



Just Transition: Developing the Skills for a Net Zero Present and Future





Executive Summary

This report identifies traditional (decline) and emerging (growth) jobs and skills across 6 UK employment sectors over the short- to long-term, employment figures, skills compositions, and overlaps with the energy industry. The report makes connections between these findings and the Just Transition, exploring opportunities for ensuring that the transition is managed in a just way. It highlights the risks of an unjust transitions, outlines opportunities to reskill or transfer employees from traditional sectors alongside opportunities in emerging sectors and concludes with reflections on the state of knowledge in this area.

Key findings

- **The primary of limitation of job and skills forecasting is the lack of granular data, limiting the ability for both evidence-based strategic investments and well-developed skills-training pathways.** This includes insufficient, patchy, or absent data on current workforces and expected areas of decline, as well as a high degree of variability and uncertainty around future estimates.
- There is broad evidence of multi-sector transformation, giving opportunity to capitalise on wide range of jobs and skills profiles.
- Where there are anticipated areas of decline, these are well anticipated, allowing opportunities for the transfer of skills into emerging sectors.
- Whilst traditional sectors are generally well understood, anticipated areas of emerging growth are often conditional and highly uncertain, relying on a supportive policy and investment landscape to drive change.
- **Most jobs in decline are likely to be transferrable.** In the energy sector, it is forecast that there will be minimal net job losses until after 2030. Softer skills and other, non-technical skills are assumed to be highly transferrable, whereas compatibility in other, more specialist areas is variable.
- Individuals working in support sectors will be in greater demand and are central to enabling transformations, including around planning, regulation, and consenting bottlenecks.
- **The impacts of transformations in traditional and emerging industries will impact some UK regions more than others,** and there are significant opportunities to embed skills long-term in communities, e.g., in rural and island communities, where there is a critical need for residential meter engineers.
- **There is a significant and urgent challenge around access to skills training. Whilst there is training capability, it is not even, and there is a lack of capacity.** We anticipate an increasing emphasis on rapid delivery short courses given the pace of the required transition, and that many workers would be seeking to complete qualifications over evenings and weekends at low financial cost.
- The skills transition is starting from a baseline of workforce inequality and in the training, education and hiring process, there must be an emphasis on gaining new, diverse entrants.

Overall, the findings of this report reveal a great deal of complexity and uncertainty. Whilst there is interest in specific, quantified detail over the 2–5-year time horizon, this data does not exist. Therefore, this report is an expose of data gaps, and the start of a long-term, more detailed package of work. Looking forward, we extend an invitation to investigate three further areas in particular: in house training provision, drivers of workforce mobility, and the prioritisation of local, unemployed workforces.

Acknowledgements

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About this report

This report follows from the publication of SSE's Just Transition Strategy in November 2020 and the Just Transition: Measuring Progress report in 2023. This report identifies traditional (decline) and emerging (growth) jobs and skills across 6 UK employment sectors over the short- to long-term, employment figures, skills compositions, and overlaps with the energy industry. The report makes connections between these findings and the Just Transition, exploring opportunities for ensuring that the transition is managed in a just way. It highlights the risks of an unjust transition, outlines opportunities to reskill or transfer employees from traditional sectors alongside opportunities in emerging sectors and concludes with reflections on the state of knowledge in this area.

Just Transition Priorities

The transition to net zero will transform the economy and society, including for those working in traditional (decline) sectors, developing emerging (growth) sectors, or those looking to transfer.

It is widely acknowledged that the net zero transition will necessitate a large-scale transformation in the jobs and skills landscape, including the absolute decline of some jobs, the creation of entirely new ones and wider transfers across all sectors of the economy. Companies like SSE have a responsibility to ensure that the transition from traditional and competition with emerging industries is managed in a just way.

In November 2020, SSE became the first UK energy company to publish a Just Transition Strategy, announcing a framework of 20 principles focused on green jobs; consumer fairness; building and operating new assets; people in high-carbon jobs, and supporting communities. Following an update on the attainment of meaningful progress towards these principles in 2023, SSE has sought to gain critical insight into the job and skills constitution of traditional and emerging workforces.

SSE recognise that the organisational support to enable the required skills transformation can be refined and that strategic, sector-wide advantage can be gained by investing in transferring or retraining workers from traditional industries alongside investing in emerging workforces. With attention to issues of equality and diversity, this includes explicit, targeted support for excluded or marginalised workforce demographics, including women and those from ethnic minority backgrounds.

Risks of an Unjust Transition

Without clear understanding of current and required skills profiles and strategies to support affected workers, there is a significant risk of an unjust transition. This could lead to increases in unemployment and socio-economic decline in affected areas, with severe implications for socio-economic outcomes, including across health and education.

The UK has experience of unjust transitions across heavy industries with localised patterns of employment, such as steel, shipbuilding, and coal mining. Rapid transitions in these sectors were driven largely by market dynamics and experienced poor management, including minimal attention to the redeployment of skilled workforces. The closure of coal mines, for instance, rapidly removed the primary local source of income for many workers and uprooted communities. The effects of this transition are still visible today. Amongst other social and economic effects, the average life expectancy of those living in such areas is a year lower than the UK average and community inhabitants often report poor mental health (Beatty et al., 2019; Abreu and Jones, 2021).

It is imperative that the net zero transition does not repeat the failures of these previous transitions. This includes making sure that new industries are created to replace the old; that where alternative employment is provided, it is as stable, well-paid and of equal status, and that there is a focus on retention of hard to train skills and the transfer of others.

Key Findings

The impacts of the net zero skills transition will stretch far beyond the energy industry, bringing opportunities to transfer skilled workers from other sectors across supply and value chains.

