2021

Low carbon in Cheshire and Warrington and the impact on jobs and skills

DRAFT FINAL REPORT

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Table of Contents

1. INTRODUCTION 2

2. EXECUTIVE SUMMARY 3

Policy Context 3

Carbon in Cheshire and Warrington 4

Low Carbon Jobs in Cheshire and Warrington 5

Conclusions and recommendations 7

3. GLOBAL WARMING AND THE POLICY RESPONSE 9

Introduction 9

Global context 9

The UK policy response 9

The local and regional context 12

4. CARBON AND THE CHESHIRE AND WARRINGTON ECONOMY 15

Introduction 15

A whole economy view of the impact of low carbon transition 15

Carbon emissions in Cheshire and Warrington 24

Carbon emissions in Cheshire and Warrington Local Authorities 27

5. LOW CARBON JOBS IN CHESHIRE AND WARRINGTON 31

Introduction 31

The low carbon and renewable energy economy in Cheshire and Warrington 31

The Environmental Goods and Services Sector in Cheshire and Warrington 33

Drivers of new employment opportunities 35

Focus on Construction 37

The impact of low carbon on energy sector jobs globally 45

LCREE job growth forecasts for Cheshire and Warrington 46

6. Conclusions and Recommendations 52

Annex 1 – The use of SIC in the Nesta taxonomy 53

Annex 2 – LCREE Sectors 54

1. INTRODUCTION

The need to address climate change and avert the worst consequences of it has led to a global response to the problem, with the Paris Agreement of 2016 bringing together almost 200 countries in a legally binding treaty to reduce greenhouse gas emissions. This global context has driven national policy for the reduction of CO_2 emissions.

The national low carbon policy agenda is stimulating transitions from activities that emit CO_2 to activities that do not. Electricity will increasingly be generated by renewables and nuclear rather than by using carbon-based fuels; vehicles will be powered by batteries rather than the internal combustion engine; houses will be heated by heat pumps rather than gas central heating and so on. Where there are activities that need to continue but do emit CO_2, action will be taken to reduce the demand for these activities and emissions will be mitigated through carbon capture, for example through tree planting or the storage of carbon underground.

These changes to the way our economy operates will drive changes to what skills will be required. This report finds that almost half (46.4%) of Cheshire and Warrington's jobs are in industries which will be significantly impacted by the low carbon agenda. These industries will need to reshape what they do – what they produce, how they consume energy, how they mitigate emissions – leading to changes to the nature of work. This will need much of the existing workforce to reskill.

The current number employed in the 'Low Carbon and Renewable Energy Economy' (LCREE) in Cheshire and Warrington is estimated to be about 4,000. These numbers are set to grow. Ecuity has forecast a fourfold growth to 15,000 employed in the LCREE in Cheshire and Warrington by 2030. However, this growth could be more significant if the project portfolio developed by Net Zero North West is delivered. This includes several significant projects that will deliver change at scale including E-Port, HyNet, Protos, and Project Vanguard. Many of the initial jobs created in the growth of the LCREE will be in construction. The Construction Industry Training Board (CITB) believes that the areas that present the greatest challenges are in retrofit and in heat pumps.

The growth of the Low Carbon and Renewable Energy Economy will be driven, in the first instance, by the reskilling of the existing workforce. For example, car manufacturers will transition from the assembly of cars with internal combustion engines to the assembly of cars with batteries; electricians will acquire the skills needed to install photovoltaic; plumbers will acquire the skills needed to install heat pumps; and oil might transition to the production of hydrogen. This means that net job growth will be lower than LCREE job growth.

This report has been commissioned by the Cheshire and Warrington Labour Market and Data Group which reports to the Cheshire and Warrington Employers' Skills and Education Board. The report has the following sections:

- Executive Summary
- Global Warming and the Policy Response
- Carbon and the Cheshire and Warrington Economy
- Low Carbon Jobs in Cheshire and Warrington
- Conclusions and recommendations

2. EXECUTIVE SUMMARY

Policy Context

The low carbon and renewable energy economy is exceptionally sensitive to the policy environment. The level of ambition for targets to reduce greenhouse gas emissions and the type of action taken to meet those targets will be what drives the size of the low carbon and renewable energy economy and will have different impacts on the wider economy.

Domestic policy in this area is, to a large extent, driven by global agreements, in particular the binding Paris Agreement of 2016. The goal of the Paris Agreement is to limit global warming to well below 2, preferably to 1.5 degrees Celsius, compared to pre-industrial levels. To achieve this long-term temperature goal, countries aim to reach global peaking of greenhouse gas emissions as soon as possible to achieve a climate neutral world by 2050.

In November 2020, the Government published a 'Ten Point Plan'[1] to support achievement of net zero by 2050. As its title suggests, the Plan identifies ten areas for action: Advancing Offshore Wind; Driving the Growth of Low Carbon Hydrogen; Delivering New and Advanced Nuclear Power; Accelerating the Shift to Zero Emission Vehicles; Green Public Transport, Cycling and Walking Point; Jet Zero and Green Ships; Greener Buildings; Investing in Carbon Capture, Usage and Storage; Protecting Our Natural Environment; and Green Finance and Innovation.

In April 2021, the Government announced that it would adopt the recommended target of the UK's Climate Change Committee (CCC) which requires a 78% reduction in UK territorial emissions between 1990 and 2035. In effect, bringing forward the UK's previous 80% target by nearly 15 years.

In its 'Sixth Carbon Budget'[2] the UK's CCC set out its view that this new target can be met through four key steps: take up of low-carbon solutions; expansion of low-carbon energy supplies; reducing demand for carbon-intensive activities; and land and greenhouse gas removals**.**

In July 2021, the Government's Green Jobs Taskforce published a report it described as "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; 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.

Locally, all three local authorities in Cheshire and Warrington have published plans or strategies focused on reducing carbon. Cheshire East Council has published a Carbon Action Plan[3], Cheshire West and Chester Council has published the Cheshire West and Chester Climate Emergency Response Plan[4], and Warrington Council has published an Energy Strategy[5].

The private sector is also active in shaping the low carbon agenda in the region. Net Zero North West[6] is an industry-led initiative seeking to become the UKs first low carbon industrial cluster by 2030. The cluster is driving investment into the net zero economy and post COVID-19 green

[1] https://www.gov.uk/government/publications/the-ten-point-plan-for-a-green-industrial-revolution/title
[2] https://www.theccc.org.uk/publication/sixth-carbon-budget/
[3] https://www.cheshireeast.gov.uk/environment/carbon-neutral-council/carbon-neutral-council.aspx
[4] https://www.cheshirewestandchester.gov.uk/your-council/councillors-and-committees/the-climate-emergency/documents/climate-emergency-response-plan.pdf
[5] https://www.warrington.gov.uk/sites/default/files/2020-02/green_energy_strategy.pdf
[6] https://netzeronw.co.uk/

recovery. In July 2021 it published an Economic Investment Prospectus designed to stimulate over £200 billion of investment in the region in eighteen key projects.

Carbon in Cheshire and Warrington

Decarbonising the economy is one of the big drivers of structural change in Cheshire and Warrington. It sits alongside other major change drivers such as digitisation and automation (which will change the nature of work in some occupations), demographic change (which will see much higher levels of demand for health and social care), and the long-term impacts of the pandemic which may change the way we work (eg levels of office utilisation) and the way we live (eg changing the nature and purpose of town centres).

Nesta[7] has developed a new taxonomy – the 'Eco-Transformation of Industries Matrix' – to quantify and gain insights into the level of risk of the low carbon agenda for all. The approach classifies industries into one of four different categories – leaders, neutrals, followers, and laggards – according to two variables: the level of carbon emissions and environmental activities.

Nesta's Eco-Transformation of Industries Matrix

Leaders - Industries in this category are the most eco-friendly, as they do not produce high levels of carbon emissions and are intensively involved in activities that directly protect the environment across the economy.

Neutrals - Industries in this category produce low levels of carbon emissions but are not involved in activities that directly protect the environment. They are part of the green sector but are not influenced by new climate-crisis policies.

Followers - Although they are producing high levels of emissions, followers are also intensively involved in activities that are intended to protect the environment and could thus create green jobs.

Laggards - Industries in this category produce high levels of carbon emissions and are not involved in activities aimed at protecting the environment.

The greatest risks and opportunities for employment will be in with industries categorised as 'followers' and 'laggards'. Both will need to reshape what they do – what they produce, how they consume energy, how they mitigate emissions – leading to changes to the nature of work in these industries. This will need new skills, and for the existing workforce to reskill. 46.4% of all employment in Cheshire and Warrington is in the 'Followers' and 'Laggards' categories – which is slightly higher than is the case for England (44.1%).

The higher proportion of employment with 'Laggard' industries in Cheshire and Warrington compared to England is driven, in particular, by a higher proportion of employment in Wholesale and Retail Trade in Cheshire West and Chester, and a higher proportion of employment in Transportation and Storage in Warrington, than is the case for England.

The higher proportion of employment with 'follower' industries in Cheshire and Warrington compared to England is driven by a higher proportion of employment in Manufacturing in Cheshire East, and to a lesser extent, a higher proportion of employment in Construction in Warrington, than is the case for England.

In 2018, at 3,620kt, Cheshire West and Chester had the highest level of emissions for a (non-metropolitan) unitary local authority in England (metropolitan districts Birmingham and Leeds had

[7] https://www.nesta.org.uk/report/going-green-preparing-uk-workforce-transition-net-zero-economy/

higher levels of emissions). Per capita emissions of CO_2 in all three Cheshire and Warrington local authorities were higher than the English level of 5t per capita in 2018. The levels of (per capita) emissions in Cheshire West and Chester in 2018 were more than double that for England.

The highest $C0_2$ emitters in Cheshire and Warrington in 2018 were:

- The Manufacturing Complex at Stanlow, run by Essar Oil (UK) Ltd (1885kt of CO_2 in 2018)
- Fiddlers Ferry power station (1339kt of CO_2 in 2018). The power station closed in 2020 and the site has been designated as an employment site, although demolition of the existing facility is expected to take up to 7 years.
- Growhow UK Ltd (now known as CF Fertilisers) is, reportedly, the UK's largest fertiliser manufacturer (565kt of CO_2 in 2018)
- Winnington CHP Ltd (352kt of CO_2 in 2018) which provides energy in the form of intermediate pressure steam and power to Tata Chemicals Europe's manufacturing sites as well as other manufacturers located within Northwich's industrial clusters.
- 3C Waste Limited (210kt of CO_2 across 4 sites in Cheshire and Warrington in 2018) is involved in the handling, recycling, and disposal of waste materials. The Company provides these services for local authority and private commercial customers.

