that the UK is a productive and competitive investment location. Specifically, the strategy should clearly signal how and where market demand will be generated and how the right skills and training can be put in place at the right time to match this.

By setting out a national roadmap the government can enable, encourage, and expect sectors and businesses to publish their own plans to invest in the green economy. Crucially, it will also give skills providers the confidence they need to design and offer courses to build the net zero workforce and support the UK's ambition to build back greener and give workers of all ages and backgrounds the confidence they need to choose a career in the green economy.

Our engagement with industry highlighted the importance of continued investment from business and government in research and development (R&D) to drive forward the tangible changes we need to see in the economy to reach net zero and remain competitive internationally. The government is already acting here, through the £1 billion Net Zero Innovation Portfolio, and initiatives such as the Automotive Transition Fund (ATF). To unlock industry investment in research and development, government should develop an R&D strategy aimed at increasing investment in critical innovative green technologies, such as electrolysers, low-cost hydrogen production, CCUS, process decarbonisation, battery and motor technology, renewable generation of electricity, carbon neutral or low energy homes, and nuclear power.

It is vital that there is strong alignment between the investment in and future demand for skills. However, our understanding of the specific skills mix needed in each sector, including in terms of both overall volumes and volumes split by region, will likely continue to change as the transition to net zero gathers pace. As such, the design and delivery of government's strategy for net zero should include an ongoing assessment of the supply of and demand for skills, which should be kept under continued review.

Recommendation 1

The government should publish a detailed net zero strategy before COP26 which sets out how the UK will reach its decarbonisation targets for 2035 and 2050, to give industry, workers and skills providers the confidence they need to invest in the transition.

- Industry and government should focus research and development resources on seeking solutions to tangible problems that would enable the rapid decarbonisation proposals in the 6th carbon budget and the development of the high-level skills the UK will require.
- The Skills and Productivity Board (SPB) should assess the skills required to deliver net zero in line with the future carbon budgets, the net zero strategy, and future policies. To enable this the SPB should ensure its membership includes economists with expertise in the transition, and ensure it engages sufficiently widely in drawing its conclusions (including in academia, industry, trade unions and skills providers). This analysis should be published to help develop a wider understanding of the green skills gaps.

The design of this strategic framework to enable private and public investment in net zero should learn from recent examples to ensure that investments create jobs, support skills and build green industries that can compete globally.

No economy exists in a vacuum and the UK should ensure that, in building back better, it is seen as a trusted partner in global trade while rebuilding competitive and productive domestic supply chains. It is important to recognise the significant public investments and policy interventions made by the European Union, Canada, the United States and others, to boost domestic zero carbon industry and green jobs. A balance must be found between enabling competitive trade and addressing anti-competitive or carbon tax evading imports, which undermine the ability for UK industries to compete on a green level playing field.

Here, our engagement with industry highlighted as templates for future policy approaches the collaborative work between government and industry on Hinkley Point C and High Speed 2 (HS2). Other recent examples of the government taking this approach include the Offshore Wind Manufacturing Fund and the UK content targets in the Offshore Wind and Nuclear sector deals. Lessons should also be learned from the effective partnership working between local enterprise partnerships (LEPs), manufacturers and developers, such as that involving Siemens Gamesa, Vestas, and Ørsted, working together to grow local supply chains and skill up the local workforce with bespoke apprenticeship schemes and investment in local colleges.¹²³

Case Study

Hinkley Point C – supporting jobs and skills

Since the start of Hinkley Point C's (HPC) construction in 2016, more than 11,700 job opportunities have been created, and 750 apprentices have been trained. HPC's investment is significant for the wider UK economy, with 3,600 British businesses being part of its supply chain. Across Britain, 71,000 jobs are expected to be supported by the project, which is now projected to deliver £18 billion into the wider UK supply chain. In the South West alone, £3.2 billion has been invested and 14,000 people have now been trained and assessed in facilities directly funded by HPC, with a further 1,700 new roles to be hired in next year.

There is real potential to embed this collaborative approach to supporting green jobs and skills, built on strong partnerships with industry, across the government's work. This would see government leverage its investments in net zero-related activity wherever possible and practicable, including in R&D. Similarly, among firms in receipt of government support to decarbonise, there is a real opportunity to leverage government investment to drive up workforce diversity, accelerate progress towards the creation of more good green jobs, which are open to all, and ensure that workers are involved in planning for the transition.

Recommendation 2

The government should use net zero policy and funding to promote good green jobs, skills and competitive supply chains within the scope of international law and trade obligations.

- The government should support job creation, skills and the development of competitive local supply chains in the green economy, through levers such as public procurement policy, funding initiatives and product standards, within the scope of international law and obligations.
- The government should ensure that all bidders for net zero related funding demonstrate best practice in relation to their equality and diversity ambitions and practices, and support transparent reporting of data on workforce diversity.
- High carbon industries which receive government funding to support decarbonisation should prepare, through formal consultation with their workforce or relevant recognised union, mandatory Just Transition agreements that outline principles and practices of the workforce transition process.
- To ensure this approach is consistent across net zero policy, government should consider adopting a principle to support green jobs and skills across its major net zero investments.

Building back greener

The past year has seen unprecedented economic turmoil as a result of the Covid-19 pandemic. The government has set out its ambition to “build back greener”¹²⁴ and should deliver on this by supporting thousands of green jobs across the UK.

Scaling up green recovery spending in line with our G7 peers creates opportunities for the UK to go further than its current plans in areas including nature restoration, energy efficiency retrofit, electric vehicle charging infrastructure, zero carbon home construction, and agriculture. Each has high employment multipliers and can be mobilised very quickly by, for example, building on existing schemes such as the Local Authority Delivery Scheme within the Green Homes Grant programme. This investment to build back greener could be spread evenly across the UK mirroring the widespread nature of the downturn brought about by the Covid-19 pandemic - or be targeted at regions experiencing persistently high unemployment or disproportionality impacted by the Covid-19 pandemic, in support the government’s levelling up agenda.

Case Study

The government’s Green Recovery Challenge Fund (GRCF)



The government’s £80 million Green Recovery Challenge Fund has provided rapid investment in the environmental Non-Governmental Organisation (NGO) sector to restore nature, tackle climate change and connect people with the natural environment in the wake of the Covid-19 pandemic.

These projects are creating and retaining thousands of jobs across England and demonstrating the skills the sector needs to deliver on the government’s ambitions for nature. The range of jobs and skills is broad: from ecologists and species specialists to nature recovery rangers and gardeners.

For example, the National Trust is creating and restoring a wide variety of habitats in its historic landscapes and implementing a variety of nature-based solutions to tackle climate change – as well as building local people’s understanding of how to address environmental challenges. The project’s activities – which include tree planting; wetland, hedgerow and meadow

restoration; and natural flood management – are being delivered by a range of jobs and apprenticeships. These include Ecologists, Rangers and Estate Managers in addition to a Hedgerow Partnership Management Officer and Invasive Non-native Species Officer.



Some GRCF projects are helping to tackle the low levels of diversity in the environment sector. The Youth Hostel Association-led 'Generation Green' project is connecting young people from deprived areas, disadvantaged backgrounds and different ethnic background with nature to help build a diverse and aspiring nature workforce for a green recovery.

The government's £2 billion Kickstart scheme has been an important intervention during the Covid-19 pandemic, aiming to create 250,000 jobs for young people furthest from the labour market by December 2021. Kickstart provides an important model for reaching both long-term unemployed young people and older workers at risk of unemployment due to decarbonisation, while also bridging the growing green skills shortages that risk slowing the climate transition.¹²⁵

Recommendation 3

The government should work with industry to extend its green recovery programmes, directing spending towards low carbon activities with rapid job creation potential, in areas at risk of unemployment.

- The government should target stimulus investments towards low carbon activities and infrastructure with rapid job creation potential to support people at risk of unemployment. Green recovery spending should be scaled up in line with G7 peers, and extended forwards until 2030.
- Targeting people who have been unemployed for three or more months, government should build on unemployment schemes to help more people into 'green' apprenticeships - as was done with Kickstart, during the

Covid-19 pandemic. This could include approaches such as wage subsidies and financial incentives for employers.

Ensuring green jobs are good jobs

At the outset of this work, we were asked to consider how green jobs could be good quality jobs. Job quality was identified as an important issue across the workshops and wider industry engagement that informed this report, particularly as it relates to supporting and incentivising workers to change sectors.