Emerging and Traditional Sectors

The net zero transition implicates all major UK sectors, including agriculture and land use, the built environment, energy, transport, support services and manufacturing. Based on a systematic review and stakeholder interviews (see Appendix 1), and according to these sectors, Table 1 shows the sub-sectors anticipated to see the most transformation. By "traditional" we refer to sub-sectors where the workforce is either in active decline or past its peak. The net zero transformation is happening alongside others, including the move towards automation which for sectors including shipping, will also lead to a decline in the workforce. Anticipated areas of growth are conditional at times, relying on a supportive policy and investment landscape to drive change, as well as being subject to external forces e.g., international competition and the rapidly developing artificial intelligence market. Where this is the case, we mark affected sub-sectors with a star.

All major UK sectors – from energy to transport – are going to fundamentally transform and evolve as our society shifts towards net zero. These sectors will not disappear, rather there will be a shift in their underpinning sub-sectors, such as from oil and gas to renewables .

Table 1: Traditional and Emerging Sectors and Sub-sectors Across the UK Economy

Sector	Traditional	Emerging
Agriculture and land use	Livestock and mixed agriculture	Agroforestry, silviculture, and logging
	Meat and dairy processing	Peatland restoration
		Agriculture (non-livestock)* and sustainable land management
Built environment	Oil and gas central heating radiators and boilers	Building construction, retrofit and efficiency
	Construction	Transition technology integration (e.g. heat pump and solar PV installation)
Energy ⚡	Coal production	Power generation (e.g. offshore and onshore wind)
	Oil and gas production	Transmission/networks, storage, and distribution
	Refining	CCUS*
	Gas distribution	Hydrogen*
		Energy storage and fuel cells*
Transport	Internal combustion engine vehicle manufacturing	Rail operation (under and overground)
	Maintenance and sale of ICE vehicles	Battery manufacturing*
	Retail sale of automotive fuel	Electric vehicle manufacturing*
	Aviation	Sustainable alternative fuels (including aviation and shipping)*
	Shipping	Construction of roads, railways and fuelling infrastructures
Support Services	None	Management; technical/professional; consenting and project planning; corporate services; health, safety, environment, and quality; commercial; facilities; operatives; people development, and IT and digital skills ♦
Manufacturing +	Energy intensive industry (e.g., steel, cement, and glass)	Construction of industrial facilities

For sector, we recreate the headlines used by the Climate Change Committee's (2023) A NetZero Workforce Report

⚡ Elements of the energy net zero transition are ongoing, including decommissioning, street lighting and smart metering.

Therefore, these sectors are not included as growth, though we recognise the importance of maintenance and replacement roles.

♦ Whilst these roles already exist and will see more marginal growth in numbers and transformations in roles, they are central to the transition and the support of all other emerging sectors.

+ By manufacturing, we refer to large-scale industrial production, including products and processes not already covered in other rows.

The traditional and emerging transformations capture:

- (a) New and emerging jobs directly related to net zero (e.g. fuel cell technicians),
- (b) Jobs affected by the transition that require new skills and knowledge (e.g. electric vehicle manufacturing),
- (c) Existing jobs needed in greater numbers (e.g. renewable energy engineers),
- (d) In limited cases, jobs that will become redundant, and
- (e) Transformation in sectors not normally considered as having "green jobs".

Analysis shows that point (e) includes changes in the support services requirements, including management, technical/professional, and consenting and project planning jobs, which are central to enabling transformations in other sectors and sub-sectors. Inefficiencies in processes and insufficient investments in skilled staff are creating backlogs around permitting, regulation, and consenting, curtailing the pace of the transition. For example, SSE's proposed Berwick Bank wind farm missed the National Grid's deadline for the government's Contracts for Difference auction round after Scottish Government consenting delays. The next round of bidding does not open until 2025.

Where there are anticipated areas of decline, including around coal and oil and gas production, changes are extensively anticipated. This allows opportunities for the transfer of skills into growth sectors, as well as driving requirements in them, including around the decommissioning of spent assets. In all sectors and sub-sectors, transformations will take place across the supply chain, value chain, and asset lifecycles.

Areas of growth are in keeping with wider transformation in the economy, including in the development of digitalisation, artificial intelligence, and smart skills. In the energy sector, this will necessitate an increase in customer-facing workers responding to the installation, assessment, maintenance, and operation of innovative digital technologies, and skilled post-holders dealing with network constraints and dynamics.

Net zero transformations will impact the total number of employees, their occupations, and the skills that they hold, as well as being accompanied by periods of increased workforce mobility and infrastructure transformation.

Within traditional sectors, it is estimated that around 7% of the total workforce will be required to transition, including workers in oil and gas extraction (CCC, 2023). Some employees in affected sectors will redirect towards low-carbon goods, services or means of production, e.g., from ICE to EV manufacturing. A smaller proportion of workers (around 1%) will see their jobs disappear altogether (CCC, 2023). This may include, for example, those working on the decommissioning of coal-fired power plants, where at the end of service, some workers could be lost to retirement age, redundancies, or offshore facilities management, drilling, and well specialists (PwC, 2022).

According to each traditional sector and sub-sector (as identified in Table 1), Table 2 gives an overview of: (1) the current workforce, (2) projected workforce decline (where the data is available), (3) key jobs and skills that are most likely to decline, and closely aligned redirect sectors where there is clear jobs and skills alignment. In many cases, detailed numerical estimates are not available, and some cells are left blank. This reflects a broader and critical gap in data availability. Where estimates are given, they are often wide-ranging and uncertain, including contingency on policy targets and investment priorities. As an example, the projected workforce declines for workers involved in oil and gas central heating radiator and boiler installation and maintenance, depends heavily on the Westminster government's recent decision to push back a new oil and gas boiler ban from 2026 to 2035, and funding measures around new gas boiler installations.