On an end user basis, Transport accounts for the most emissions in Cheshire East (1,179kt of CO_2), Industry and Commercial accounts for the most emissions in Cheshire West and Chester (2,147kt of CO_2), and Transport accounts for the most emissions in Warrington (677kt of CO_2).

Low Carbon Jobs in Cheshire and Warrington

At a national level, turnover in the UK Low carbon and renewable energy economy (LCREE) was estimated to be £42.6 billion in 2019. Employment in the UK LCREE was estimated to be 202,100 full-time equivalent (FTE) jobs in 2019. Businesses classified within the manufacturing, energy supply and construction industries accounted for 82% of all UK LCREE turnover in 2019, and 74% of all employment.

In 2018, the UK Government projected that LCREE could grow by 11 per cent per year up to 2030, which is substantially higher than the projected growth rate for the whole economy (estimated at 1-2% per year). However, the LCREE overall has seen no significant change in size since the Office for National Statistics began publishing statistics on the sector in 2014.

Applying national data on the LCREE to data on Cheshire and Warrington's industrial structure suggests that the LCREE in Cheshire and Warrington might currently employ in the region of 4,000 people. This is less than 1% of all those employed in Cheshire and Warrington. On this basis, most of the current LCREE jobs in Cheshire and Warrington are likely to be in manufacturing, construction and professional, scientific and technical activities; with (very) small numbers employed in other sectors.

One way of understanding the future demand for labour in the LCREE in Cheshire and Warrington is to consider the likely, or confirmed, pipeline of projects. BEIS publishes a Renewable Energy Planning Database that tracks large scale renewable energy projects. There are currently 15 such projects where plans have been submitted or approved, or that are currently being constructed (8 in Cheshire West and Chester, 5 in Cheshire East, and 2 in Warrington). In addition, Net Zero North West has identified several significant projects that will deliver change at scale including E-Port, HyNet, Protos, and Project Vanguard.

Many of the initial jobs created in the growth of the LCREE will be in construction. The Construction Industry Training Board (CITB) has recently reported on likely national demand against five 'pathways': Hydrogen; Fabric First (retrofit); Heat Pumps; Heat Networks; and On-site energy. In CITB's view, the areas that present the greatest challenges are in retrofit which is estimated to generate a national demand for training of an additional 12k workers pa over the next seven years, and in heat pumps which is estimated to generate a national demand for training of an additional 7.5k-15k workers pa.

The Microgeneration Certification Scheme (MCS) certifies low-carbon products and installations used to produce electricity and heat from renewable sources. Qualified electricians and plumbers can become MCS certified installers by taking short courses in: Solar Photovoltaic; Solar Photovoltaic Maintenance; Solar Thermal Hot Water; and Heat Pumps. These courses are typically 5 days in duration and cost between £500 and £1000.

The construction industry in Cheshire and Warrington currently employs 21,000 people in 4,665 establishments. If the construction sector in Cheshire and Warrington had the same share of employment as it has nationally, the sector would employ a further 3,700 people in the sub-region.

The sub-sector with the highest location quotient (LQ) in Cheshire and Warrington is "Construction of Utility Projects for Electricity and Telecommunications" with an LQ of 2.32. This sector class includes the construction of distribution lines for electricity and telecommunications and related buildings and structures. This will include civil engineering constructions for long-distance and urban communication and power lines and power plants. It seems highly probable that many renewable energy projects in Cheshire and Warrington and beyond will involve this type of construction company.

Similarly, Cheshire and Warrington has a competitive advantage in "Construction of Other Civil Engineering Projects n.e.c." (LQ of 1.27) which includes construction of industrial facilities (except buildings) such as refineries and chemical plants. It is likely that hydrogen/CCUS projects, for example, will involve this type of construction company.

Conversely, Cheshire and Warrington has relatively low location quotients for "Electrical Installation" (LQ of 0.7) and "Plumbing, Heat and Air-conditioning Installation" (LQ of 0.4) and so may be less well positioned for construction activities related to, for example, heat pumps and photovoltaic.

The volume of apprenticeship activity in construction in Cheshire and Warrington is broadly comparable to England. In 2019/20 there were 370 construction apprenticeship starts by residents in Cheshire and Warrington which equates to 9.3 starts per 10,000 of the employed workforce (all sectors). On this measure, England had 9.2 starts.

In 2019/20, there were 207 AEB-funded learning aim enrolments in building and construction at levels 2-7 and 317 enrolments at level 1 by residents of Cheshire and Warrington who were aged 19 and over.

In work commissioned by the Local Government Association, Ecuity has produced forecasts for LCREE jobs at local authority level. There are several methodological issues with these forecasts. Notwithstanding these, Ecuity forecast that there will be c15,000 jobs in Cheshire and Warrington in the low carbon and renewable energy economy in 2030. This is almost four times the estimate of current volumes (c4,000). These are forecast to split approximately 6,000 jobs in Cheshire East, 4,000 in Cheshire West and Chester, and 5,000 in Warrington.

Ecuity 2030 forecasts for Cheshire and Warrington are that there will be:

- c4,500 jobs in low carbon electricity, with over half of those (c2,800) located in Warrington and over two thirds (c3,200) being in nuclear.
- c2,800 jobs in low carbon heat with about 40% of those (c1,100) located in Cheshire East, almost all (c2,600) being in heat pumps.
- c700 jobs in alternative fuels by 2030 with about 40% of those (c300) located in Cheshire East and most (c600) being in bioenergy. If the Hynet proposals were to come to fruition, there would likely be significantly more jobs in Hydrogen production.
- c900 jobs in low carbon services with over half of those (c500) located in Cheshire East.
- c3,600 jobs in low emission vehicles and infrastructure with over half of those (c1,900) located in Cheshire East and over half (c1,900) being in the transition from the internal combustion engine (ICE) to electric vehicles (EV).

Conclusions and recommendations

Forecasts are for a fourfold increase in the number of jobs employed in the low carbon and renewable energy economy in Cheshire and Warrington by 2030. This will be driven, in the first instance, by the reskilling of the existing workforce. For example, car manufacturers will transition from the assembly of cars with internal combustion engines to the assembly of cars with batteries; electricians will acquire the skills needed to install photovoltaic; plumbers will acquire the skills needed to install heat pumps; and oil might transition to the production of hydrogen.

However, it will also be important to ensure that as new workers join the workforce, they are equipped with the skills and competences needed for a green 21st century, rather than those that were required for a brown 20th century. This will require that skills providers deliver an appropriate curriculum that encompasses the changed skillsets that the growth of the low carbon and renewable energy sector will bring. It also means that information and information resources about job opportunities and careers will need to reflect these changes.

It is therefore recommended that:

A. There should be support for short courses designed to facilitate the entry of already skilled workers to the LCREE. For example, supporting the training for trades people (electricians, plumbers etc) that is required to become MCS certified.

B. There should be support for employers that are introducing new process in response to the low carbon agenda to ensure that their workforce have the skills needed for implementation.

C. Partners should work with large-scale projects to ensure that there will be apprenticeship opportunities in both the construction phase (working with specialist construction companies) and the delivery phase of these projects.

D. Providers should review their curriculum (particularly for construction) to ensure that the learning aims offered have the content required for work in a low carbon future.

E. Providers should review and adapt their infrastructure to ensure that learning environments (workshops etc) are equipped appropriately and meet industry standards.

F. Providers should review their capacity to scale up delivery if Government takes the advice of CITB that low-carbon related construction skills training should be forecast-led rather than demand-led.

G. The Pledge partners should review and update resources on careers to ensure that the changing nature of some roles is reflected, and the best estimate of demand volumes is understood.

3. GLOBAL WARMING AND THE POLICY RESPONSE

Introduction

The low carbon and renewable energy economy is exceptionally sensitive to the policy environment. The level of ambition for targets to reduce greenhouse gas emissions and the type of action taken to meet those targets will be what drives the size of the low carbon energy economy and will have different impacts on the wider economy. This section considers the current global, national and local policy context.

Global context

Greenhouse gas emissions have increased substantially since the Industrial Revolution, causing average global surface temperatures to rise to about 1.0°C above pre-industrial levels during the last hundred years. The effects of the climate crisis, including rising sea levels, population displacement and extreme weather, are already being experienced around the world. To address the escalating situation created by global warming a legally binding international treaty on climate change called the Paris agreement[8] was adopted by 196 countries and entered into force in 2016.

The goal of the Paris agreement is to limit global warming to well below 2, preferably to 1.5 degrees Celsius, compared to pre-industrial levels. To achieve this long-term temperature goal, countries aim to reach global peaking of greenhouse gas emissions as soon as possible to achieve a climate neutral world by 2050. The Paris Agreement is a binding agreement that mobilises global efforts to combat climate change and adapt to its effects.

The UK policy response

In response to the Paris agreement, in 2018, the UK became the first major economy to adopt a legally binding obligation to reach net zero greenhouse gas emissions by 2050. In November 2020, the Government published a 'Ten Point Plan'[9] to support achievement of net zero by 2050. The Government believes that the Plan will deliver 90,000 jobs across the UK within the current Parliament, and up to 250,000 by 2030. The introduction to the plan states "*Engineers, fitters, construction workers and many others will be engaged in harnessing British science and technology to create and use clean energy and forge great new industries that export to new markets around the world. Our Lifetime Skills Guarantee will equip people with the training they need to take advantage of these opportunities*."

As its title suggests, the Plan identifies ten areas for action:

1. Advancing Offshore Wind
2. Driving the Growth of Low Carbon Hydrogen
3. Delivering New and Advanced Nuclear Power
4. Accelerating the Shift to Zero Emission Vehicles
5. Green Public Transport, Cycling and Walking Point
6. Jet Zero and Green Ships
7. Greener Buildings
8. Investing in Carbon Capture, Usage and Storage
9. Protecting Our Natural Environment
10. Green Finance and Innovation

[8] https://unfccc.int/process-and-meetings/the-paris-agreement/the-paris-agreement
[9] https://www.gov.uk/government/publications/the-ten-point-plan-for-a-green-industrial-revolution/title

Each point of the plan is described briefly below.