Higher job quality is often described in terms of, for example, high wages and full-time employment, and jobs being permanent rather than temporary. In considering this issue, we have used the definition outlined in the government's 2018 *Good Work Plan*¹²⁶, which sets out five foundational principles that jobs must be rated positively against to be considered good quality. These are overall worker satisfaction; fair pay; participation and progression; wellbeing, safety and security, and voice and autonomy.

In the UK, the ONS has undertaken some exploratory analysis to examine three aspects of good work (satisfactory hours, pay and desired contract) to measure quality of work across the economy.¹²⁷ On top of this, two additional measures of quality of jobs have been added to the Annual Population Survey (APS) by the ONS in 2020. In the longer term, the ONS is looking at ways to add more measures of quality of work into both the APS and the Labour Force Survey.

However, it is important to emphasize that there is currently no way of identifying from this data which jobs considered against measures of quality are in the green economy, and which are not. Additionally, our review of the evidence on the quality of work in the green economy also found significant gaps in the data, with few studies that focus on the UK. Where data is available, it provides a mixed picture, with clear variations in job quality across and within sectors.

The evidence suggests that, currently, not all green jobs are good jobs. For example, there are concerns about some worker's long-term career prospects after initial construction/installations are completed.¹²⁸ New technologies and materials often bring a new set of challenges and risks as well as other risks common to traditional sectors. For example:

- Retrofit workers are at risk of exposure to hazardous materials and chemicals during renovations.¹²⁹
- Mechanics involved in servicing electric vehicles are presented with a new set of risks. For example, as electric vehicles are increasingly maintained by independent garages rather than specialists, workers who are not familiar with the high voltages involved could be at greater risk of electrocution.¹³⁰

- While the advances in technology that allow us to build larger offshore wind turbines in deeper water should be celebrated, the additional risks from getting further from shore, reduced access, and the safety concerns raised by unions must be acknowledged.



It is also important to note that high carbon sectors (such as fossil fuel power plants) are often vital sources of good, well-paid jobs in some areas of the UK. Looking at the pay differentials between renewables and the rest of the energy sector in Europe (including data from the UK) in the 2019 Global Energy Talent Index (GETI) report¹³¹ shows that average annual salaries for those working in renewables (\$58,000) are comparable with those in petrochemical, power and nuclear sectors (\$60,000, \$66,000 and \$64,000 respectively) but lower than those working in oil and gas (\$82,000). While there is no guarantee that this information is comparable with the UK labour markets in these sectors - as it is for Europe as whole - it is likely to give a good indication of pay differentials between sectors in the UK. There is a need to carefully manage the transition for everyone, to ensure local workers are not deprived of well-paid jobs.¹³²

It is therefore clear that actions to improve the data on the quality of work will be important if the UK is to seize the opportunity to deliver good green jobs. The government can also learn from how ‘fair work’ charters in Scotland¹³³ and individual cities in England^{134, 135} have helped to build job quality commitments into procurement and business support programmes.

Recommendation 4

The government should work with industry, unions and other key stakeholders to actively set out, as part of its *Net Zero Strategy*, how it will ensure that the green jobs created by employers are good quality as defined by the *Good Work Plan*, regardless of skills base.

- As part of this, HMG should actively set out the levers it will use to deliver job quality in the green economy, in a separate plan or as part of its wider strategy. Levers to be explored should include regulation, licensing, financing and procurement, the promotion of framework agreements, sectoral bargaining, and industry-wide pay agreements, alongside legislation on employment rights and health & safety.
- The government, working in partnership with industry and unions, should seek to understand the quality of work, including through ongoing qualitative and quantitative research, in the green economy as it evolves and factor this understanding into decision making. This could be a key function for the UK-wide body proposed in **Recommendation 5**.
- There would be value in the UK Government working with international partners to deliver this objective, including ensuring the UK and sister governments meet international labour law obligations and United Nations Sustainable Development Goals.

Maintaining momentum and coherence

The recommendations in Theme 1 provide the foundation for a strategy to deliver good green jobs. The government must continue to monitor labour market impacts of the transition so that this strategy is informed by emerging data and technical progress, and it must work with stakeholders to continually update recommendations and required action in this space. While approaches for delivering good green jobs will vary across regions and sectors, it is important that a UK-wide body is established to ensure that there is a coherent approach.

Recommendation 5

The government should establish a UK-wide body with national representation to ensure momentum and coherence on workforce transition, including progress in delivery. The national body should be supported by local transition bodies to ensure effective place-based strategies for the transition.

- The UK-wide body's remit should be to monitor, drive and report on progress of the transition to a net zero economy that supports good quality green jobs and skills, and to recommend any additional measures required to accelerate delivery. The national body will bring coherence to work by industry and other stakeholders delivering the transition as well as supporting coherence across different UK government departments and different sectors of the green economy.
- National membership should comprise representatives of national government, industry, and unions with an ability to co-opt experts as appropriate. Representation from the Devolved Administrations should help to ensure a joined-up approach across all nations.
- The national body should be supported by analytical capability and should also be charged to collect information from regional or local just transition bodies and to share best practice.
- The role of local transition bodies should be to proactively plan and manage the changes needed in their areas.
- At the local level, membership should generally include industry, local government, unions, skills, and economic development bodies. Community-based bodies should include volunteers.

Theme 2: Building pathways into good green careers

Building clear, accessible and lifelong pathways into good green careers is fundamental to the UK realising a sustainable and just transition to net zero by 2050. Given the disproportionate impacts of the Covid-19 pandemic on youth employment, coupled with pre-existing inequalities in access to education, training and jobs, it is also crucial that we take advantage of the present moment to improve the diversity, wellbeing, and competitiveness of the entire UK workforce.

Ensuring that green jobs are open to all

At the outset, we were asked to consider how to ensure green jobs could be open to all. Diversity goes beyond the standard protected characteristics and includes protections for employees with diverse religious and political beliefs, education, socioeconomic backgrounds, sexual orientation, cultures, and disabilities. It is also important to consider ways these overlap and that employers must understand and address the overlaps in “(multiple, overlapping) intersecting disadvantage”¹³⁶ and bring this thinking into their diversity strategies. A diverse workforce helps to bring about the diversity of thought which is necessary to challenge old orthodoxies and accelerate innovation.



But given current data limitations, such as the ONS LCREE survey not currently being broken down by any diversity characteristics, it is difficult to understand the true extent of the diversity problem in the green economy. What is clear from the evidence available is that many sectors already face diversity challenges, for example in terms of gender and ethnicity, and a lot of green jobs are in or could be in these sectors. It is, though, difficult to quantify how diversity challenges within these sectors extend to ‘green jobs’ specifically. More data on ‘green jobs’, including characteristics of workers, needs to be collected to fully understand these challenges.

By looking at some selected Standard Occupational Classification (SOC) occupations where we believe there are or will be more green jobs, we can see that

women account for a small share of the workforce. This is particularly true within Skilled Trades occupations (see final three rows in Table 1). The story is more positive among Conservation and Environment Professionals, of whom 46% are estimated to be women.

Table 1: Gender diversity in selected (non-exhaustive) occupational groups (three digit SOC codes) which are expected to include significant numbers of green jobs and/or will transition to being green.

Occupation (SOC)	All persons employed in this SOC	Percentage employed in SOC that self-identify as female
214 Conservation and Environment Professionals	60,600	46%
243 Architects, Town Planners and Surveyors	292,200	20%
311 Science, Engineering and Production Technicians	357,800	31%
511 Agricultural and Related Trades	335,000	16%
531 Construction and Building Trades	735,900	2%
523 Vehicle Trades	250,100	2%

Source: ONS, Annual Population Survey, Jan - Dec 2020

Additional external sector sources also indicate gender diversity challenges that may impact green jobs.

Table 2: Gender diversity in selected sectors.