Table 2: Overview of Traditional UK Economic Sectors, Including Current Workforce, Projected Decline and Redirect Opportunities

Sector	Sub-sectors in Decline	Current Workforce	Projected Decline	Key Skills and Roles in Decline	Redirect Opportunities
Agriculture and land use	Livestock and mixed agriculture	457,000 (ONS 2024)	7,000 – 42,000 (CCC 2023)	Livestock farmers and managers; livestock herders and shepherds; feedlot manager	Agriculture (non-livestock) and sustainable land management; agroforestry, silviculture, and logging; peatland restoration
	Meat and dairy processing	104,500 (BMPA 2020, AHDB 2024)		Slaughterhouse workers; dairy farm workers; meat and dairy administrators and managers	Agriculture (non-livestock) and sustainable land management
Built environment	Oil and gas central heating radiators and boilers	130,700 (Gas Safety Register, 2022)	Uncertain given changes to government targets	Heating, ventilation, and air condition (HVAC) engineers; fossil fuel boiler servicers; traditional meter readers, gas safety inspectors	Building construction, retrofit and efficiency; Transition technology integration (e.g. heat pump and solar PV installation)
	Construction	2,207,000 (ONS 2024)	No reliable estimates are available	Concrete finisher; steel erector; traditional building inspectors	Other low-carbon construction practices or the construction of low-carbon infrastructure
Energy	Coal production	1,400–2,700 (CCC 2023, Broome et al. 2022)	Uncertain given potential investments at the Whitehaven, West Cumbria site	Coal miners and engineers; coal transporters; mine safety inspector; power plant operators; traditional utilities administrative staff	Power generation (e.g. offshore and onshore wind); CCUS; hydrogen
	Oil and gas production	200,800 (OEUK, 2023)	15,000–80,000 (CCC 2023, PWC 2022)	Oil drillers and engineers; petroleum engineers; power plant operators; traditional utilities administrative staff; oil and gas exploration geologists; reservoir and wellsite geologists	Power generation (e.g. offshore and onshore wind); CCUS; hydrogen
	Refining	Figure unavailable	No reliable estimates are available	Refinery operators and technicians; traditional utilities administrative staff	Power generation (e.g. offshore and onshore wind); CCUS; hydrogen
	Gas distribution	12,904 (Energy Utility and Skills, 2023)	11,449 vacancies by 2030 (Energy Utility and Skills, 2023)	Gas network technicians and engineers; gas meter installers and services; pipeline maintenance workers; gas appliance installers and repair technicians; gas distribution administrators and managers; gas safety inspectors and auditors; power plant operators; traditional utilities administrative staff	Transmission/networks, storage, and distribution; hydrogen
Transport	ICE vehicle manufacturing	165,965 (IMI Research 2023)	No reliable estimates are available	ICE assembly workers; ICE component manufacturers e.g., exhaust, fuel system, transmission and drivetrain manufacturers; ICE technology engineers and designers; emissions control system manufacturers; testing and certification personnel	Electric vehicle manufacturing
	Maintenance and sale of ICE vehicles	432,800 (IMI Research 2023)	No reliable estimates are available	ICE mechanics and technicians; ICE parts retailers and suppliers	Electric vehicle mechanics and salespeople
	Retail sale of automotive fuel	Figure unavailable	No reliable estimates are available	Petrol station attendants; fuel delivery drivers; fuel retail managers and staff	Sustainable alternative fuels (including aviation and shipping)
	Aviation	536,000 (Airlines UK 2021)	No reliable estimates are available	Fossil fuel aircraft fuelling personnel; sales and marketing; designers and engineers; maintenance technicians; fuel efficiency analysts	Sustainable alternative fuels (including aviation and shipping); alternative modes of transport, including rail operation (under and overground)
	Shipping	24,100 (Department for Transport, 2024a)	No reliable estimates are available	Fossil fuel ship fuelling personnel; sales and marketing; designers and engineers; maintenance technicians; fuel efficiency analysts	Sustainable alternative fuels (including aviation and shipping); alternative modes of transport, including rail operation (under and overground)
Manufacturing	Energy intensive industry (e.g., steel, cement, and glass)	150,000 – 250,000 (Balderson et al., 2022)	No reliable estimates are available	Cement plant operator; steelworker; glass manufacturing technicians; maintenance technicians for energy intensive equipment	Fuel switching (e.g. electrification and hydrogen), the introduction of CCUS and export

† Across all sectors and sub-sectors, there is likely to be a decline in sales, finance, marketing, and administration associated with each niche

Table 3 below shows, for non-energy sectors, jobs and skills overlaps with the energy sector. Jobs and skills in decline are allocated to one of three categories:

- (a) **Direct transfer**, where the jobs and skills from these sectors are directly transferable to energy emerging sector jobs,
- (b) **Transfer with retraining**, where related jobs and skills require adaptation to a new application,
- (c) **Not directly transferrable**, where there is unlikely to be substantial overlap in required skills profiles or where role transfer is more likely to take place within the original sector (e.g., for petrol station attendants or fuel delivery drivers, who will likely remain in the transport sector whilst engaging with alternative products).

Table 3: Redirect Pathways for Traditional Sub-Sectors into the Energy Sector

Sector	Pathway	Role
Agriculture and land use	Direct transfer	N/A
	Transfer with retraining	Livestock managers; meat and dairy administrators and managers
	Not directly transferrable	Livestock farmers; herders and shepherds; feedlot managers; dairy farm workers; slaughterhouse workers
Built environment	Direct transfer	Concrete finisher; steel erector
	Transfer with retraining	Heating, ventilation, and air condition (HVAC) engineers; fossil fuel boiler servicers; traditional meter readers; gas safety inspectors; traditional building inspectors
	Not directly transferrable	N/A
Transport	Direct transfer	N/A
	Transfer with retraining	ICE assembly workers; ICE component manufacturers; ICE technology engineers and designers; testing and certification personnel; ICE mechanics and technicians; ICE parts retailers and suppliers; fossil fuel aircraft and ship designers, engineers, maintenance technicians; fuel efficiency analysts; fuel retail managers and staff; Fossil fuel aircraft and ship sales and marketing;
	Not directly transferrable	Emissions control system manufacturers; petrol station attendants; fossil fuel aircraft and ship fuelling personnel; fuel delivery drivers
Manufacturing	Direct transfer	Steelworker
	Transfer with retraining	Maintenance technicians for energy intensive equipment
	Not directly transferrable	Cement plant operator; glass manufacturing technicians

Quantifying change

Numerical estimates of job losses or gains are either absent, carry a high degree of variability and uncertainty, or are stated not by the number of jobs, but per hectare, trees planted, charging points, installed or another relevant unit. Therefore, not all estimates are comparable or reliable, and an economy-wide lack of granular data severely limits the capacity for evidence-based strategic investments and well-developed skills-training pathways. By way of an example, the Climate Change Committee (CCC) (2023) state that anywhere between 135,000 to 725,000 new jobs could be created in low-carbon sectors.