Advancing Offshore Wind

The Government has committed to deliver up to double the amount of renewables procured through the next Contract for Difference auction. By 2030, the aim is to produce 40GW of offshore wind, including 1GW of innovative floating offshore wind in the windiest parts of the UK's seas.

Driving the Growth of Low Carbon Hydrogen

The Government is aiming for 5GW of low carbon hydrogen production capacity by 2030. To support this there will be a range of measures, including a £240 million Net Zero Hydrogen Fund. This year the Government will set out hydrogen business models, and a revenue mechanism for them, intended to bring through private sector investment. The Government believes that producing low carbon hydrogen at scale will be made possible by carbon capture and storage infrastructure, and it plans to grow both of these industries side by side in industrial 'SuperPlaces'.

Delivering New and Advanced Nuclear Power

The Government has confirmed its policy to pursue large-scale new nuclear projects. Alongside this, there is an intention to invest in the next generation of nuclear technology through an Advanced Nuclear Fund. This will enable investment into Small Modular Reactors and a research and development programme on Advanced Modular Reactors.

Accelerating the Shift to Zero Emission Vehicles

The Government intends to end the sale of new petrol and diesel cars and vans by 2030, with all vehicles being required to have a significant zero emissions capability (e.g. plug-in and full hybrids) from 2030 and be 100% zero emissions from 2035. Alongside this, there is a commitment to support the electrification of UK vehicles and their supply chains, including developing "Gigafactories" in the UK to produce the batteries needed at scale. In addition, there will be investment to accelerate the roll out of charging infrastructure, and continued subsidies for consumer purchases of electric vehicles.

Green Public Transport, Cycling and Walking

Government will invest in enhancements and renewals of the rail network, city public transport, buses, cycling and walking. There are commitments to: electrify more railway lines; create integrated bus and train networks; introduce more zero emission buses; build cycle lanes; and create more low traffic neighbourhoods.

Jet Zero and Green Ships

The Government has established the Jet Zero Council as a sector-wide partnership to accelerate the development and adoption of new technologies to help develop a strategy for net zero aviation, supported by a 12-month study into the strategic, technical, and commercial issues in designing and developing zero-emission aircraft that could enter service in 2030. There will be a competition to support the production of Sustainable Aviation Fuels (SAF) in the UK and R&D into the infrastructure upgrades required at UK airports to move to battery and hydrogen aircraft. There will also be a Clean Maritime Demonstration Programme to develop clean maritime technology.

Greener Buildings

To future-proof new buildings and avoid the need for costly retrofit, the Government will seek to implement the Future Home Standard in the shortest possible timeline and consult shortly on increased standards for non-domestic buildings. There is a target for 600,000 heat pump installations per year by 2028. Initiatives have been extended and introduced to support energy efficiency in the residential and public sectors.

Investing in Carbon Capture, Usage and Storage (CCUS)

It is intended to establish CCUS in two industrial clusters by mid 2020s, and aim for four of these sites by 2030, capturing up to 10 Mt of carbon dioxide per year - "*Developed alongside hydrogen, we can create these transformative "SuperPlaces" in areas such as the heart of the North East, the Humber, North West and in Scotland and Wales…. These clusters will be the starting point for a new carbon capture industry*".

Protecting Our Natural Environment

Government will start the process for designating more National Parks and Areas of Outstanding Natural Beauty. New funding has been announced for nature conservation, restoration, and Landscape Recovery projects. Tree planting and peatland restoration will be incentivised; farmers will be supported to invest in modern technology to make their businesses more efficient and more profitable, while reducing their emissions. There will be investment in flood and coastal defences.

Green Finance and Innovation

The Government has announced a 'Net Zero Innovation Portfolio'. The portfolio will focus on ten priority areas that correspond with this Ten Point Plan, including: floating offshore wind; nuclear advanced modular reactors; energy storage and flexibility; bioenergy; hydrogen; homes; direct air capture and advanced CCUS; industrial fuel switching; and disruptive technologies such as artificial intelligence for energy. A 'Sovereign Green Bond' will be issued in 2021 to help finance sustainable projects and infrastructure investment. A Green Jobs Taskforce will develop plans for new long-term good quality, green jobs by 2030 and advise what support is needed for people in transitioning industries. The taskforce will conclude its work in spring 2021.

In April 2021, the Government announced that it would adopt the recommended target of the UK's Climate Change Committee (CCC) which requires a 78% reduction in UK territorial emissions between 1990 and 2035. In effect, bringing forward the UK's previous 80% target by nearly 15 years.

In its 'Sixth Carbon Budget'[10] the CCC set out its view that this target can be met through four key steps:

- **"Take up of low-carbon solutions.** People and businesses will choose to adopt low-carbon solutions, as high carbon options are progressively phased out. By the early 2030s all new cars and vans and all boiler replacements in homes and other buildings are low-carbon – largely electric. By 2040 all new trucks are low-carbon. UK industry shifts to using renewable electricity or hydrogen instead of fossil fuels, or captures its carbon emissions, storing them safely under the sea.
- **Expansion of low-carbon energy supplies.** UK electricity production is zero carbon by 2035. Offshore wind becomes the backbone of the whole UK energy system, growing from the Prime Minister's promised 40GW in 2030 to 100GW or more by 2050. New uses for this clean electricity are found in transport, heating and industry, pushing up electricity demand by a half over the next 15 years, and doubling or even trebling demand by 2050. Low-carbon hydrogen scales-up to be almost as large, in 2050, as electricity production is today. Hydrogen is used as a shipping and transport fuel and in industry, and potentially in some buildings, as a replacement for natural gas for heating.
- **Reducing demand for carbon-intensive activities.** The UK wastes fewer resources and reduces its reliance on high-carbon goods. Buildings lose less energy through a national programme to improve insulation across the UK. Diets change, reducing our consumption of

[10] https://www.theccc.org.uk/publication/sixth-carbon-budget/

high-carbon meat and dairy products by 20% by 2030, with further reductions in later years. There are fewer car miles travelled and demand for flights grows more slowly. These changes bring striking positive benefits for health and well-being.

- **Land and greenhouse gas removals.** There is a transformation in agriculture and the use of farmland while maintaining the same levels of food per head produced today. By 2035, 460,000 hectares of new mixed woodland are planted to remove CO2 and deliver wider environmental benefits. 260,000 hectares of farmland shifts to producing energy crops. Woodland rises from 13% of UK land today to 15% by 2035 and 18% by 2050. Peatlands are widely restored and managed sustainably."

In July 2021, the Green Jobs Taskforce established by Government published its report[11]. It confirmed that across the UK there are already over 410,000 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. Research quoted in the report 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.

The taskforce describes its report as "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;
- 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.

The local and regional context

Local authorities and local industry are seeking to reduce carbon in Cheshire and Warrington. Key initiatives are described briefly below.

Cheshire East Council

In support of the Council's declaration of a climate emergency in 2019, Cheshire East Council has published a Carbon Action Plan[12]. The Action plan to reduce carbon emissions is broken down into 5 areas:

- ***Behaviour Change and Internal Policy*** - focussing on internal policy, culture and behaviour of the council.
- ***Energy Demand Reduction*** - focussing on council operations and assets.
- ***Increase Low Carbon Energy Supply*** – focussing on improving the supply of energy from renewable sources. The scope is both internal to the council and borough-wide
- ***Natural Capital*** - progressing action both on its own land estate and within the borough more widely.
- ***Reduce Borough-wide Emissions/External Policy*** - developing communication resources and toolkits to assist parish town councils and communities in calculating, reducing and offsetting Carbon.

11 https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/1003570/gjtf-report.pdf

12 https://www.cheshireeast.gov.uk/environment/carbon-neutral-council/carbon-neutral-council.aspx

The council anticipates that these actions, alongside decarbonisation of the electricity grid, will save 6,095 t/CO2e, across all relevant services, a 39% reduction on the 2019 baseline

Cheshire West and Chester Council

Following its declaration of a climate emergency in 2019, Cheshire West and Chester Council has published the Cheshire West and Chester Climate Emergency Response Plan[13].

- ***Energy and Industry***. The Council will take a range of action itself including the purchase of renewable electricity; improvements to the energy efficiency of public sector buildings; LED streetlights; and the expansion of community energy provision. Working with partners, it will support projects such as Hynet and the Mersey Tidal barrage.
- ***Transport***. The Council will take a range of action itself including promoting modal shift; review options for zero emissions buses; procure zero emission vehicles; and promote digital. Working with partners it will support the development of infrastructure for EV, hydrogen and train electrification.
- ***Housing***. The Council will take a range of action itself including action to reduce fuel poor households; deliver low-carbon social housing and retrofit existing stock; and encourage take up of retrofit by homeowners and landlords. Working with partners, it will support businesses and partners to sign up to the Net Zero Carbon Buildings Commitment.
- ***Business Premises and Engagement.*** The Council will develop an information pack for SMEs and ensure the energy efficiency of the Council's own industrial and commercial assets.
- ***Land Use, Adaptation, Climate Repair***. The Council will take a range of action itself including supporting an aspiration for 150 hectares of new planting a year across the borough and introducing the requirement for 'net gain' in biodiversity in new development. Working with partners, it will develop a biodiversity strategy and deliver the Trees for Climate programme.
- ***Waste and Recycling.*** The Council will end avoidable single-use plastics, work with Cheshire West Recycling to procure the most efficient and environmentally friendly fleet possible, and review opportunities to use de-commissioned landfill sites to provide renewable energy.

Warrington Council

The Council's twin goals are to be energy self-sufficient in its own operations by 2030 and to support the work underpinning its Climate Emergency Declaration of 18 June 2019. Energy self-sufficiency has not been reached by any local authority in the UK to date and would be achieved where the Council is generating an equivalent amount of energy from renewable sources to that which it uses in the delivery of its services. To support this the Council has published an Energy Strategy[14] which identifies six key areas:

- Reducing fuel poverty
- Reducing greenhouse gas emissions
- Improving security of energy supply
- Creating regeneration and economic growth
- Achieving sustainability in all the Council's operations
- Generating income to fund the investments.