Sector	Percentage who identify as female	Source
Offshore Wind	18%	Offshore wind sector deal 2019 ¹³⁷
Nuclear	20%	NSSG 2019 Nuclear Workforce Assessment ¹³⁸
Green finance	17%	Wider data in finance industry (FCA)
Rail	16%	National Skills Academy Rail (2020) ¹³⁹
Oil and Gas	25%	OGUK 2021 Diversity & Inclusion Survey Report ¹⁴⁰

Source: See each row

Granular data on ethnic diversity is even harder to come by, although the ONS does provide high-level data split by industry. By looking at the four industries (defined using top-level Standard Industrial Classification (SIC) codes) with the largest representation in estimated direct employment in the UK's low carbon and renewable energy economy (manufacturing, construction, professional, scientific and technical activities, and electricity, gas, steam and air conditioning supply) we can see some evidence of a potential lack of representation for ethnic minorities. According to the Annual Population Survey, all four have a significantly higher share of employees who identify as 'White'¹⁴¹, relative to the estimated share among all people employed in the UK in 2019 (86.75%).¹⁴² The furthest-right column of Table 3 shows the proportion of total direct employment in the LCREE which the ONS estimate to be in each industry SIC code (LCREE direct jobs totalled 202,100 in 2019). However, it should be noted that a lack of data means it is not possible to identify the ethnic makeup of low carbon jobs specifically within each industry SIC code.

Table 3: Ethnicity in top 4 SIC codes within the Low Carbon and Renewable Energy Economy (LCREE).

SIC	Percentage of employees in this SIC that self-identify as “White”	2019 LCREE FTE (direct) in this SIC (SOURCE: 2019 LCREE)	Percentage of LCREE direct FTE in this SIC (SOURCE: 2019 LCREE)
C Manufacturing	91.8%	69,300	34%
D Electricity, gas, steam and air conditioning supply	92.6%	16,800	8%
F Construction	94.6%	62,800	31%
M Professional, scientific and technical activities	88.8%	23,800	12%

Source: ONS, Annual Population Survey, Jan - Dec 2020; ONS, Low Carbon and Renewable Energy Economy Survey, 2019. Note that the figures in the second column were correct as of their original download from Nomis in June 2021 but may be subject to (minor) changes pending the ONS releasing revised figures to account for reweighting required due to the the impacts of COVID-19 on the Labour Force Survey in 2020. See here for details <https://www.ons.gov.uk/employmentandlabourmarket/peopleinwork/employmentandemployeetypes/articles/impa ctofreweightingonlabourforcesurveykeyindicatorsuk/2020>.

Many sectors in the green economy recognise the challenge; for example, the Offshore Wind Sector deal made a commitment to set a target, which has since been established, to increase the number of Black, Asian and minority ethnic workers in the sector from 5% today to 9% in 2030.¹⁴³

A clear message from our engagement with industry, unions and community groups was that tackling the barriers which stop women and other underrepresented groups from accessing green jobs should be a priority if the UK is to have the skilled workforce needed to reach net zero.

There are two primary reasons for this. First, the extent of the skills gaps identified in this report point to the need to significantly increase the size of the green workforce to deliver net zero. The challenge of bridging this gap is made more difficult if the sector is not accessing talent from the widest possible pool. Second, research shows that diversity brings many advantages to an organisation, from increased profitability, creativity, stronger governance, and better problem-solving abilities.

Employees from underrepresented groups can bring in their own perspectives, ideas and experiences, helping to create organisations that are resilient and effective, and

which outperform organisations that do not invest in diversity. For example, McKinsey found that companies in the top quartile for gender diversity on executive teams were 25% more likely to have above-average profitability than companies in the fourth quartile. For ethnic and cultural diversity, top-quartile companies outperformed those in the fourth quartile by 36% in profitability.¹⁴⁴

A key challenge is, however, the limited granular data available, which means it is difficult to understand the true extent of the challenge in the green workforce. Data collected by the ONS often focuses on traditional definitions of sectors making it difficult to build a picture of emerging sectors of the green economy, particularly beyond gender diversity. Some industries are, therefore, reliant on sector led data collection, such as the Nuclear Workforce Assessment and Renewable UK's workforce data. While providing useful data, this too can be limited in scope and requires significant resourcing and planning, often resulting in the data collected being outdated and/or incomplete. The challenging reality is that many companies are simply unaware of the exact problems that lie within their organisation and industry. A 2018 Equalities and Human Rights Commission (EHRC) survey¹⁴⁵ found that despite 77% of employers suggesting workforce diversity was a priority, only 36% of businesses kept data on ethnicity, with many feeling this would be too intrusive and assuming that employees would not like to share such information.



An urgent priority for industry should be to address the lack of diversity among potential recruits in the green economy. This starts in the education system and continues throughout the lifecycle of employment. Although half of 18- to 34-year-olds desire a career which helps protect the environment¹⁴⁶, the relevant sectors struggle with attracting young people. For example, while there is an even split of males and females studying STEM education at GCSE level, numbers of females drop off at a greater rate than males once these subjects are no longer compulsory. At A-Level, the proportion of female students drops to just 39%, and just 19% of Engineering degree students are women.¹⁴⁷ Despite forming 22% of higher education student bodies, students from ethnic minority groups are consistently underrepresented in 'green' courses (such as geography, environmental conservation and environmental sciences), where they make up fewer than 10% of enrolments. This is despite research suggesting that Black, Asian, or other ethnic minority students are more likely to desire a job that helps the environment – 59% of Black, Asian or minority ethnic (BAME) survey respondents compared with 42% of White British respondents.¹⁴⁸

Poor practice within industry also needs to be overcome if the necessary progress is to be made. For example, Energy & Utility Skills estimate that more than 75% of women who leave engineering after maternity leave or career breaks want to return to the engineering profession but are put off due to inflexible working hours and practices.¹⁴⁹ Promotion of flexible working practices seen within the Covid-19 lockdowns must not be left behind, but continually embraced. It is not just inflexibility that leads to a lack of inclusion; a key suggestion from underrepresented groups, to improve inclusion in the environmental sector (the second least diverse out of 202 professions in the UK in 2017), was to increase awareness of the opportunities within the sector across all education levels, including highlighting what working in these sectors is like and having commitments from organisations to address key concerns of underrepresented groups.¹⁵⁰

Despite the clear need to make progress in improving diversity and inclusion within the workforce, our engagement also found many examples of good practice and progress that is being made across the green economy, which are exemplified in the case studies below.

Case Study

National Grid – Grid for Good

In 2020, National Grid launched its Responsible Business Charter which committed to provide access to skills development for 45,000 people by 2030, with a specific focus on lower-income communities. To do this, it established Grid for Good, an energy industry community programme to support socio-economically disadvantaged young people aged 16-25.

Powered by volunteering, it connects the most under-served and hardest to reach young people in the UK and US with training and employment opportunities. The bespoke curriculum helps them build the skills they need and gives advice on career and employability development. The programme is now run virtually and includes twelve weeks of career mentoring, two weeks' paid work experience, access to apprenticeships and internships at National Grid, work-readiness training, networking, and industry taster sessions.

Since the launch in November 2020, this programme has helped many more young people come to understand the globally essential challenge of building the clean energy networks of the future, and benefit from the wider range of roles available in the energy industry. Candidates from Grid for Good are already successfully getting roles across the business; the programme now has alumni in construction, communications, customer service and network modelling jobs.

Case Study

Ørsted, - improving recruitment and retention

Ørsted, the global leader in offshore wind, established its own Wind Turbine Technician Apprenticeship programme in Grimsby in 2017.

The initial cohort consisted of four white males, however as the programme became more established, and with buy-in from senior leadership, a new approach to recruitment was initiated with a sharp focus on diversity.

The first step was to ensure gender neutrality in job adverts - across both wording and imagery - followed by attendance at careers fairs which saw engagement with over 5,000 students in one week. The team also attended Women into Manufacturing and Engineering (WIME) reaching out directly to females interested in STEM careers.

A diverse panel from across the organisation reviewed over 600 applications and assessment day tasks, before final interviews. The diversity of the recruitment panel gave a fresh perspective and ensured candidates could see themselves represented in the company.

The result was the most diverse and gender-balanced group of apprentices to date.

Based on last year's data, the team is continuing to encourage women into the sector and now also targeting disadvantaged schools.

Case Study

Barratt Developments – Improving diversity

Barratt's diversity and inclusion agenda is underpinned by its ambition to have a workforce that reflects local communities.

According to figures produced by the ONS for April to June 2020, women only make up 13.32% of the construction sector, representing little improvement over the past two decades. This is the most significant diversity and equality gap in the construction sector.

However, Barratt has built a workforce that is more than double the national average of women in construction, with 70% men and 30% women employed by the organisation as of April 2020.