Where estimates are available, Table 4 provides indicative figures of the number of new jobs required by 2030 according to the main emerging sub-sectors. In some instances, the quoted figures include directly employed workers and those indirectly employed in related supply chains.

Table 4: Overview of Emerging Sub-sectors, including an Estimate of Job Numbers

Sector	Emerging Sub-sector	Estimate
Agriculture and land use	Agroforestry, silviculture, and logging	6,600 – 39,000 (CCC 2023)
	Peatland restoration	560 – 2,200 (CCC 2023)
	Agriculture (non-livestock) and sustainable land management	8,300 for hedge planting and 23,000 for other priority areas, including non-meat-based proteins and production (CCC 2023)
Built environment	Building construction, retrofit Oil and gas central heating radiators and boilers and efficiency	120,000 – 230,000 (CCC 2023)
	Transition technology integration (e.g. heat pump and solar PV installation)	30,000 heat pump engineers No reliable estimates for the other sectors are available
Energy	Power generation (e.g. offshore and onshore wind)	2,500 – 95,000 (CCC 2023)
	Transmission/networks, storage, and distribution	50,000 (Xodus Academy 2023)
	CCUS	50,000 (Xodus Academy 2023)
	Hydrogen	12,000 – 29,000 (DESNZ 2023; Hydrogen UK 2024)
	Energy storage and fuel cells	7,000 in storage and demand side flexibility (HM Government 2021)
Transport	Rail operation (under and overground)	120,000 (CWE 2022)
	Battery manufacturing	270,000 (Faraday 2022)
	Vehicle manufacturing	
	Sustainable alternative fuels (including aviation and shipping)	100,000 (Department for Transport, 2024b) No reliable estimates for the shipping sector are available
	Construction of roads, railways and fuelling infrastructures	No reliable estimates are available
Support Services	Management; technical/professional; consenting and project planning; corporate services; health, safety, environment and quality; commercial; facilities; operatives; people development, and IT and digital skills	No reliable estimates are available
Manufacturing	Construction of industrial facilities	No reliable estimates are available

Skills Makeup

Changes in the sub-sectors dominant across the economy translates to a change in the skills makeup of the workforce at all levels, including low, medium, and high-skilled individuals. Table 5 gives indicative jobs according to each traditional sub-sector, illustrating the diversity of the skills pool. For the built environment, this includes heating, ventilation, and air conditioning engineers, fossil fuel boiler servicers, and traditional meter readers, for instance.

Softer skills and other, non-technical skills (including more generalised skills in construction) are generally understood to be highly transferrable to adjacent sectors and sub-sectors, whereas compatibility in other areas is more variable. In the energy sector, there will be minimal net job losses until after 2030 due to a high degree of transference (PwC, 2022). Over 90% of the North-East of Scotland's existing oil and gas (traditional) workforce is understood to have medium/high skills transferability to adjacent energy sectors, for instance (RGU, 2022; PwC, 2022). Yet, evidence also suggests that workers moving from high-carbon jobs to low-carbon jobs tend to be higher educated (Broome et al., 2022), raising equality of opportunity concerns and highlighting the need for targeted support.

Where workforces are to transfer, there is a responsibility to facilitate this process seamlessly. There are calls, for instance, to increase the use of skills passports, which would enable oil and gas workers to move to renewable sectors without the need for significant additional certification (OPITO, 2022), as well as calls for companies rather than individuals to shoulder the costs.

Table 5: Overview of Declining Sub-sectors Skills, from Low to High Skilled

Sector/ job family*	Sub-sector	Low skilled (Skill level 1-3)†	Medium skilled (Skill level 4-6)	High skilled (Skill level 7-9)
Agriculture and land use	Livestock and mixed agriculture	Livestock farmers and managers; livestock herders; shepherds	Land agent or factor; farm manager, agricultural economist, agronomist	Company director
	Meat and dairy processing	Slaughterhouse workers; dairy farm workers	Maintenance engineer; quality manager; distribution service manager	Chief executives and senior officials; director
Built environment	Oil and gas central heating radiators and boilers	Heating, ventilation, and air condition engineers; fossil fuel boiler servicers; traditional meter readers	Quality manager; distribution service manager	Chief executives and senior officials; director
	Construction	Concrete finisher; steel erector; groundworker; scaffolder	Quality manager; site foreman	Chief executives and senior officials; director
Energy	Coal production	Coal miners and engineers; coal transporters; mine safety inspector	Supervisors or skilled asset operators; geologist; seismologist	Chief executives and senior officials; supply chain director
	Oil and gas production	Oil drillers; power plant operators; traditional utilities administrative staff	Petroleum engineers; oil and gas exploration geologists	Chief executives and senior officials; supply chain director
	Refining	Refinery operators and technicians; traditional utilities administrative staff	Team leaders and managers; development and industrial chemist	Chief executives and senior officials; supply chain director
	Gas distribution	Gas meter installers and services; pipeline maintenance workers	Gas network engineers; gas distribution managers; auditors	Chief executives and senior officials; supply chain director
Transport	Internal combustion engine vehicle manufacturing	ICE assembly workers; ICE component manufacturers	ICE technology engineers and designers	Chief executives and senior officials; supply chain director
	Maintenance and sale of ICE vehicles	ICE mechanics and technicians; ICE parts retailers and suppliers	Team leaders, supervisors, and managers; sales managers	Chief executives and senior officials; director
	Retail sale of automotive fuel	Petrol station attendants; fuel delivery drivers; fuel retail managers and staff	Head of logistics and shipping manager	Chief executives and senior officials; airport director
	Aviation	Baggage handlers; fossil fuel aircraft fuelling personnel	Team leaders, supervisors, and managers	Chief executives and senior officials; airport director
	Shipping	Deck hand; fossil fuel ship fuelling personnel	Head of logistics and shipping manager	Chief executives and senior officials; shipping director
Manufacturing	Energy intensive industry	Cement plant operator; steelworker; glass manufacturing technicians	Fabrication manager; production managers and directors	Chief executives and senior officials; director