The following outcomes are targeted:

[13] https://www.cheshirewestandchester.gov.uk/your-council/councillors-and-committees/the-climate-emergency/documents/climate-emergency-response-plan.pdf
[14] https://www.warrington.gov.uk/sites/default/files/2020-02/green_energy_strategy.pdf

- A reduction in fuel poverty figures for Warrington
- A reduction in greenhouse gas emissions in Warrington
- Achieving security of energy supply, largely by owning and controlling the generating assets to achieve energy self-sufficiency
- promoting economic regeneration, including creating jobs and growth, by Warrington becoming a centre of excellence in the green agenda
- Delivering a more sustainable Warrington
- Undertaking the work on the basis of a sound business case approach that manages risk and delivers a return on investment.

Net Zero North West

Net Zero North West[15] is an industry-led initiative seeking to become the UKs first low carbon industrial cluster by 2030. The cluster is driving investment into the net zero economy and post COVID-19 green recovery.

The Net Zero North West proposition is that the North West is the only region which already has all the elements required to deliver a low carbon industrial cluster by 2030 – including renewables, hydrogen, Carbon Capture usage and Storage, nuclear and smart grids. With a range of projects, the Cluster offers a multi vector energy system that can drive clean growth. Together these projects could save over 10 million tonnes of carbon per year. Projects being promoted by Net Zero Northwest include E-port, HyNet, Protos, Mersey Tidal Power Project, and Project Vanguard.

In July 2021, NetZero Northwest published an Economic Investment Prospectus[16] to showcase the investment opportunities presented by the North West of England's drive to achieve net zero emissions by 2040 across the region's industries, communities and built-environment. Net Zero North West is promoting the Economic Investment Prospectus to the UK Government and Investors to attract the necessary resources and input. It is the intention that the document will be used to stimulate interest and investment from both the public sector and large-scale private-sector finance, including pension funds, infrastructure investors and international finance institutions.

In aggregate, the prospectus proposes to deliver a 38.5 $MtCO_2$ emissions reduction to meet the North West's decarbonisation net zero goal by 2040 through £206.9 billion of investment, which, it says, will help support 660,000 jobs to be secured or created and grow the economy by £285 billion GVA.

[15] https://netzeronw.co.uk/

[16] https://netzeronw.co.uk/wp-content/uploads/2021/07/Net-Zero-North-West-Economic-Investment-Prospectus.pdf

4. CARBON AND THE CHESHIRE AND WARRINGTON ECONOMY

Introduction

Decarbonising the economy is one of the big drivers of structural change in local economies. It sits alongside other major change drivers such as digitisation and automation (which will change the nature of work in some occupations), demographic change (which will see much higher levels of demand for health and social care), and the long-term impacts of the pandemic which may change the way we work (eg levels of office utilisation) and the way we live (eg changing the nature and purpose of town centres).

There may be inter-dependencies between these drivers of change. For example, declining footfall in city centres and out-of-town retail triggered by the pandemic might drive diversification in the local town centre offer leading to more use of minor roads and public transport, and less use of motorways. The introduction of driverless vehicles might lead to reductions in congestion. Increased working from home will increase domestic energy consumption, and so on.

It is important to consider how carbon impacts across the whole of the local economy. This section of the report considers the structure of the Cheshire and Warrington economy through a low carbon lens, using a taxonomy developed by Nesta[17]. It goes on to consider the sectors that produce carbon across the three local authorities of Cheshire and Warrington.

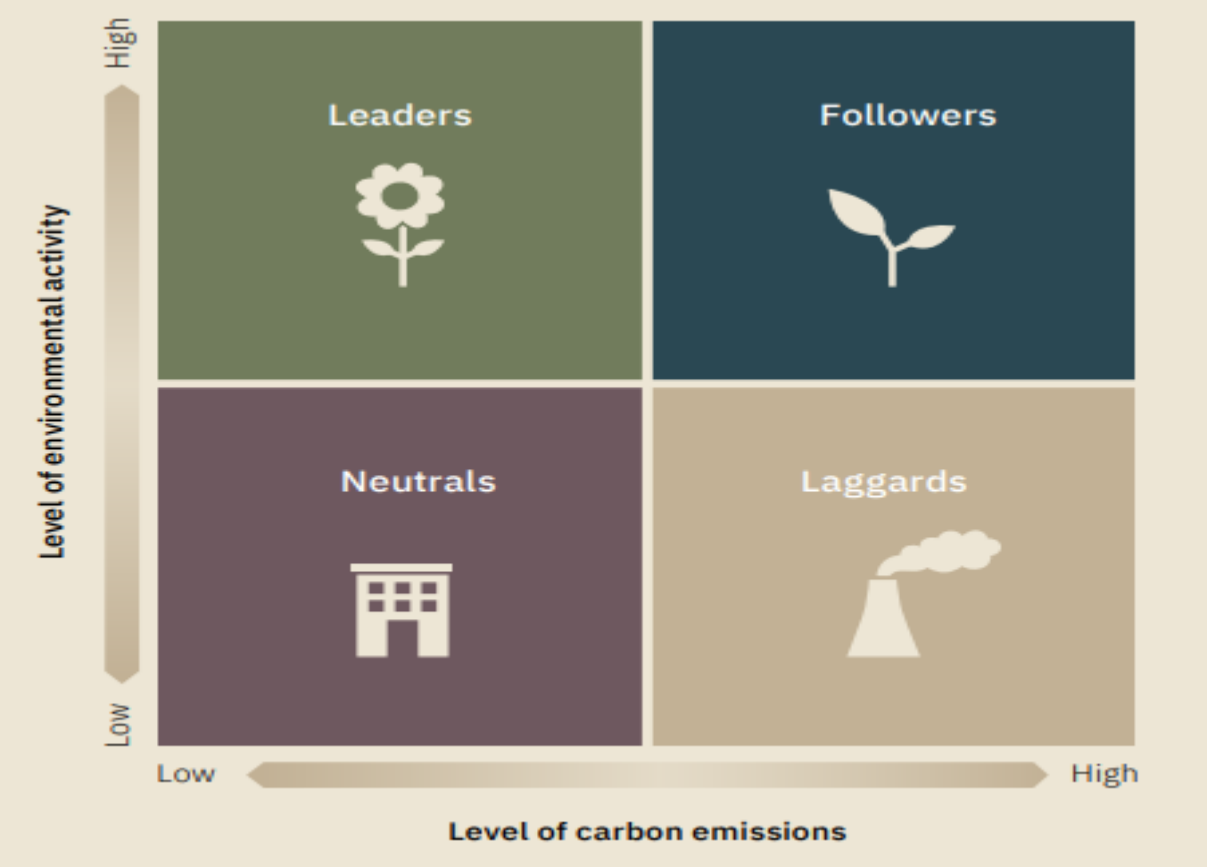
A whole economy view of the impact of low carbon transition

The UN's International Labour Organisation has argued that the shift to 'green growth' will be a significant challenge for regions with a major concentration of 'brown sector' industries, and for individuals currently working in these industries, while regions with a major concentration of 'green sector' industries will flourish. Although jobs may be lost or transformed in the brown sector, the 'greening' of the labour market will create new jobs in the green sector that could produce employment gains and prevent net job losses[18].

However, it is not clear which industries comprise the green sector or the brown sector; these categories can include different industries in different countries at different times. Recognising that the opportunities and risks vary by industry, a new taxonomy – the 'Eco-Transformation of Industries Matrix' – has been developed by Nesta[19] to quantify and gain insights into the level of risk for each industry and the related implications for employment and reskilling in the UK.

This taxonomy is useful because it provides a way of considering how the economy in a place might be affected by decarbonisation. Because it is based on existing industrial classifications[20], it is possible to compare the industrial structures of places and how they might be affected differently. The approach classifies industries into one of four different categories – leaders, neutrals, followers, and laggards – according to two variables: the level of carbon emissions and environmental activities. This is illustrated in the figure and described in the box below.

[17] Formerly NESTA (National Endowment for Science, Technology and the Arts)
[18] Anticipating skill needs for green jobs: A practical guide (ilo.org)
[19] https://www.nesta.org.uk/report/going-green-preparing-uk-workforce-transition-net-zero-economy/
[20] See Annex 1 for a mapping of the Standard Industrial Classification to the Nesta taxonomy



Source: Nesta, 'Going Green'

Nesta's Eco-Transformation of Industries Matrix

Leaders - Industries in this category are the most eco-friendly, as they do not produce high levels of carbon emissions and are intensively involved in activities that directly protect the environment across the economy.

Neutrals - Industries in this category produce low levels of carbon emissions but are not involved in activities that directly protect the environment. They are part of the green sector but are not influenced by new climate-crisis policies.

Followers - Although they are producing high levels of emissions, followers are also intensively involved in activities that are intended to protect the environment and could thus create green jobs.

Laggards - Industries in this category produce high levels of carbon emissions and are not involved in activities aimed at protecting the environment.

The table below presents the proportion of employment that falls into each of the Nesta categories in each of the local authorities, Cheshire and Warrington, the North West, England, and Great Britain.

The proportion of employment in 'laggard' industries is higher in all three local authorities and for Cheshire and Warrington than is the case for England, with over 32% of employment being in such industries in Cheshire West compared with less than 28% for England. The proportion of employment in 'follower' industries is also higher for Cheshire and Warrington than is the case for

England. However, this is because the proportion employed in Cheshire East is almost 4% higher than for England. Each of the other two authorities have a slightly lower proportion of employment in 'follower' industries than is the case for England.