Building on these strong foundations, Barratt has a range of key programmes to further redress the gender balance in the sector over the long-term. This includes the "Built by Both" programme, launched by Barratt's graduates, which provides an industry-wide networking forum to demonstrate that the housebuilding sector is built by both genders and to actively promote the potential career opportunities for women.

Barratt also has many examples of women in key roles, which helps to promote and inspire others regarding opportunities in the sector through links with local schools, professional bodies and campus teams. Barratt also invests in its own future female leaders through its Catalyst programme. This programme, which has been running for three years, provides leadership development for potential female leaders within the business, supported by a reverse mentoring approach.

Case Study

Sector targets – Offshore Wind and Nuclear

The Nuclear and Offshore Wind Sector Deals, published in 2018 and 2019 respectively, are useful partnerships between Industry and government, that have increased the profile of diversity issues within the senior leadership of sectors, creating a greater focus on “diversity of thought”, and the myriad of benefits that come with it.

The Nuclear Sector Deal, for example, will help to ensure the nuclear industry benefits from the skills it requires through a more diverse workforce and achieve 40% women in nuclear by 2030. Despite this specific target on gender diversity, the Sector Deal recognises the need to focus on the wider “diversity of thought”, which is crucial to ensure that the nuclear industry is innovative, productive and has the skills it needs.

Driving the delivery of the people and skills commitments within the Offshore Wind Sector Deal, an Investment in Talent Group (overseen by the trade association RenewableUK) is actively working to increase the number of skilled people working in the sector by attracting a wide, diverse pool of talent. The industry has committed to increasing the proportion of women employed in the offshore wind sector to at least one third by 2030 – and to reach a stretch target of 40% if possible. The sector has identified a challenging target to increase the number of BAME workers in the sector from 5% today to 9% in 2030, aiming for a more ambitious target of 12% if feasible.

A key success of the Sector Deal has been the rising profile of equality, diversity and inclusion issues across the sector, with diversity becoming a regular topic of discussion within the sector’s most senior boards.

Sharing experiences and best practice across the Ethnicity and Gender Working Groups has resulted in changes in working practices in many of the top tier companies within the industry. In addition, the Offshore Wind Industry Council (OWIC) Diversity & Inclusion Best Practice Guide is widely regarded as an exemplar supporting companies particularly to start gathering ethnicity data and recruiting for a more diverse workforce.

Recommendation 6

To address the skills gap and ensure green jobs are open to all, industry bodies and all employers in the green economy should prioritise the creation of a diverse workforce and should share best practice across the economy.

- Industry action should focus on the following priorities:
 - improving recruitment practices, for instance through diverse representation in recruitment panels; anonymous application forms; and removing degree requirements where not directly relevant;
 - creating a culture of inclusivity;
 - focusing on promotion and retention of staff from diverse backgrounds;
 - diversity & inclusion training for leaders and recruitment teams; and
 - working with SMEs and supply chain to bring through talent from the local area.
- To deliver this, employers must first work to improve the quality of data on diversity in their companies, and overcome the barriers to collecting it. The government should explore if the collection of this data should be enforced, and the data published regularly.
- Industry bodies and employers in the green economy should agree stretching and sector relevant targets for driving up the diversity of their workforce, and progress against this should be assessed independently and be held accountable for their delivery.
- Sector deals should include appropriate and stretching equality and diversity targets and initiatives to achieve them.

The importance of education and skills for creating the net zero workforce

In developing education and skills policy and provision, it is important to note that every job of the future will be directly or indirectly shaped by the transition to net zero. Education and skills already play a key role in UK productivity.¹⁵¹ Investment in skills delivers a wide range of social and economic benefits, including productivity, social mobility, and wellbeing.¹⁵²

Improving skills provision and utilisation is important, especially in the context of the net zero transition and as the UK has large and persistent productivity gaps. The UK also has regional disparities in economic performance. The difference between the most and least productive regions in the UK is large compared to other advanced economies.¹⁵³

A number of US studies show that, to date, “high-skilled green jobs account for the lion’s share of the increase in green employment which is consistent with the idea that new technologies including environmental ones are skills biased.”¹⁵⁴ Similarly, “green jobs exhibit higher levels of education, work experience and job training” and “use more intensively high-level cognitive and interpersonal skills compared to non-green jobs.”¹⁵⁵ Given this, the huge expansion required in green employment across the UK, requires the creation of a highly skilled workforce to deliver net zero. In turn, this requires a systemic and ‘whole life’ approach to the enhancement of green careers pathways and the alignment of education and training provision with net zero.

Our research and engagement found several barriers to creating this skilled workforce to deliver net zero:

Latent demand for low carbon skills is as a key barrier.¹⁵⁶ To invest in skills, employers must feel assured that any funded training they offer to their employees will provide sufficient pay back. However, employers do not always have sufficient knowledge of the benefits of training and therefore cannot always make informed decisions that lead to an investment in the skills of their current workforce. This latent demand results in the market not providing skills at the scale and pace that is needed as employers are simply not demanding them. Up to five years are required to develop apprenticeships or training programmes. This, coupled with the time needed for an individual to undertake an apprenticeship or training, could result in a considerable lag between the moment a skills need is identified, and workers are trained. It is therefore essential that employers are alert to their skills needs.^{157,158}

The existence of present bias, a cognitive barrier in which immediate costs and benefits are overweighted whilst future ones are underweighted,¹⁵⁹ coupled with short-termism, in which a greater relative value is placed on current rather than future business needs, means employers can exhibit risk-averse behaviours and are less keen to make longer-term investment¹⁶⁰ into skills due to the uncertainty surrounding future benefits. Without a forward-looking workforce development

strategy with a focused approach to skills investment, employers may find it difficult to capitalise on the growth of the green economy and the advantages this could bring such as improved financial performance, greater product or service quality and increased productivity.¹⁶¹

There is a potential reluctance among employers to fund training due to the possibility of employees leaving the organisation and joining another company. This is an externality known as ‘poaching’, reducing the incentive for employers to invest in improving the skills of their workforce as they are not certain to realise the benefits.¹⁶²

The economic downturn brought about by the Covid-19 pandemic and uncertainty have made businesses more risk averse. Greater clarity and stronger market signals from government are needed to reassure businesses and skills providers to enable them to confidently invest in the transition to a green economy.¹⁶³

Challenges of green skills and training

The skills system ought to be flexible and adapt to the ever-evolving energy sector.¹⁶⁴ It is important to consider the challenges training providers experience in delivering skills. Participants in our workshops discussed how further education (FE) providers often bear higher delivery costs to deliver courses in green skills, including upfront capital costs resulting from the need to teach using new technologies. Building a sustainable, high-quality FE workforce able to deliver training for green jobs is also challenging due to an overall shortage of STEM graduates, providers having to compete with industry where wages are higher; and the need to fish within a small pool of people trained in emerging technologies.

This challenge is exacerbated when considering workers in high carbon sectors. Nesta research suggests that over 70% of workers in high carbon sectors are medium or low-skilled, compared to 30% in sectors that are leaders in eco-transformation. Chapter two pointed to the need for a significant amount of retraining among the workforce in high carbon industries, but just 11% of high carbon workers participate in adult learning currently, creating a real risk. Finally, workers with the lowest qualifications are currently the least likely to get access to training, which is often more available to staff who are already highly skilled and working in greener sectors.¹⁶⁵ Some support should, therefore, target those that have lower qualification levels within these sectors or target specific skills that are more challenging to transition to other technologies.

Access to short, modular, and high-quality provision is required to ensure the workforce has the right skills to help workers from high carbon sectors to transition. We therefore welcome the government's recent investment in Higher Technical Education as part of their education reforms, which is supporting STEM and modular provision for both the Higher Education and Further Education sectors.

Recommendation 7

As part of a well-sequenced curriculum, government, employers and education providers should promote the effective teaching of climate change and the knowledge and skills (in STEM and other key subjects) required for green jobs.