Skills level categorisations are adapted from the [Operry Common Skills Taxonomy](#) as reported on the Energy Skills Intelligence Hub.

Anticipating the Pace of Change

The pace of change across emerging and traditional sectors will be uneven.

In traditional areas, including the manufacture of central heating radiators and boilers, retail sale of automotive fuel, and oil and gas production, change is largely expected to be gradual or well-foreseen, and is often supported by clear policy targets, e.g., around the end to sales of new petrol and diesel vehicles by 2035. Yet in other areas, the pathway is less certain. Whilst UK steel production has declined substantively over the past decade, demand is increasing and planning permission has been granted for a new electric arc furnace on Teesside. The UK cement and glass industries also do not yet have such clear phase-out routes despite their high carbon intensity (see Figure 1).

Figure 1: Pace of Change Projections for Traditional Sub-sectors

TRADITIONAL	Rapid (< 10 years)	Gradual (next 10-20 years)	Long-term (20+ years)	Uncertain*
Agriculture and land use		Livestock and mixed agriculture		
		Meat and dairy processing		
Built environment		Oil and gas central heating radiators and boilers		
			Construction	
Energy			Oil and gas production	Coal production*
			Refining	
			Gas distribution	
Transport		ICE vehicle manufacturing		
			Maintenance and sale of ICE vehicles	
		Aviation		
		Shipping		
Support Services				
Manufacturing		Energy intensive industry (e.g. steel, cement, and glass)		

The sub-sectors that are expected to see the largest growth are also the sectors that will see some of the fastest transitions, driven partly by the need for rapid low-carbon technology roll out (e.g., in transport and low carbon energy supply), but also by their current political backing.

The development of large-scale infrastructure, however, (e.g. for industrial heat or carbon capture, utilisation, and storage processes) can take several decades, as can growth in areas where more research and development are required (including in alternative aviation fuels). Therefore, the pace of change for some emerging sectors will be more gradual. There are areas, too, in which the pace of change is uncertain, as noted above. The UK’s heat pump and battery manufacturing capabilities also have an unclear trajectory, for instance (see Figure 2).

Figure 2: Pace of Change Projections for Emerging Sub-sectors

EMERGING	Rapid (< 10 years) †	Gradual (next 10–20 years)	Long-term (20+ years)	Uncertain*
Agriculture and land use	Peatland restoration			
	Agroforestry, silviculture, logging	Agriculture (non-livestock) and sustainable land management		
Built environment	Transition technology integration (e.g. heat pump and solar PV installation)			
	Building construction, retrofit, and efficiency			
Energy	Power generation (e.g. offshore and onshore wind)			CCUS* Hydrogen*
	Transmission/networks, storage, and distribution			Energy storage and fuel cells*
Transport	Construction of roads, railways and fuelling infrastructures	Rail operation (under and overground)		Vehicle manufacturing*; battery manufacturing*
				Sustainable alternative fuels (including aviation and shipping)*
Support services	E.g., Management; technical/professional; consenting and project planning; corporate services; health, safety, environment, and quality			
Manufacturing		Construction of industrial facilities		

† Expected areas of rapid progress include those for which there is current political backing

Due to the lack of available data, it has not been possible to give 2-, 5-, 7- or 10-year traditional projections. Where figures do become available in the future, estimates for the 2-year range are likely to be most accurate given they will be made considering current political and investment priorities. Where there are uncertainties in either of these factors, this will stall rapid transformation. There is future potential to map long-term trajectories where, for instance, jobs in agriculture and land use decreased 1.7% between 2023 and 2022.