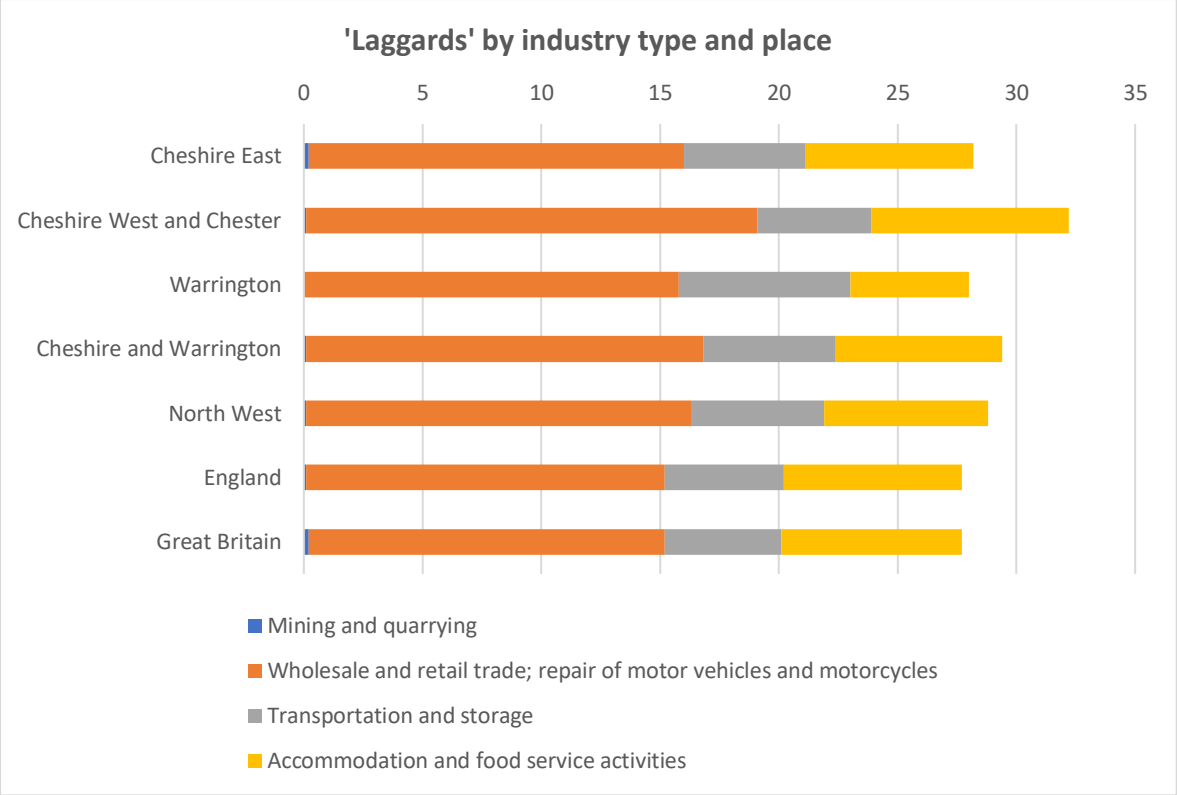
In total, 46.4% of employment in Cheshire and Warrington is in industries that may need to manage the transition to Net Zero. This amounts to more than 260,000 employees that may need to reskill as their employers change their business processes to transition to low carbon.

Proportion of jobs in each Nesta category by local authority, region and Great Britain				
	Laggard	***Follower***	***Neutral***	***Leader***
Cheshire East	28.2	20.2	30.6	21.9
Cheshire West	32.2	15.4	28.3	23.8
Warrington	28	14.2	29.8	26.9
LEP	29.4	17	29.6	23.9
North West	28.8	17.4	29.9	24
England	27.7	16.4	31.5	24.3
Great Britain	27.7	16.7	31.3	24.2
Source: Brennan Wilson Ltd analysis of BRES using Nesta taxonomy				

Nesta 'Laggards'

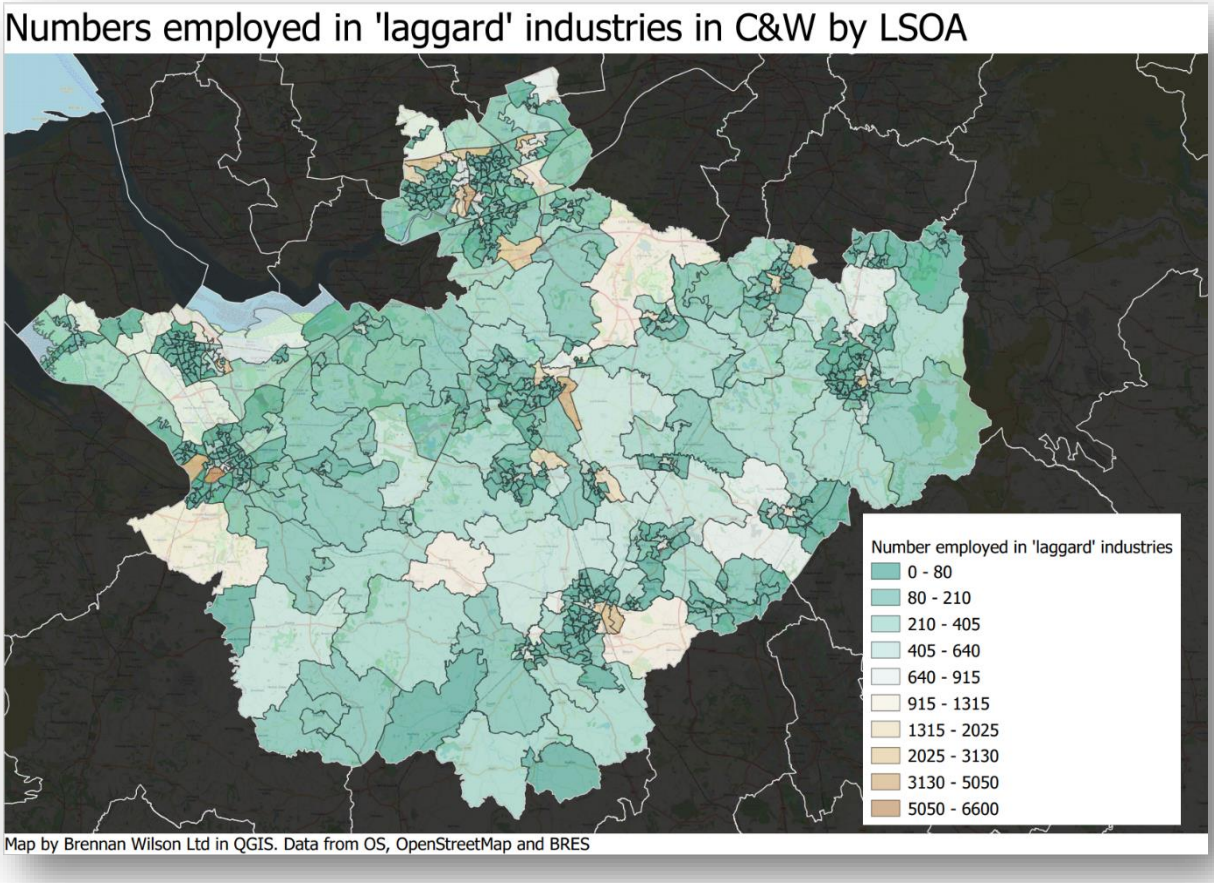
Nesta class the following sectors as being 'Laggards' – Mining and quarrying; Wholesale and retail trade, repair of motor vehicles and motorcycles; Transportation and storage; and Accommodation and food service activities.

The chart below provides a disaggregated analysis of the 'laggards' category across the three local authorities compared to the regional and national position. The higher proportion of employment with 'laggard' industries in Cheshire and Warrington compared to England is driven, in particular, by a higher proportion of employment in Wholesale and retail trade in Cheshire West and Chester, and a higher proportion of employment in Transportation and Storage in Warrington, than is the case for England.



Source: Brennan Wilson Ltd analysis of BRES using the Nesta taxonomy

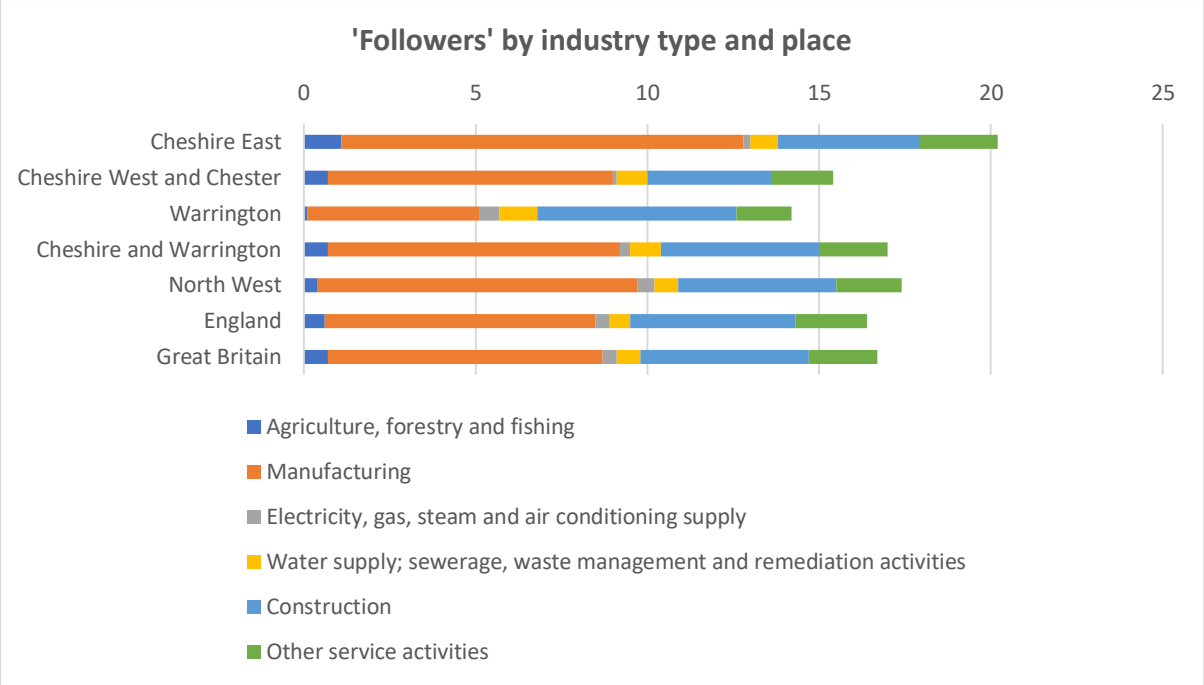
The map below shows the concentrations of employment in 'laggard' industries in Cheshire and Warrington by lower super output area (LSOA). The greener the shading, the fewer jobs there are in 'laggard' industries. Conversely, the browner the shading, the higher are the concentrations of employment in those places. Many of the brown-shaded areas are associated with shopping centres, or are adjacent to motorways – as might be expected from a classification that includes retail, and transportation and storage.