- The government and education providers should ensure that teachers have the expertise required to teach climate change and the knowledge and skills in STEM and other key subjects required for green jobs. This should take advantage of the opportunities afforded by the review of Initial Teacher Training (ITT) to make sure ITT providers teach high quality courses which incorporate detailed subject knowledge. The government should also ensure that teachers have access to high quality subject continuous professional development.
- To boost school-age engagement with net zero-aligned STEM education by underrepresented groups (especially female students), schools, local government and employers should partner to co-create modular programmes that maximise accessibility, for example, via digital provision and the Oak National Academy.
- The government and exam boards should promote exemplary curriculum resources (for example through the Oak National Academy) and support schools to mainstream climate education into formal qualifications in existing subjects, such as business and design & technology. This will help to align school leaver attributes with the net zero transition and provide clearer pathways into further learning and green careers.

For students to receive the best possible climate change and green skills education, they need to have teachers who are equipped with relevant resources, training and support from employers. To deliver this we must build capacity within all schools and enhance collaboration between industry and the education sector. Building lasting relationships between schools and employers requires dedicated support that draws in industry talent, inspires students, and maximises green career opportunities within local contexts. Green Skills Champions will enable sustained capacity building for green skills and education provision in every school, and provide the crucial school-

level coordination with employers and careers services needed to enhance green careers pathways. They could also help facilitate the accreditation of their schools to recognise climate action, encompassing outcomes such as improved energy efficiency in school buildings, alongside the alignment of learning and careers provision with net zero.

Further education providers must also have the capacity to deliver green skills training that is closely aligned with employers' needs; therefore they must attract, train and retain the best teachers and trainers. Central government, Ofsted and local government (including LEPs) should facilitate partnerships between education providers and industry to enable better engagement and support of FE provision, and increase part-time working opportunities for these teachers to allow them to retain their industry expertise.

For tertiary education, by prioritising elements of masters and doctoral-level studies that support green careers, underpin R&D for net zero, and enhance the capacity of college and university staff to mainstream climate education, funders can help to align all tertiary education provision in the UK with net zero.

Recommendation 8

Employers and government should work with the skills and education sector to attract and retain talented teachers to teach subjects, including in STEM, which are important for green jobs.

- To enable schools to support a green recovery from Covid-19 and to underpin provision of green skills and career pathways for all, every school should receive a financial incentive for the recruitment or internal promotion of one or more 'Green Skills Champions'.
- The government should incentivise workers with strong subject expertise to retrain as a teacher in subjects that are important for green jobs. This could include additional recruitment and retention payments, funded by the government. The government and education providers should work together to increase part-time working opportunities for these teachers to allow them to retain their industry expertise. The pay differential between the FE sector and other parts of the education sector (particularly schools) should be addressed.
- The funders of doctoral training programmes (such as industry and UK Research & Innovation) should work with universities to ensure the training of doctoral students enables them to develop the skills they need to help deliver the research, innovation and knowledge required for the UK's net zero transition.

Good green careers advice is crucial across all levels of education. This is to ensure advice on what green jobs are available to individuals, as well as the training and education pathways into them, is clear, accessible and resonates across different audiences. This is equally applicable to those in work or out of work, and for those considering changing jobs.

Several factors influence an individual's decision to study STEM, including: public perceptions, teaching, under-representation, qualifications and pathways to progress. While there is generally a positive perception of engineering and science in the UK, multiple other factors compound the challenge. For example, across all STEM subjects leading to engineering, there are ongoing, critical shortages of specialist teachers. In addition, because of the diversity across many sectors, the careers progression pathway is difficult to navigate.

Green careers opportunities must therefore be underpinned by a support system that combines high level national advice on green career pathways with bespoke elements that speak to local and regional priorities, help boost diversity, and allow timely responses to acute opportunities and risks arising from the net zero transition. Evidence suggests that for Year 11 leavers, there is a positive association between careers provision, as reported in Gatsby Benchmarks, and sustained destinations post-16. Expanding careers provision across the board can contribute to narrowing the gap in outcomes between disadvantaged and advantaged cohorts.¹⁶⁶ Additionally, an evaluation of the Gatsby Benchmarks pilot in 16 schools and colleges in the Northeast of England found that careers provision was associated with better career readiness.^{167,168}

Turning to the National Careers Service, a careers information, advice and guidance service for anyone aged over 13 in England, an independent survey found that 94% of face-to-face and telephone customers indicated that they had gained some form of 'Personal Added Value'¹⁶⁹ in the six months since their call or meeting. Additionally, the proportion of customers who achieved employment progression averaged 53% across the year.^{170,171}

In addition to this formal provision of careers advice, engaging and inspiring young people, especially via parents and carers, will also play a crucial role in building the next generation green workforce. A green careers campaign (akin to 'Made in the Royal Navy'¹⁷²) could also be regionally targeted to maximise relevance to green employment needs and opportunities by area.

For tertiary education, there should be institution-wide strategies to align provision and graduate attributes with net zero. These include by supporting green career pathways. Given the strength of the UK higher education sector internationally, the introduction of institution-led strategies for green skills would represent a potentially effective mechanism to support an economy-wide transition in the UK and globally.

For those currently seeking to enter the workforce, or who are already in work and seeking to retrain, the Jobcentre Plus interventions and pathways can provide further opportunities to connect skills, employment and training opportunities; for example through the various funded universal learner entitlements available across the government including the Lifetime Skills Guarantee.

Recommendation 9

Industry, the education sector, and government, should work together to ensure green careers advice and pathways are a continuous offer for all.

- The continuous green careers offer should include rolling out of a ‘Green Careers Launchpad’ during the UK’s Presidency of COP26 (November 2022). This should involve working with the National Careers Service and Careers Enterprise Company, to provide comprehensive and dynamic green skills and careers advice.
- The Launchpad should be supplemented by a significant and sustained green careers marketing campaign that is led by government and supported by industry and education providers. This campaign should aim to break down stereotypes, raise awareness of green careers among parents and carers, and inspire young people and those from underrepresented backgrounds to pursue a green career.
- Providers in the tertiary education sector should highlight green careers advice and work-based opportunities to all students as part of institutional ‘Green Skills Action Plans’, which should also promote diversity in college and university entrants through to Master’s and Doctoral level.
- Jobcentre Plus should actively promote green skills, education and training opportunities and advice alongside overt provision of green employment opportunities.

As has been emphasised throughout this report, meeting the UK’s net zero target will require economy-wide changes. The transition to net zero will likely affect all those in work. To support existing workers to move into green jobs, good, inclusive training pathways are essential. This is also a great opportunity to improve the quality of jobs across the board by ensuring access to relevant green skills and training.

Young people without formal qualifications are over-represented in low paid, low quality jobs.¹⁷³ There is a huge opportunity to break this cycle by supporting more young people to train for a green career. To support both young people and older workers who need to retrain, creating a stronger and clearer system of inclusive training pathways which link different programmes and offers (such as

apprenticeships, traineeships, bootcamps, T-Levels and higher technical qualifications) will be essential.

A focus on improving training pathways will help to improve the clarity, quality and flexibility of skills provision and support the improved uptake of green job opportunities. Building on existing work on green apprenticeships, the government should invite sectoral trailblazer groups to review other training pathways to ensure they incentivise investment in the skills needed to support green job-creation in all demographics across the UK, supporting levelling up, and delivering net zero. This should also complement the recent proposals from the government on introducing flexi-job apprenticeships, which could pave the way for greater flexibility on the use of apprenticeship levy funds as well as allowing apprentices to work across multiple projects with different employers.

The government has also introduced Skills Bootcamps¹⁷⁴ which provide free, short courses (up to 12-16 weeks) to adults aged 19 and over and who are either in work or recently unemployed. This is aimed at individuals who need to retrain and build up sector specific skills.



Apprenticeships and other training pathways such as traineeships and T Levels will be also crucial to support the skills needs of employers in green industries.¹⁷⁵ The Institute for Apprenticeships and Technical Education (IFATE) has convened a Green Apprenticeships Advisory Panel (GAAP) to guide it in encouraging trailblazers to align apprenticeships to net zero and wider sustainability objectives. Employers will need to ensure they are co-designing and creating demand for green apprenticeships to help recruit for the workforce of the future. These and other training programmes can be directed to support the net zero agenda, in line with the evidence set out in this report.

Recommendation 10

Building on existing work to review green apprenticeships, government should map, review and enhance other training pathways (for example, traineeships, T-levels, internships and skills bootcamps) to ensure they support a diverse, inclusive and net zero-aligned workforce across the UK.