Geographies of the Just Transition

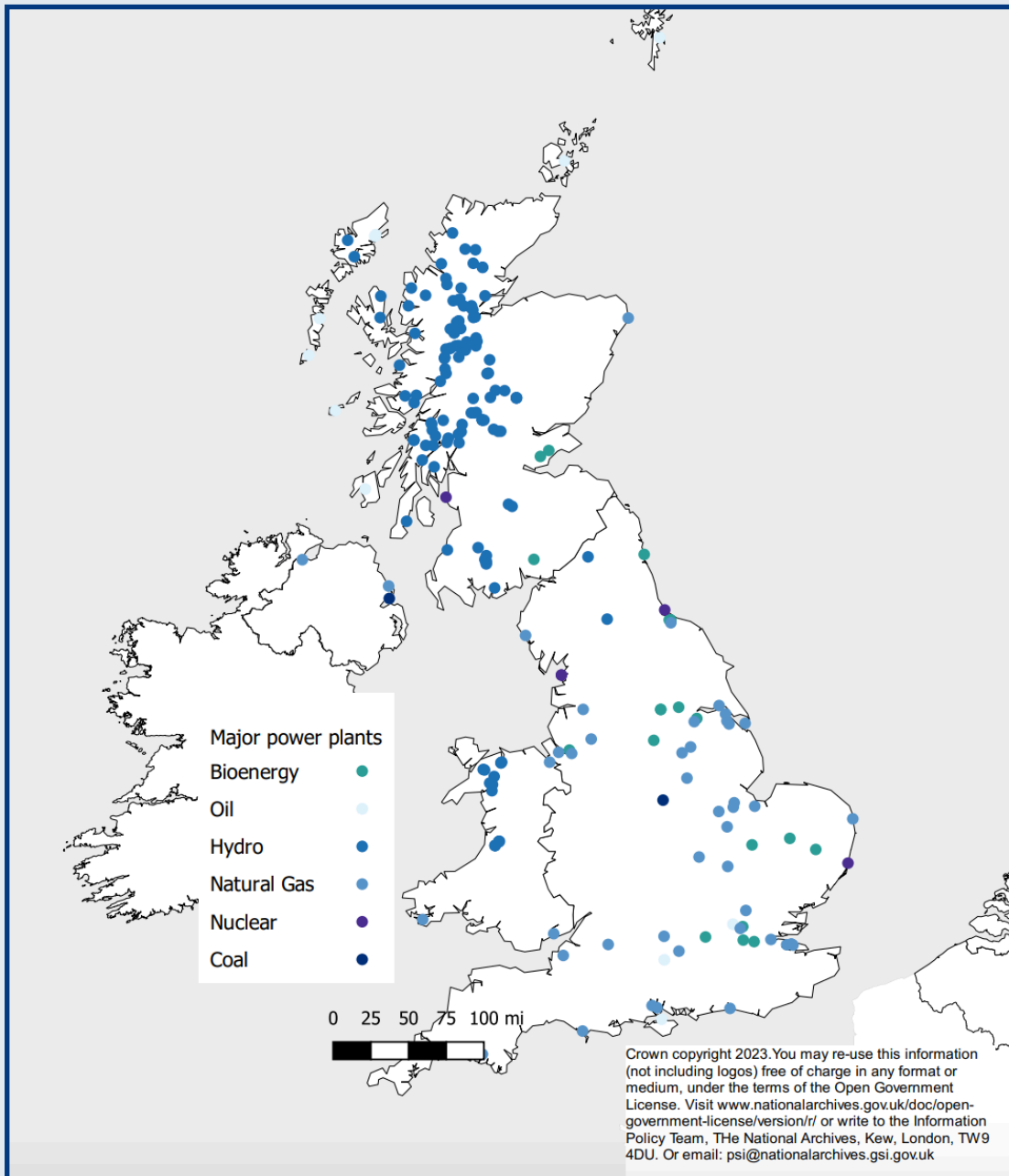
The transformations in sectors and sub-sectors created by the net zero transition will be felt unevenly across the UK.

The impacts of traditional industries will influence some regions more than others, leading the differential impacts on the distribution of jobs and skills required, as well as capabilities to access them. Within regions, it is widely acknowledged that cities will be impacted first, seeing the most innovation and job creation.

Whilst predictions in job growth by region are not available, it is possible to map the current hotspots in terms of high carbon jobs and areas of projected decline. The CCC give detailed maps of workers in selected net zero sectors relative to the economically active population and according to local authority, including for livestock agriculture, vehicle maintenance, and manufacturing jobs, for instance (see CCC, 2023 pg., 68 and 69). Detailed, interactive maps of industrial clusters are available through Investment Monitor (2022) and renewables investments can be seen on the [Renewable Energy Planning Database](#).

In the energy sector, the location of major power plants closely shows local geographies likely to be impacted by their potential closure (where the closure of hydro facilities is less impactful) (see Map 1).

Map 1: Map of Major Power Producers in the UK (operational May 2023) (DESNZ, 2023b)



Geographical areas where several traditional, high-carbon sectors are already dominant will face the greatest rates of multi-sector change. Figure 3 maps how dominant each sector is in the local economy on a score of low to high as well as giving an overall transition score. The highest levels of investment are needed where there is a dominance of affected sub-sectors in operation and therefore a high concentration of affected workers, including in Northeast Scotland, where the agriculture and land use, energy and transport sectors are dominant, and there is a density of oil and gas workers.

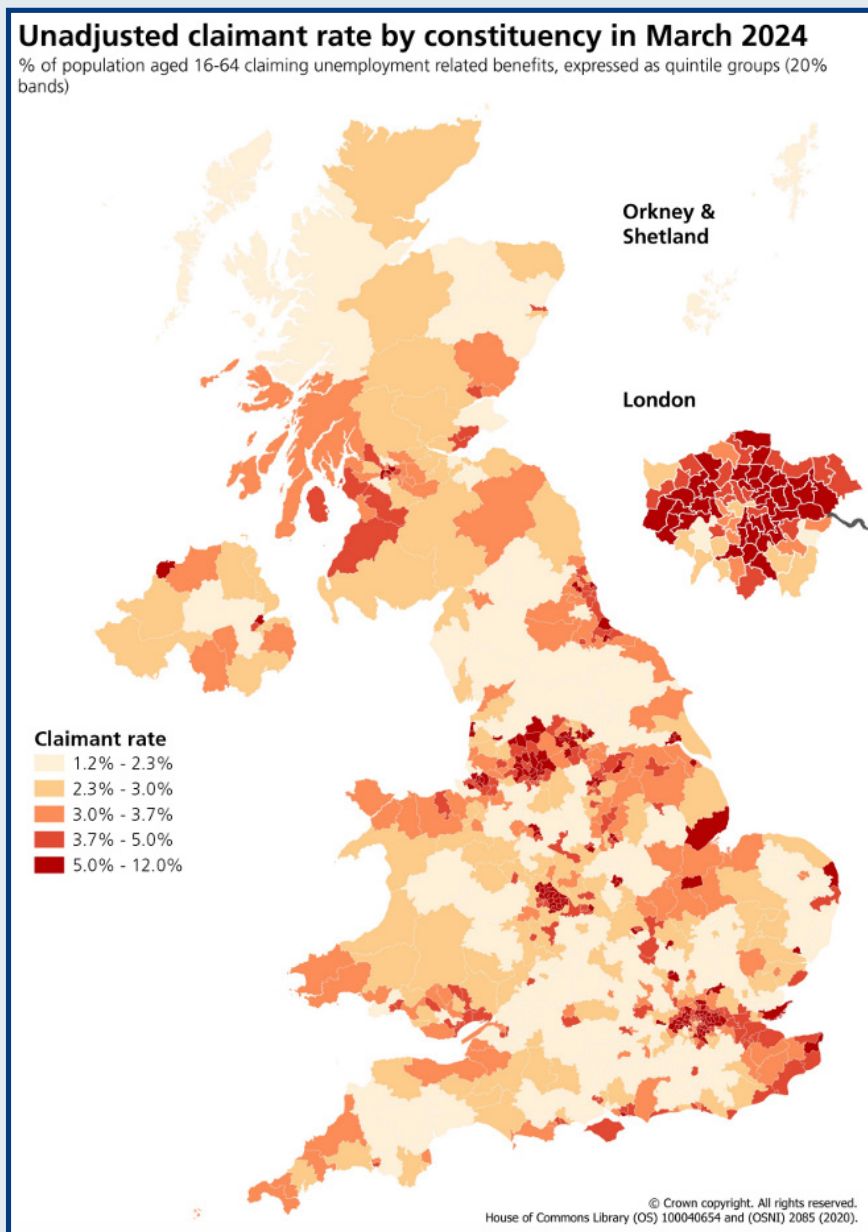
Figure 3: Traffic Light Rankings for the UK Regions undergoing Transition, Showing Low, Medium and High Exposure to Impacts