Nesta 'Followers'

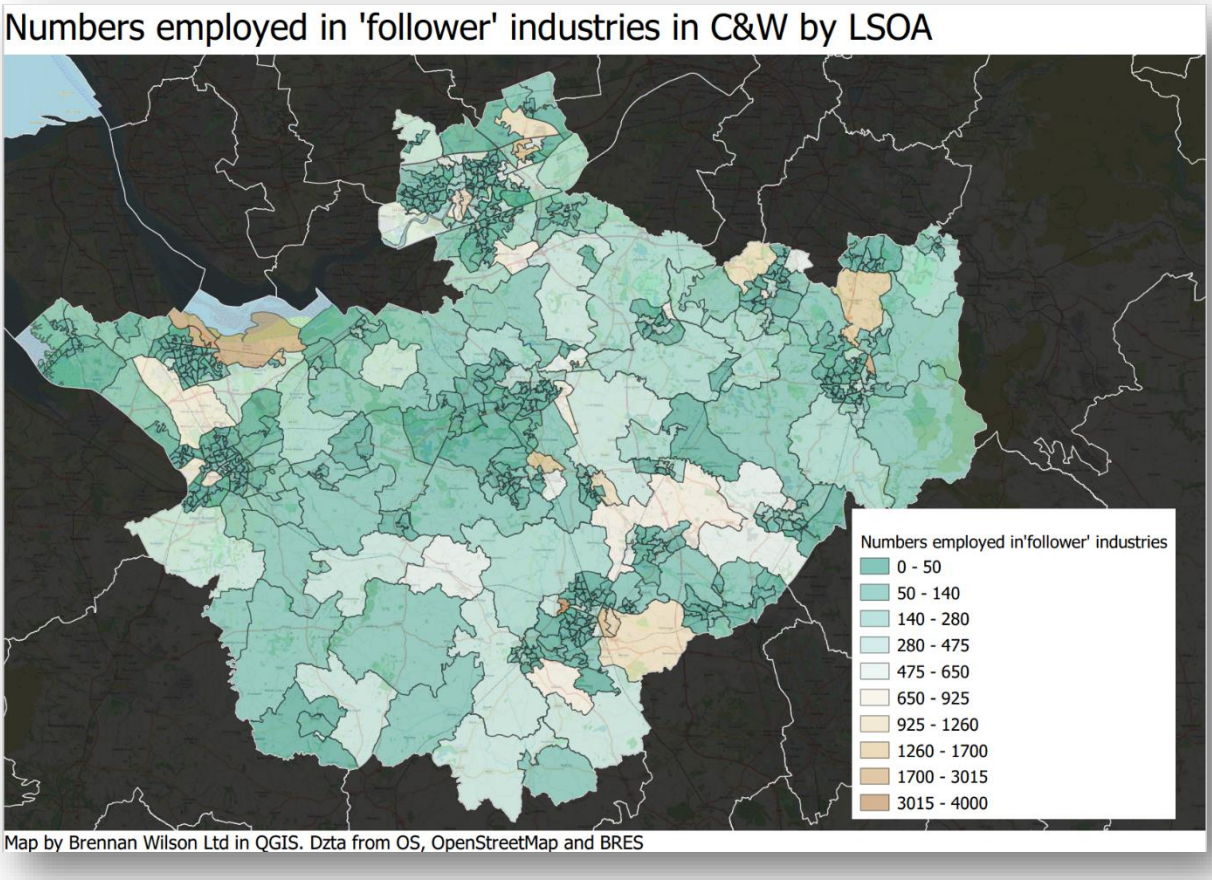
Nesta class the following sectors as being 'Followers' – Agriculture, forestry and fisheries; Manufacturing; Electricity, gas and water supply; Construction; and Other service activities.

The chart below provides a disaggregated analysis of the 'followers' category across the three local authorities compared to the regional and national position. The higher proportion of employment with 'follower' industries in Cheshire and Warrington compared to England is driven by a higher proportion of employment in Manufacturing in Cheshire East, and to a lesser extent, a higher proportion of employment in Construction in Warrington, than is the case for England.



Source: Brennan Wilson Ltd analysis of BRES using the Nesta taxonomy

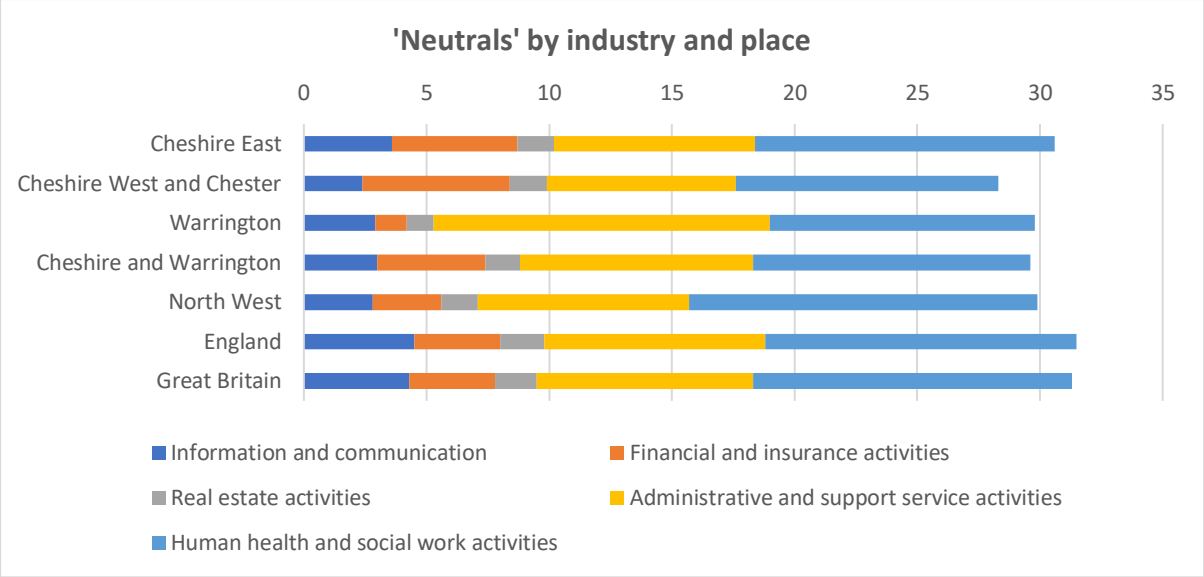
The map below shows the concentrations of employment in 'follower' industries in Cheshire and Warrington by lower super output area (LSOA). The greener the shading the fewer jobs there are in 'follower' industries. Conversely, the browner the shading, the higher are the concentrations of employment in these industries in those places. The areas with the highest concentrations of employment in this category include the Essar Stanlow refinery, Birchwood, central Warrington, Adlington Business Park and Industrial Estate/Poynton Industrial Estate, Bentley, and Crewe Industrial Estate.



Nesta 'Neutrals'

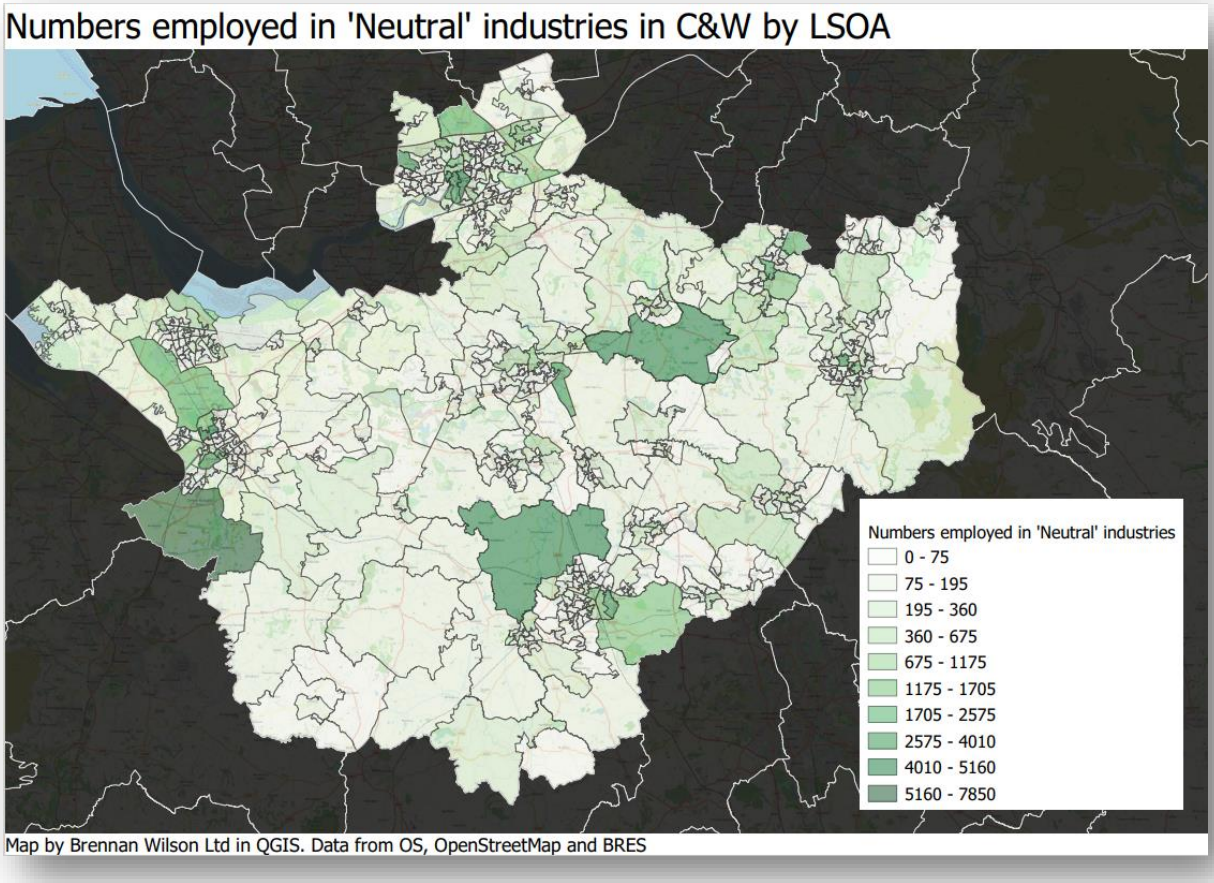
Nesta class the following sectors as being 'Neutrals' – Information and communication; Financial and insurance activities; Real estate activities; Administrative and support service activities; and Human health and social work activities.