- Green occupational traineeships should be developed to provide relevant work placements, leading onto apprenticeships, including accelerated apprenticeships. This will help provide young people with an understanding of green career pathways, and give them the confidence, soft skills, and core skills they need to move into an entry-level role.
- Education providers, employers and the wider public sector should incentivise young people to enter and move through 'green' training pathways – with incentives targeted in a way to support the levelling up agenda and grow a more diverse and inclusive workforce.

Theme 3: Ensuring a just transition for workers in high carbon sectors

Although the climate emergency will affect all sectors of the economy and all generations, it is important to recognise that workers in high carbon sectors are already being directly impacted by the drive to decarbonisation. These workers deserve a just transition; they must be supported through a process of fair change to remain in or move into good quality green jobs. This includes support in relation to training, qualifications and skills.

Many small employers cannot afford to have large sections of their workforce off on training. It is also not cost efficient for them, or training providers, to host training for small cohorts of their workforce at a time. This problem is particularly acute further down the supply chain. Modular learning can help to address this.

Qualifications will play an important part in delivering a just transition. They should be updated using the SPB assessment of future skills needs, as well as input from stakeholders including business and trade unions.

It will also likely be important to maximise flexibility to meet learners' needs, for example by using online learning and emerging technologies. Further incorporating on-the-job training and experience into assessments (for example, through portfolio assessment) should also be considered.

The market provides skills in areas for which there is established demand. The transition to net zero requires forward planning by employers and skills providers, guided by government-set climate targets, so that there is a clear picture of anticipated demand, and that skills are developed in time for their application. As set out above, existing programmes such as Skills Bootcamps and the Lifetime Skills Guarantee could be expanded to support a just transition. Employers, providers and local stakeholders should also work together to better understand the local labour market green skills needs, particularly when developing their Local Skills Improvement Plans (LSIPs).

To complement these efforts, there is a need to ensure there are FE colleges that can provide regional and national hubs of expertise in zero carbon skills. This should build on the role of College Business Centres and the expansion of Institutes of Technology (as referenced in the *Skills for Jobs* White Paper). In turn, these can play a key role in levelling up the skills base, supporting regions' to overcome persistent employment and productivity challenges and, ensuring high-quality delivery of training – plugging both skills gaps and skills shortages. Support should be prioritised towards sectors where technology deployment is already cost-competitive, but the UK skills-base is lagging other countries.

Recommendation 11

Building on the *Skills for Jobs* White Paper, industry, government, and skills providers should ensure the adult skills system can meet the challenge of the transition to net zero. This includes being responsive to local demand and supporting workers in high carbon sectors to take opportunities in the new economy.

- A system of accessible, tailored, and flexible training aligned to the government's wider reforms to technical education should be developed, reflecting the needs and circumstances of learners in work, with competency-based assessments to assure relevance to the workplace. This should include flexible delivery, such as modular qualifications, free-standing short courses, and options for non-continuous study recognising prior achievement where appropriate.
- To support the transition to net zero, employers should work together with government and key stakeholders, regularly updating qualifications to ensure they are of high-value and in-line with labour market needs.
- Additional funding for adult skills committed in the manifesto for the National Skills Fund (NSF) should be directed to green skills over the remainder of the current Parliament, ensuring effective support for training, upskilling and retraining in green skills. Through its adult education funding and accountability reforms, government should ensure that growth in green and emerging skills are prioritised to address existing market failure and to anticipate future failures - taking advice from the SPB and the national body referenced in Recommendation 5.
- The government should continue to allocate strategic development funding (as proposed in the *Skills for Jobs* White Paper) to support local areas to expand their provision of green skills, and ensure there are FE colleges who can provide regional and national hubs of expertise in zero carbon skills. These hubs should form a network that develops high-value courses and upskills the teaching workforce in line with local labour market needs, boosting the supply of high-quality FE teachers and trainers covering green skills.

To ensure that no worker is left behind or excluded from retraining or acquiring additional skills, the accessibility of relevant courses and provision must be improved. Employers and industry bodies have a key role to play. They will need to consider a broad range of roles and training needs, and recognise that people have different learning styles and preferences. User-friendly training formats can help to widen participation.



Practical and financial barriers to workers engaging in training will also need to be overcome. Investing in the existing workforce – with their accumulated knowledge and experience – makes sound business sense and follows OECD advice¹⁷⁶.

On apprenticeships, a review of the apprenticeship levy is forthcoming. This is a timely opportunity for government to support employers to direct more unused levy funding to support adult apprenticeships and facilitate the transition to green jobs.

Workers are likely to move employers and sectors several times over the course of their career. Certification that is recognised beyond an existing employer will enhance mobility and incentivise participation in training.

To deliver this, employers in other sectors of the green economy should critically review their certification requirements and collaboratively look to standardise this as much as possible via ‘passporting’ arrangements. The development of a common certification framework, that employers can sign up to, which lists employers and their recognised standards, has the potential to greatly ease the burden on workers as they consider career changes.

Existing workers may lack confidence to put themselves forward for training, particularly if they have not done any formal learning for a long time or have concerns over perceived areas of weakness. Research shows that learning mentor programmes supported by employers and unions can play a crucial role in encouraging reluctant learners to take up training courses.¹⁷⁷ This has proved to be most effective when the mentor is a fellow worker rather than a representative of the organisation’s human resources and training department.

Case Study

Centrica – Upskilling

With the need to reach net zero by 2050, Smart Energy Experts will play an important role in Centrica’s contribution to the green homes revolution.

Many Smart Energy Experts have already been upskilled to fit electric vehicle charging points, accelerate electric vehicle adoption, and install heat pumps. Apprentices will receive technical skills training and knowledge for the job at one of the company’s award-winning academies in Dartford, Hamilton, Leicester and Thatcham.

Centrica offers its Smart Energy Experts the opportunity to upskill to become domestic electrical installers with skills in electric vehicle charging point installation, or the opportunity to upskill to achieve gas boiler service and repair capability. The upskilling training for domestic electrical installers lasts 20 weeks, and is offered 12 months after Smart Energy Experts have finished their apprenticeships in one of Centrica’s four academies. The gas boiler service and repair programme also takes place 12 months after the completion of the Smart Energy Apprenticeships, and is split over two years.

Every year Centrica’s academies train and assess 5,000 engineers, in order to keep all British Gas engineers compliant with the regulatory and industry requirements needed for their specific roles.

Recommendation 12

Employers, industry bodies, government and unions should work together to tackle barriers to retraining and upskilling so that no worker is left behind by the transition to net zero.

- Test innovative approaches to tackle barriers to training faced by many workers, such as skills vouchers, training sabbaticals and paid-time-off-to-train arrangements. It is imperative workers collect an appropriate wage (as close as possible to their normal income) during their training.
- The government should make apprenticeship levy funds available for other forms of training (such as modular provision) where this is more relevant to business transition needs.

- Skills providers should modernise and develop training to maximise flexibility to meet learners' needs. This should include increased use of online learning, digital delivery and emerging technologies (such as Virtual Reality), as well as the recognition of on-the-job learning (for example, through portfolio assessment).
- Industry should, where possible, ensure mutual recognition of training certification and supply chain standards across sectors, to ease transfer of workers between businesses and sectors, and maximise use of existing skills.
- Employers should make full use of workplace mentorship schemes, including recognising union learning representatives, in order to increase access to training for hard-to-reach employees.