Country	Region/country	Agriculture and land use	Built environment	Energy	Transport	Manufacturing	Overall score
Scotland	Aberdeen and North East	Red	Orange	Red	Red	Green	High
	Highlands and Islands	Red	Green	Red	Orange	Green	Medium
	Tayside, Central and Fife	Red	Orange	Red	Orange	Green	Medium
	Edinburgh and Lothians	Orange	Red	Orange	Red	Green	Medium
	Glasgow and Strathclyde	Orange	Red	Red	Red	Orange	High
	Scotland South	Red	Green	Green	Green	Green	Low
England	North East	Orange	Orange	Green	Orange	Orange	Medium
	North West	Orange	Orange	Orange	Red	Red	Medium
	Yorkshire and Humber	Red	Green	Red	Orange	Red	High
	East Midlands	Red	Green	Red	Green	Red	High
	West Midlands	Red	Orange	Green	Orange	Red	Medium
	Anglia	Red	Orange	Red	Orange	Red	High
	London	Green	Red	Orange	Red	Red	High
	South East	Red	Red	Red	Red	Red	High
	South West	Red	Green	Red	Orange	Orange	Medium
Wales	North Wales	Red	Green	Red	Green	Green	Low
	Mid Wales	Red	Green	Orange	Green	Green	Low
	South East	Orange	Red	Orange	Red	Red	High
	South West	Red	Green	Orange	Green	Green	Low
Northern Ireland	Londonderry	Red	Green	Orange	Orange	Orange	Medium
	Antrim	Red	Orange	Red	Orange	Orange	Medium
	Tyrone	Red	Green	Orange	Orange	Green	Medium
	Fermanagh	Red	Green	Green	Red	Green	Low
	Armagh	Red	Green	Orange	Red	Green	Medium
	Down	Orange	Orange	Red	Red	Green	Medium

Key: Red = high intensity, orange = medium intensity, green = low intensity

Failures to invest in regions undergoing significant transformation risks an increase in unemployment, as well as the loss of embedded local identity and knock-ons for local and regional economic vitality. More favourably, uneven geographies of impact also open the opportunity to direct investment towards deprived areas or areas of high unemployment (see Map 2)¹.

Map 2: Unadjusted claimant rate by constituency in March 2024 (% of population aged 16–64 claiming unemployment related benefits, expressed as quantile groups (20% bands)) (House of Commons, 2024)



Wider evidence also points to a risk of "rural area brain drain" in the Just Transition, and therefore, a need to focus on supporting rural projects to ensure that local skills can be used, fostered, and retained. This includes opportunities to embed skills long-term in communities, rather than having transient, temporary workforces, particularly in rural and island communities e.g., residential meter engineers. Whilst some workers are highly mobile, there is also a trend towards re-localisation and remote working. Therefore, there is a challenge both in preventing socio-economic deprivation in areas of decline without accompanying low-carbon investment, and in matching training provision to geographical areas of need.

¹ Note this map cannot be reproduced in the public domain without the permission of the House of Commons.

Training Provision

There is a widely understood complex inter-play between skills, jobs, and education, where a lack of current demand or certainty around anticipated jobs and skills is creating a reticence to provide education and training, and a lack of education and training may provide a barrier to sub-sector development where jobs and skills are not directly transferrable (see Table 3).

As the current level of understanding of the current and required workforce is relatively low, strategies for the delivery of the emerging skills are highly fragmented. Our research indicates that this is a significant and urgent challenge. Whilst some areas of the UK have coverage from a wide range of specialist training providers, colleges, and universities – offering from basic, vocational skills and apprenticeships to more advanced training – other areas are not well served.

The training challenge is further reinforced by the financial difficulty facing many further and higher education institutions, including from the downscaling of government funding. It is currently unclear where the required investment in training costs for individuals, training centres, or new programmes will be derived from at the pace and scale required.