The chart below provides a disaggregated analysis of the 'neutrals' category across the three local authorities compared to the regional and national position. The lower proportion of employment with 'neutral' industries in Cheshire and Warrington compared to England applies in all three local authorities. This is partly explained by Cheshire and Warrington's relatively high job density which means that jobs in sectors such as health will account for a lower percentage of total employment.



Source: Brennan Wilson Ltd analysis of BRES using the Nesta taxonomy

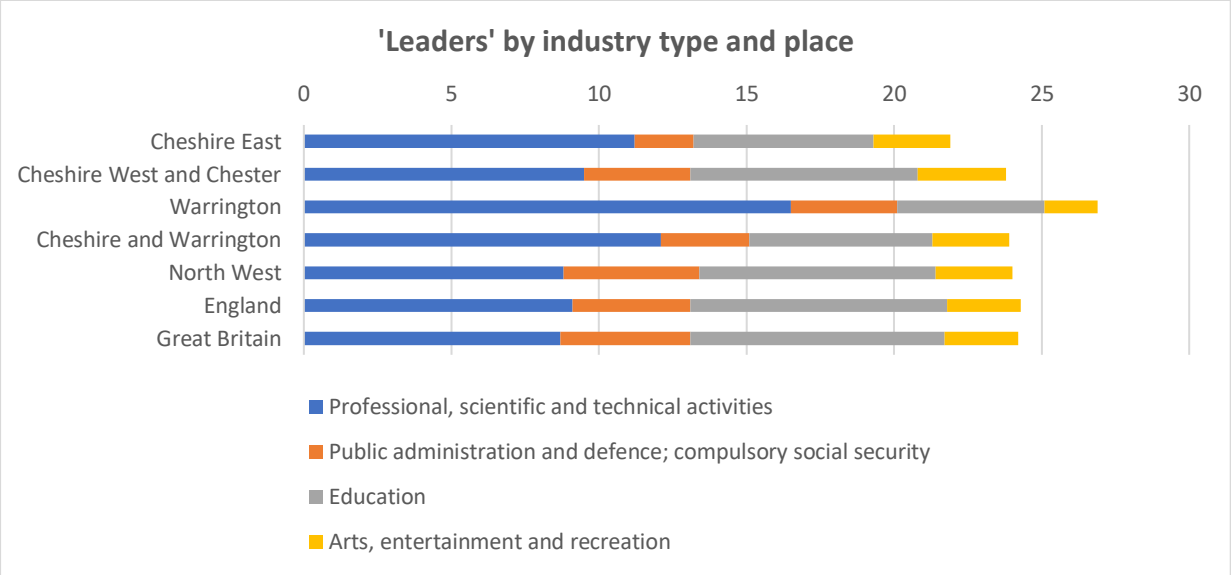
The map below shows the concentrations of employment in 'neutral' industries in Cheshire and Warrington by lower super output area (LSOA). The greener the shading, the more jobs there are in 'neutral' industries. The areas with the highest concentrations of employment in this category include the locations of hospitals, and concentrations of financial services/ICT companies such as Chester Business Park.



Nesta 'Leaders'

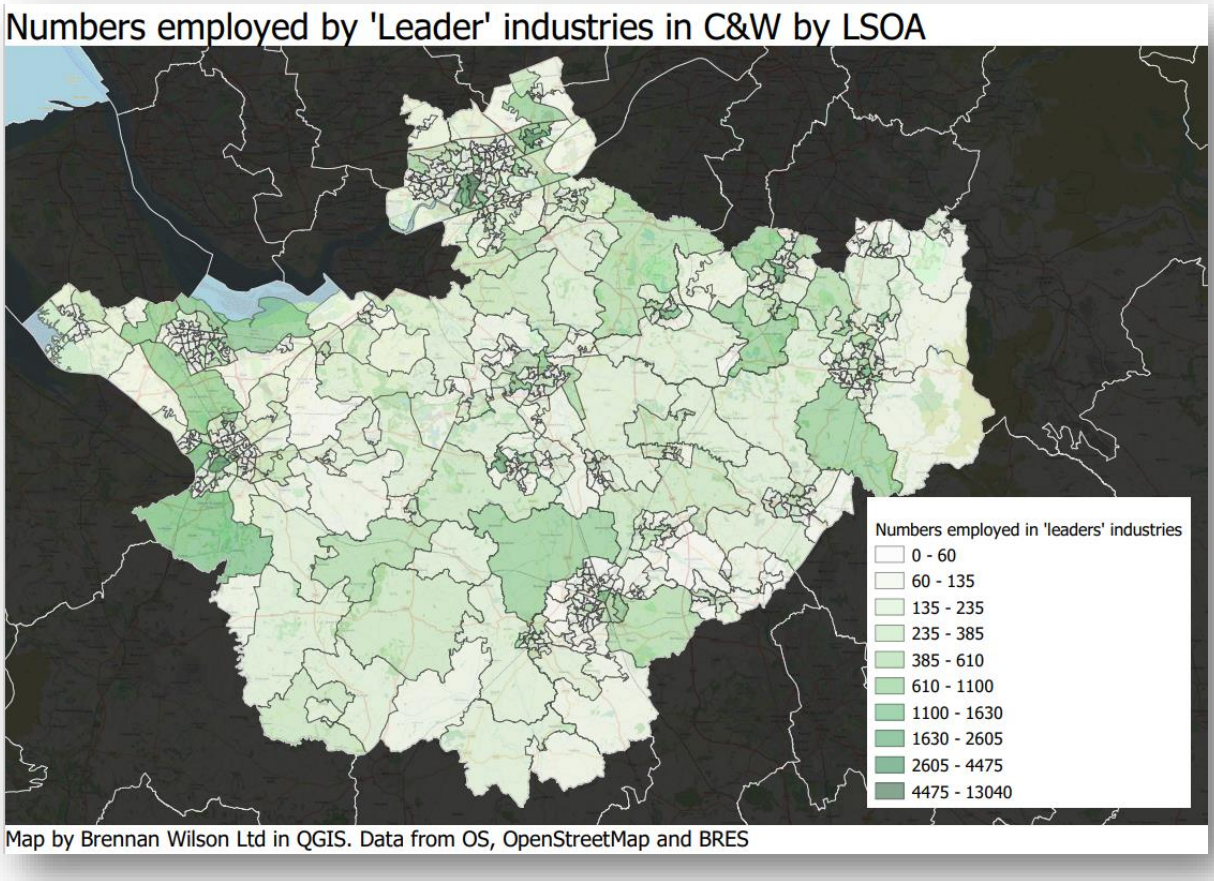
Nesta class the following sectors as being 'Leaders' – Professional, scientific and technical activities; Public administration and defense; Education; Arts, entertainment and recreation.

The chart below provides a disaggregated analysis of the Nesta 'leaders' category across the three local authorities compared to the regional and national position. The proportion of employment within 'leaders' industries in Cheshire and Warrington compared to England is very similar. However, this disguises variance at local authority level. The proportion of employment in Education and the proportion employed in Public administration are both lower than England in all three local authorities. This is mostly explained by the fact that Cheshire and Warrington has a relatively high job density. However, the proportion employed in Professional, scientific and technical activities is higher than for England in all three local authorities with Warrington having a particularly high 16.5% employed in this sector compared to 9.1% in England.



Source: Brennan Wilson Ltd analysis of BRES using the Nesta taxonomy

The map below shows the concentrations of employment in 'leader' industries in Cheshire and Warrington by lower super output area (LSOA). The greener the shading the more jobs there are in 'leader' industries. The areas with the highest concentrations of employment in this category include the locations of police and local authority HQs, colleges and universities.



Carbon emissions in Cheshire and Warrington

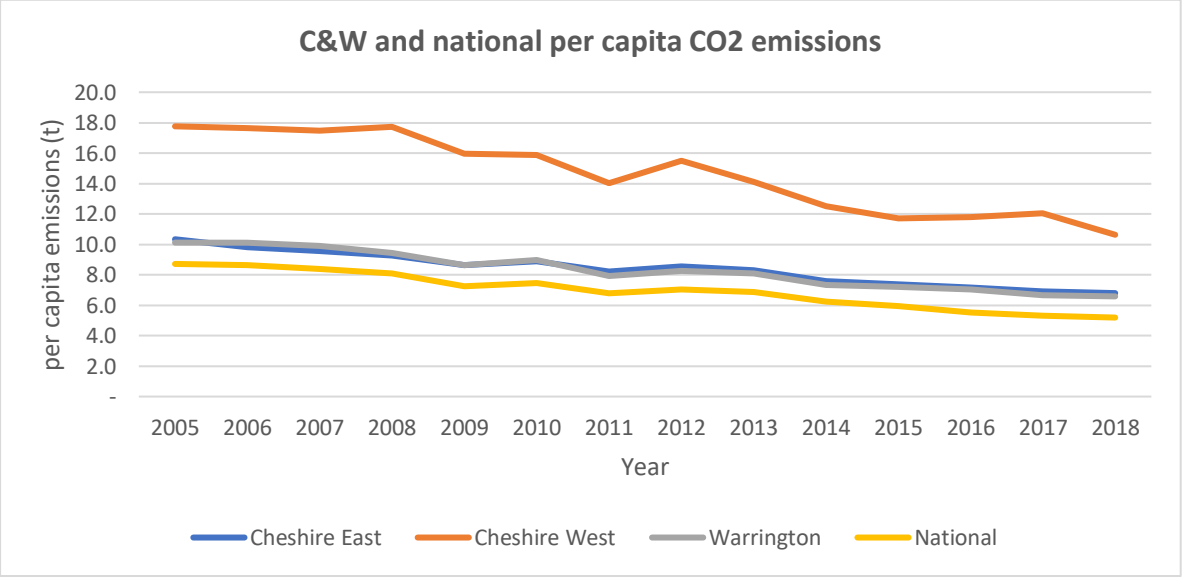
The Department for Business, Energy & Industrial Strategy publish local authority and regional carbon dioxide emissions national statistics for the UK. These statistics provide the most reliable and consistent breakdown of CO_2 emissions across the country, using nationally available data sets going back to 2005. The main data sources are the UK National Atmospheric Emissions Inventory and the BEIS National Statistics of energy consumption for local authority areas. All emissions included in the national inventory are covered, except aviation, shipping, and military transport, for which there is no obvious basis for allocation to local areas.