Past experiences of transitions provide us with invaluable lessons for the future, including those that were not as successful as they could have been. In the 1980s, 250,000 jobs were lost in coal mining communities across northern England. The impacts of this 'unmanaged' transition last to this day, with about 43% of all coal communities being among the most deprived areas in Britain.¹⁷⁸

Presently, the UK economy is experiencing multiple causes of industrial change, and as we look to transition to net zero, more workers, particularly in energy-intensive industries, may be vulnerable to the transition.¹⁷⁹ But this transition can also be a catalyst for raising living standards across regions and communities, particularly in our industrial regions.¹⁸⁰ Delivered effectively, there is an enormous potential to generate sustainable employment across the country and revitalise local economies, while addressing longer-term socioeconomic challenges, and rebalancing regional economic investment.¹⁸¹

Where workplaces can be decarbonised, retooled, and transitioned, the negative impacts on working people and local communities can be reduced, existing skills can be maintained and enhanced, and local economies can adapt most rapidly to the net zero transition. In contrast, closing down existing industries and workplaces, and then trying to create new work, leads to greater friction and loss both for individuals and communities.^{182,183} Successes in converting automotive manufacturing to electric vehicle production (for example, in Canada) demonstrate the role of regional and national governments in using public investment to drive decarbonisation of existing industry.¹⁸⁴

Examples from the UK and overseas of transitions being managed well, point to the importance of close working between a variety of stakeholders such as government, industry, unions, skills providers and community leaders:

- **EDF Energy Cottam power plant:** We heard first-hand from EDF Energy's experience of closing its Cottam power plant in 2019. EDF's management and trade unions worked together to prepare and successfully transition the workers to new employment. This included redeployment and retraining measures.¹⁸⁵
- **Germany:** In June 2018 the German federal government established the 'Commission on Growth Structural Change and Employment' which was represented by a wide range of interests and pointed to the importance of the retention of creation of new jobs protected by collective labour agreements and ongoing development of coal-mining areas to ensure that they continue to remain liveable, attractive regions.¹⁸⁶
- **EU:** The EU's Just Transition Mechanism aims to mobilise €65-75 billion in public funds over six years to alleviate the socio-economic impacts of the climate transition in hard hit regions.¹⁸⁷

Case Study

Just Transition for Canadian Coal Power Workers and Communities¹⁸⁸

Following a decision in 2016 to cease coal fired electricity generation by 2030, the Canadian government established a Taskforce on Just Transition (TJT) for Canadian Coal Power Workers and Communities.

The TJT was chaired by the Canadian Labour Congress and an environmental campaigner, with a secretariat provided by government. Membership included trade unions, employers' organisations, local government, and sustainable development experts. Its remit encompassed engaging with stakeholders to assess the impact on affected communities; identifying opportunities for workers to transition; assessing how existing funding streams may support transition; and identifying gaps in current policy.

The group was tasked with making recommendations to government about the contents of a just transition plan for the coal sector, with a view to minimise negative impacts. Its final report to government set out ten policy recommendations, including:

- Develop, communicate, implement, monitor, evaluate, and publicly report on a just transition plan for the coal phase out;

- Establish a targeted, long-term research fund for studying the impact of the coal phase-out and the transition to a low carbon economy;
- Fund the establishment and operation of locally driven transition centres;
- Create a publicly available inventory with labour market information on coal workers (for example, skills, demographics, locations, and potential employers);
- Create a comprehensive funding programme for workers staying in the labour market to address their needs across the stages of securing a new job; and
- Identify, prioritise, and fund infrastructure projects in affected communities.

The full implementation of the TJT's recommendations will depend on government capacities, and capabilities of trade unions and employers, but the existence of this framework is an important step in the right direction.

Although larger employers will have established business planning processes, these will inevitably be disrupted by the opportunities and challenges of net zero. They, along with sector skills bodies, should proactively consider and plan for the skilled workforces they will need to succeed in this new environment. Investment in infrastructure and technology should progress hand-in-hand with investment in skills. Engaging unions and workers early in the transition process delivers a smoother outcome for business and workers, and more rapid climate action, as demonstrated by the case studies below.

In some sectors of the green economy (for example, wind energy, forestry and heat pump manufacturing), there are significant gaps in the domestic supply chain, which can lead to the offshoring of investment, jobs and export opportunities.^{189 190 191}
¹⁹²This needs to be reversed. It is in the interests of large employers to strengthen their supply chains, setting standards that incentivise contact and communication and co-investing in the future skills pipeline to ensure resilience.

Proactivity is essential to ensuring a just transition for workers. Experience from countries such as Germany and Canada demonstrate the value of joint planning with union representatives, involving the workers affected, and pursuing an agreed course of action.¹⁹³

All UK workplaces will need to transition to zero carbon. Ensuring that collective bargaining processes incorporate climate transition planning will improve participation by workers and deliver smoother outcomes – accelerating climate action.

Case Study

A National Electrification Skills Framework and Forum – Automotive sector

In 2019, the Auto Council's Skills Working Group identified a common need to better anticipate the transformation to electric vehicle production across employers, employees, accrediting organisations and training providers. The Faraday Institution initiated a project with Warwick Manufacturing Group (WMG) to understand demand for electrification skilled workers over time; determine competencies needed by job family, type and role; and evaluate the existing training landscape and available offers.

In phase two, the team utilised the Foresighting and Skills Value Chain approach demonstrated by the High Value Manufacturing Catapult (HMVC) and Gatsby Foundation in its 2020 report *Manufacturing the Future Workforce*. This argues that transformation of engineering and manufacturing professions to address competency gaps related to emerging technologies requires a connected, systematic response across employers, government investment, innovating bodies, and education and training systems using a consistent rigorous process. Results include:

- **Assessment of Industry Capabilities:** UK vehicle electrification design and manufacturing strategies, roadmaps and plans were assessed by technical specialists to identify capabilities required by UK manufacturing to enable their adoption of battery powered automotive solutions.
- **Definition of Workforce Competencies:** Expert educators defined competency sets for three role groups: Technical Operator, Junior Engineer and Senior Engineer. About 450 competence statements were developed and linked to capability requirements for each role group. These can inform reviews of apprenticeship standards and qualifications.
- **Curation of Existing Continuous Professional Development (CPD) Course Provision:** Expert educators also mapped these competency needs using a range of existing qualifications and sector training providers to develop over 20 unit definitions ranging from fundamental electrical, battery, engineering science and health and safety topics to advanced domain specific requirements.
- **Identification of Future CPD Courses and Development:** Where there is no current suitable CPD offer, the UK Government funded Emerging Skills Project led by HMVC with WMG coordinating electrification content with the group of Institutes of Technology, will create pilot courses and train the trainer content available for roll out to meet demand from mid-2021.

Providing 'line of sight' from technology roadmaps to related workforce development activities, the overall aim of the project is to secure the

competitiveness of the sector. A clear and common path will enable the transformation of the workforce by closely connecting their future skills and opportunities to the demands of technologies yet to be widely adopted. Results will be made publicly available in summer 2021 and a forum among key stakeholders established.

Recommendation 13

Employers and sector bodies should set out business and skills plans for the net zero transition, engaging unions and workers.

- Sector industry bodies should bring together large and small employers to develop skills strategies for the entire sector that tackle skills transition in their supply chains and the communities in which companies operate, involving workers and unions.
- Larger employers can support green skills transitions in smaller employers, where possible and relevant through measures including:
 - By setting Science Based Targets, in line with United Nation's *Race to Zero*, and how they intend to meet those decarbonisation goals;
 - Initiating dialogue with supply chain companies on future skills needs;
 - Transferring unused apprenticeship levy funding;
 - Opening up inhouse skills programmes to supply chain employees, or beyond, to residents local to a project;
 - Incorporating skills collaboration into their procurement processes; and
 - A transition to a net zero emissions business model.
- Where businesses dependent on the high carbon economy will need to change, or face closure, due to the transition to net zero, they should take proactive steps to ensure workers, and their unions where relevant, are involved in the development of their plans from an early stage. This should, where possible, include engaging workers in affected supply chains. Lessons can be learnt from EDF's success at Cottam coal power station in providing transition pathways for their workforce, both directly employed and on-site contractors. As per Recommendation 2 this should

be mandatory for companies receiving financial support to transition from the government.

- The government should explore how regulation and guidance on collective bargaining and information and consultation arrangements could be amended to support climate transition planning at an employer level.

Some high carbon sectors, for example steel and coal, are already being directly impacted by the transition to net zero, sometimes with negative consequences for those involved. As discussed above, where technologically possible, within the necessary timeframe, decarbonising and retooling existing workplaces delivers a more efficient climate transition. It is less disruptive to the economy, to communities, and to working people's lives than closing down or offshoring industries and retraining individual workers. It also strengthens the competitive advantage of UK industry into the future, supporting long term job protection and creation.

The UK has a strategic interest in being an early adopter and developer of zero carbon processes and technologies to develop a global competitive edge. If employers wait for decarbonisation pathways to be developed elsewhere and costs to be driven down before implementing them domestically, this risks negative ramifications for local skilled workers, and for the UK's productivity and economic activity.

Support must be conditional on driving through outcomes that are fair for workers and their communities and benefit the UK economy. Italian company Enel has shown that skills and jobs can be protected through a framework just transition agreement signed with its Italian union partners¹⁹⁴.