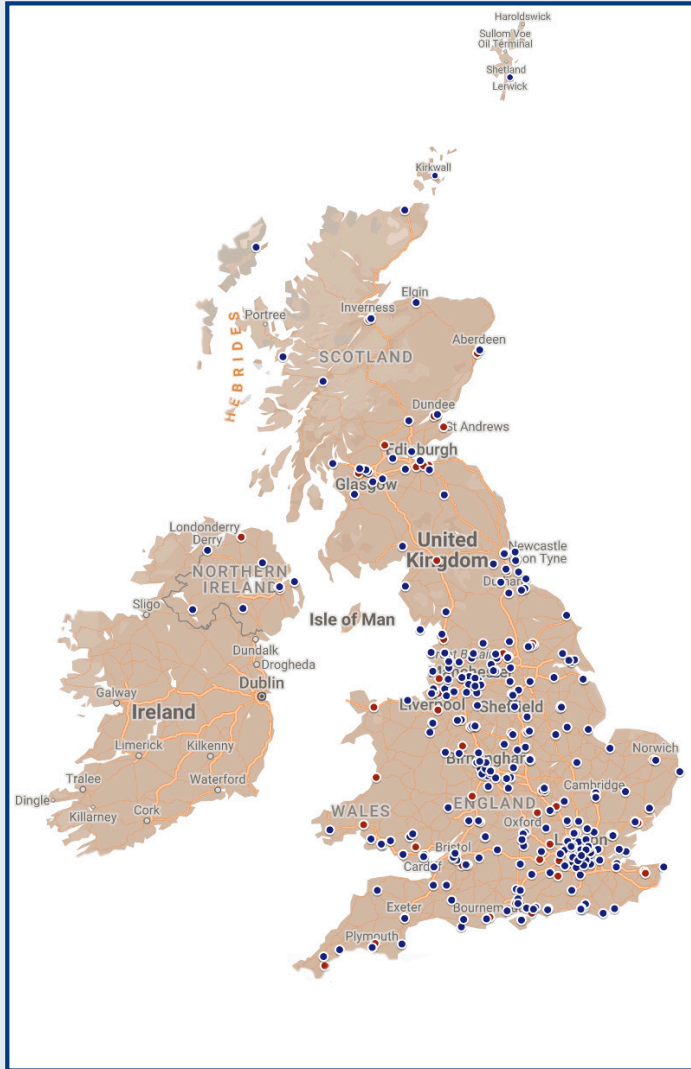
Where there is pre-existing training provision, some institutions lack modern infrastructure, or face limitations in the number of workers they can train due to the size of demonstrator machinery or staffing. The training challenge also signposts the need for radical transformation in the mode of education provision. We anticipate an increasing emphasis on rapid delivery short courses given the pace of the required transition, and that many workers would be seeking to complete qualifications over evenings and weekends at low financial cost. There is need, too, for schools to educate pupils to a high standard of literacy and numeracy, alongside encouraging proficiency in STEM subjects. This will feed the further education sector and long-term, emerging sectors and sub-sectors.

The skills transition is also starting from a baseline of workforce inequality and, therefore, in the training, education, and hiring process, there must be an emphasis on gaining new, diverse entrants. This includes a role for both behavioural nudges that change learner choice and systems of recruitment that create equitable learning and employment including flexible or remote working where appropriate.

Maps 3 shows the distribution of UK universities and colleges. In some cases, satellite campuses are omitted e.g., Heriot-Watt's campus in Orkney, meaning only one marker is given to represent the University of the Highlands and Island's Orkney College. Map 4 shows an indicative spread of specialist training providers, including those approved by OPITO and the Building Engineering Services Association.

Further insight is needed into the number of jobs in emerging sectors which require specialist skills and therefore advanced training courses, versus the number of jobs requiring baseline competency in STEM subjects and later upskilling during role-specific and additional training.

Map 3: UK University and College Provision



Key: Universities = red, colleges = blue

Map 4: Specialist Training Providers



(Note, this map is non-exhaustive and shows indicative distributions only)

Conclusions

The primary limitation of job and skills forecasting is the lack of granular data, limiting the ability for both evidence-based strategic investments and well-developed skills-training pathways, and, in the case of this report, the depth of the findings. This includes insufficient, patchy, or absent data on current workforces and expected areas of decline, as well as a high degree of variability and uncertainty around future estimates. Nonetheless, there is broad evidence of multi-sector transformation, giving opportunity to capitalise on a wide range of jobs and skills profiles. Considering this, we offer several headline findings.

transfer of skills into emerging sectors. Yet whilst traditional sectors are generally well understood, anticipated areas of emerging growth are often conditional and highly uncertain, relying on a supportive policy and investment landscape to drive change.

Evidence suggests that most jobs in decline are likely to be transferrable. In the energy sector, it is forecast that there will be minimal net job losses until after 2030. Softer skills and other, non-technical skills are assumed to be highly transferrable, whereas compatibility in other, more specialist areas is variable. Individuals working in support sectors will be in greater demand and are central to enabling transformations, including around planning, regulation, and consenting bottlenecks.

Third, there is both risk and opportunity surrounding the geographies of the workforce. Geographically, the impacts of transformations in traditional and emerging industries will impact some UK regions more than others, and this report has shown the geographical hotspots where changes in workforce dynamics are likely to be more prevalent, as well as the unevenness of training provision. There are significant opportunities to embed skills long-term in communities, e.g., in rural and island communities, where there is a critical need for residential meter engineers.

There is a significant and urgent challenge around access to skills training. Whilst there is training capability, it is not even, and there is a lack of capacity. Therefore, there are insufficient training opportunities or places to meet the anticipated demand for skilled workers over immediate, short- and long-term timescales. For SSE, there is potential to offer specialist training provision through an SSE skills academy or similar.

Overall, the findings of this report reveal a great deal of complexity and uncertainty. Whilst there is interest in specific, quantified detail over the 2–5-year time horizon, this data does not exist. Therefore, this report is an exposé of data gaps, and the start of a long-term, more detailed package of work. Looking forward, we also expect continued challenges in quantifying jobs and skills dynamics at a granular level in the short-term, and extend an invitation to investigate three further areas in particular: in-house training provision, drivers of workforce mobility, and the prioritisation of local, unemployed workforces.

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Appendix 1: Interview participants

- Dave Raey, Professor of Carbon Management and Education, University of Edinburgh and Co-chair of the Just Transition Commission for Scotland
- Carl Hickson, VP Future Talent at BP
- David Reid, Co-founder Powering Futures
- Anonymous Industry Representative
- Anonymous NGO Representative
- Anonymous Policy Representative