Recommendation 14

To boost private investment and decarbonisation of industry, government should prioritise supporting high carbon sectors to transition and increase productivity and competitiveness, thereby protecting jobs and local economies.

- Proactive investment should be targeted at transforming high carbon sectors, and those dependent on high carbon supply chains, where there is a business case for advanced R&D or infrastructure upgrades to enable transition to net-zero business models.
- The government's support to decarbonise sectors should be tied to industry commitment to retraining existing workers, and transition agreements to ensure job quality and numbers are protected through the transition.

Although the first option should be to enable adaptation within high carbon industries, this will not always be possible. The communities that depend on these industries must not be left to decline, but instead actively supported to develop alternative good quality jobs. Investment in these communities ahead of any significant industrial change or redundancies will allow the economy to diversify and mitigate the effects of job losses.

Local and regional bodies need to be able to shape regional transition and diversification programmes. The local transition bodies called for in Recommendation 5 will be ideally placed to deliver this support.

Where redundancies cannot be avoided financial support for relocating and retraining is important, to ensure that green transition is not an involuntary route to retirement or to long-term unemployment.

Recommendation 15

Where local economies depend on a source of high carbon employment, government should work with local government, employers and workers to diversify local economies, recognising the safety net that is already in place to support workers.

- Wherever a pathway to maintain existing jobs by transitioning a locally keystone industry to net zero cannot be established, the UK should provide funding equivalent to the EU's Just Transition Fund (for example through the Levelling Up Fund) to support communities to diversify and develop alternative industries. Such support should be targeted at any localities where a high carbon employer, or industrial cluster, that makes up a large proportion of local employment is expected to wind down or shrink operations.
- Implementation of place-based financial support should be accountable to regional or local transition bodies as appropriate.
- Where redundancies cannot be avoided, government should offer adequate financial support to enable people to make a meaningful choice according to their wishes to retrain or relocate, as relevant to their circumstances, to transition into new sectors and further employment.

5. Next steps

This report represents a call to action for government, industry and the skills sector. Within its 15 recommendations there is a comprehensive plan for delivering green jobs and skills that we believe is commensurate to the challenge. All actions must be addressed, however, many will require time for government and industry to implement. The following priority actions should, be implemented by the government, industry and the skills sector over the next twelve months:

Priority actions for the next six months (by January 2022):

Milestone referenced are for January 2022, unless it is stated otherwise.

- **Recommendation 1:** The government should publish a detailed net zero strategy before COP26 which sets out how the UK will reach its decarbonisation targets for 2035 and 2050, to give industry, workers and skills providers the confidence they need to invest in the transition.
 - **Milestone:** Net Zero Strategy published by November 2021. This should set out how government levers will be used to deliver job quality in green economy.
- **Recommendation 6:** To address the skills gap and ensure green jobs are open to all, industry bodies and all employers in the green economy should prioritise the creation of a diverse workforce and should share best practice across the economy.
 - **Milestone:** Action to improve quality of diversity data and agree diversity targets by the end 2021.
 - **Milestone:** Related progress reports in place by January 2022.
- **Recommendation 9:** Industry, the education sector, and the government, should work together to ensure green careers advice and pathways are a continuous offer for all.
 - **Milestone:** Launch of Green Careers Launchpad and green careers marketing campaign.
- **Recommendation 11:** Building on the *Skills for Jobs* White Paper, industry, government, and skills providers should ensure the adult skills system can meet the challenge of the transition to net zero. This includes being responsive to local demand and supporting workers in high carbon sectors to take opportunities in the new economy.
 - **Milestones:** Announcement of additional funding for adult green skills, and strategic development funding for FE hubs of expertise as part of the Comprehensive Spending Review for delivery from 2022/23

- **Recommendation 14:** To boost private investment and decarbonisation of industry, government should prioritise supporting high carbon sectors to transition and increase productivity and competitiveness, thereby protecting jobs and local economies
 - **Milestone:** the Comprehensive Spending Review should allocate sufficient funding to support accelerated decarbonisation

Priority actions for the following six months (by July 2022):

Milestones referenced are for July 2022, unless it is stated otherwise.

- **Recommendation 1:** The government should publish a detailed net zero strategy before COP26 which sets out how the UK will reach its decarbonisation targets for 2035 and 2050, to give industry, workers and skills providers the confidence they need to invest in the transition.
 - **Milestone:** Skills and Productivity Board (SPB) to publish first net zero skills report.
- **Recommendation 2:** The government should use its net zero policy and funding to promote industry investment in good green jobs, skills and competitive supply chains within the scope of international law and trade obligations.
 - **Milestone:** Government should set out how its net zero policy and funding are promoting investment in good green jobs, skills and competitive supply chains in its annual report to the Climate Change Committee.
- **Recommendation 3:** The government should work with industry to extend its green recovery programmes to direct spending towards low carbon activities with rapid job creation potential, in areas at risk of unemployment.
 - **Milestone:** match G7 levels of green stimulus investments by June 2022 (the next G7).
 - **Milestone:** build on unemployment schemes as a springboard to target green apprenticeships.
- **Recommendation 4:** The government should work with industry to actively set out, as part of the Net Zero Strategy, how it will ensure that green jobs are good quality as defined by the Good Work Plan, regardless of skills base.
 - **Milestone:** Establish framework to understand the quality of work in the green economy
 - **Milestone:** Track the quality of work in the green economy by commissioning qualitative and quantitative research
- **Recommendation 5:** The government should establish a UK-wide body with national representation to ensure momentum and coherence on workforce

transition, including progress in delivery. The national body should be supported by local transition bodies to ensure effective place-based strategies for the transition.

- **Milestone:** The national body should be launched by Spring 2022.
- **Milestone:** Local transition bodies should be established by stakeholders or existing bodies enhanced to include full stakeholder representation.
- **Milestone:** Using its supportive analytical capability the national body should report on progress by July 2022, and thereafter on an annual basis.
- **Recommendation 7:** As part of a well-sequenced curriculum, government, employers and education providers should promote the effective teaching of climate change and the knowledge and skills (in science, technology, engineering, and mathematics (STEM) and other key subjects) required for green jobs.
 - **Milestone:** Schools, local government and employers should co-create modular programmes to maximise accessibility
 - **Milestone:** Support to promote the importance of net zero-alignment in the existing curriculum at all ages
 - **Milestone:** by Spring 2022 share existing resources (e.g. developingexperts.com) on these areas and establish a working group of relevant stakeholders
- **Recommendation 10:** Building on existing work to review green apprenticeships, government should map, review and enhance other training pathways (e.g. traineeships, T-levels, internships and skills bootcamps) to ensure they support a diverse, inclusive and net zero-aligned workforce across the UK.
 - **Milestone:** The government should have expanded its review of green apprenticeships to cover all other training pathways and set out how it will ensure these align with the net zero transition.
- **Recommendation 12:** Employers, industry bodies, government and unions should work together to tackle barriers to retraining and upskilling so that no worker is left behind by the transition to net zero.
 - **Milestone:** Trials of innovative approaches (skills vouchers, training sabbaticals, and paid time-off-to-train arrangements) established.
 - **Milestone:** Employers and industry bodies to review and report on existing routes to retraining and upskilling in their sectors by Spring 2022.
 - **Milestone:** Employers and unions to consult with workers to identify barriers to reskilling / retraining and action needed to address these by Spring 2022.

- **Milestone:** The government to work with all stakeholders to review and publish by July 2022 opportunities available and action agreed to address barriers.
- **Milestone:** Industry should ensure mutual recognition of training certification and supply chain standards across sectors. Certification requirements standardised into a common framework by 2022 with passporting arrangements finalised including for offshore sectors by 2022 where possible.
- **Recommendation 13:** Employers and sector bodies should set out business and skills plans for the net zero transition, engaging unions and workers.
 - **Milestone:** Large employers set out their process for consulting with employees and their representatives to create net zero business and skills plans.
 - **Milestone:** Where not established already, sector bodies establish process to develop skills strategy involving large and small employers and unions.
- **Recommendation 15:** Where local economies depend on a source of high carbon employment, government should work with local leaders (including local government and LEPs), employers and workers to diversify local economies.
 - **Milestone:** By April 2022, the government should set out how it will provide funding equivalent to the EU's Just Transition Fund to support communities to diversify and develop alternative industries.

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