Using this data, the table below classifies 2018 CO_2 emissions by local authority and industry type. As can be seen from this the industry source of $C0_2$ varies significantly by local authority. In Cheshire East, 'Transport' is the largest emitter and accounts for 46% of all emissions (1,179kt in 2018). In Cheshire West and Chester, 'Industry and Commercial' is the largest emitter and accounts for 59% of all emissions (2,147kt in 2018). In Warrington 'Transport' is the largest emitter accounting for 49% of all emissions (677kt in 2018).

In 2018, at 3,620kt, Cheshire West and Chester had the highest level of emissions for a (non-metropolitan) unitary local authority in England (metropolitan districts Birmingham and Leeds had higher levels of emissions). Per capita emissions of CO_2 in all three Cheshire and Warrington local authorities were higher than the English level of 5t per capita in 2018. The levels of (per capita) emissions in Cheshire West and Chester in 2018 were more than double that for England.

Source of CO_2 Emissions by Local Authority, 2018							
Name	Industry and Commercial Total	Domestic Total	Transport Total	LULUCF Net Emissions	Grand Total	Per Capita Emissions (t)	Emissions per km^2 (kt)
Cheshire East	749.5	667.0	1,178.7	-6.4	2,588.8	6.8	2.2
Cheshire West and Chester	2,147.4	530.0	950.1	-7.1	3,620.4	10.6	3.8
Warrington	389.8	300.4	677.0	12.0	1,379.3	6.6	7.6
Source: Local Authority territorial CO_2 emissions estimates 2005-2018 (kt CO_2) - Full dataset							

Whilst per capita levels of CO_2 emissions in Cheshire and Warrington are comparatively high in all three local authorities, levels have declined in all three from 2005. This is illustrated in the chart below. The rate of decline in all three local authorities has approximately tracked the national rate, with around a 40% reduction on the 2005 baseline. This has seen a 7.2kt reduction in CO_2 emissions in Cheshire West and Chester in this time from 17.8kt pa to 10.6kt pa.



Source: Local Authority territorial CO2 emissions estimates 2005-2018

Each year the Environment Agency publishes a Pollution Inventory. The pollution inventory includes reporting on annual emissions of certain substances to air, controlled waters and land, and off-site transfers in wastewater and waste. This includes reporting on CO_2 emissions. Organisations must report to the pollution inventory if they:

- Operate under a part A (1) environmental permit and have received a notice under Regulation 60 of the Environmental Permitting Regulations 2010.

- Operate a sewage treatment works with a capacity at, or over, 100,000 population equivalents.
- Dispose of radioactive waste to air, water or sewers covered by a permit issued under the Environmental Permitting Regulations 2010.
- Run an opencast mine or quarry with a surface area over 25 hectares, or an underground mine and related operation (no capacity threshold).

The table below provides data on CO_2 emissions in Cheshire and Warrington from the Environment Agency Pollution Inventory for 2018. The highest $C0_2$ emitters in Cheshire and Warrington in 2018 were:

- The Manufacturing Complex at Stanlow, run by Essar Oil (UK) Ltd (1885kt of CO_2 in 2018)
- Fiddlers Ferry power station (1339kt of CO_2 in 2018). The power station closed in 2020 and the site has been designated as an employment site, although demolition of the existing facility is expected to take up to 7 years.
- Growhow UK Ltd (now known as CF Fertilisers) is, reportedly, the UK's largest fertiliser manufacturer (565kt of CO_2 in 2018)
- Winnington CHP Ltd (352kt of CO_2 in 2018) which provides energy in the form of intermediate pressure steam and power to Tata Chemicals Europe's manufacturing sites as well as other manufacturers located within Northwich's industrial clusters.
- 3C Waste Limited (210kt of CO_2 across 4 sites in Cheshire and Warrington in 2018) is involved in the handling, recycling, and disposal of waste materials. The Company provides these services for local authority and private commercial customers.

CO2 'by source' emissions in Cheshire and Warrington, 2018			
	Operator	Site	CO2 emissions (kt)
Cheshire East	3C Waste Ltd	Gawsworth	13
	3C Waste Ltd	Maw Green Landfill	26
	British Salt Ltd	Middlewich	63
	Dalkia Utilities Services Plc	Macclesfield	69
	Disley Tissue Ltd	Waterside	12
	E.ON UK Cogeneration Ltd	Sandbach	24
Cheshire West and Chester	3C Waste Ltd	Gowy	36
	Associated Octel Co Ltd	Ellesmere Port	12
	Brunner Mond (UK) Ltd	Lostock	78
	Cleanaway Ltd	Ellesmere Port	70
	Essar Oil UK Ltd	Stanlow Manufacturing Complex	1885
	Growhow UK Ltd	Ince	565
	Veolia Energy & Utility Services UK	Alderley Park Energy Centre	11
	Winnington CHP Ltd	Winnington Sodium Carbonate Manufacturing Site	352
Warrington	3C Waste Ltd	Arpley Landfill	135
	Alcan Primary Metal Europe	Latchford	46
	Biffa Waste Services Ltd	Risley	87

	Collier Industrial Waste Ltd	Rixton	15
	Keadby Generations Ltd	Fiddlers Ferry	1339
	PQ Silicas UK Ltd	Bank Quay	59
	Solvay Interox Ltd	Stretford	52
	United Utilities Water Plc	Warrington North	18
Source: UK local authority and regional carbon dioxide emissions national statistics: 2005-2018			

Carbon emissions in Cheshire and Warrington Local Authorities

Cheshire East

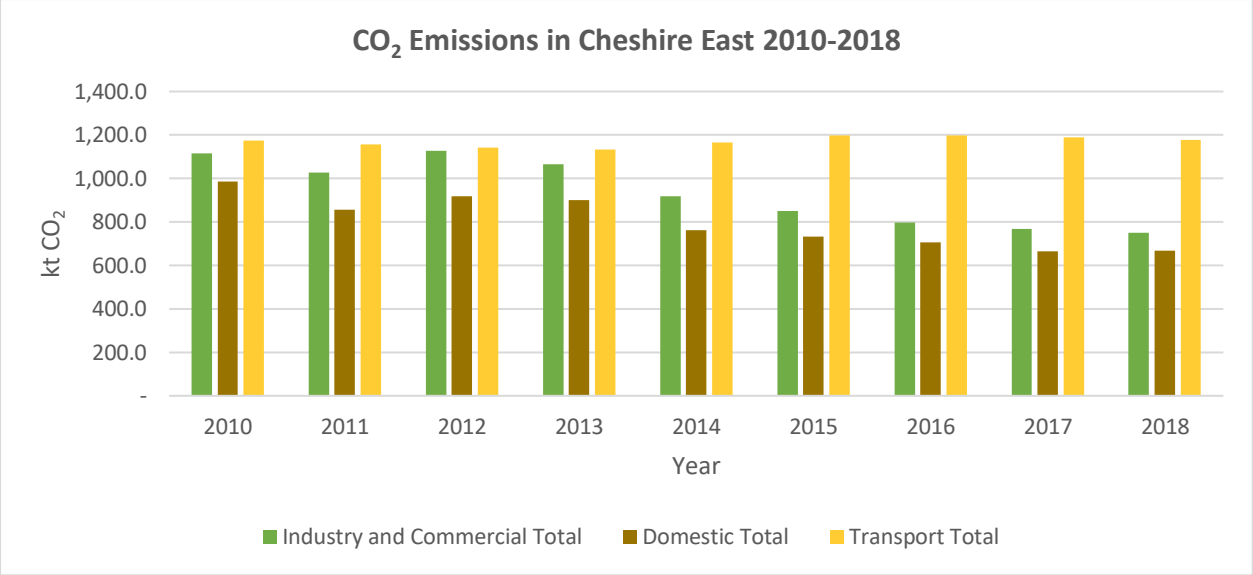
An alternative way of considering CO_2 emissions is on an end-user basis rather than a producer basis (which is the approach used in the 'by source' statistics used directly above). Statistics from the National Atmospheric Emissions Inventory[21] are prepared on an end-user basis, which means that emissions from the production and processing of fuels, including the production of electricity, are reallocated to users of these fuels to reflect total emissions for each type of fuel consumed.

The table below provides data on CO_2 emissions in Cheshire East by sector/activity in 2018. Road Transport (A roads, motorways, and minor roads) accounted for 3 of the top six emitters in 2018, with 'Domestic Gas' (426kt of CO_2) 'Industry & Commercial Gas' (332kt of CO_2), and Industry & Commercial Electricity (242kt of CO_2) also generating significant levels of emissions in the area.

CO_2 Emission in Cheshire East by Sector/Activity, 2018	
Sector Name	**CO_2 (kt)**
Industry & Commercial Electricity	242
Industry & Commercial Gas	332
Large Industrial Installations	14
Industrial & Commercial Other Fuels	114
Agricultural Combustion	48
Domestic Electricity	157
Domestic Gas	426
Domestic Other Fuels	84
Road Transport (A roads)	373
Road Transport (Motorways)	516
Road Transport (Minor roads)	205
Diesel Railways	18
Transport Other	68
LULUCF Net Emissions	-6
Total for all sectors	2,589
Source: National Atmospheric Emissions Inventory ***https://naei.beis.gov.uk/laco2app/***	

Considered over time (2010-2018) emissions in Cheshire East from 'Industry and Commercial' sources have declined by 35%, emissions from 'Domestic' sources have declined by 32%, whilst emissions from 'Transport' have remained a broadly the same level over this time period (a slight increase of 4kt between 2010 and 2018).

[21] https://naei.beis.gov.uk/



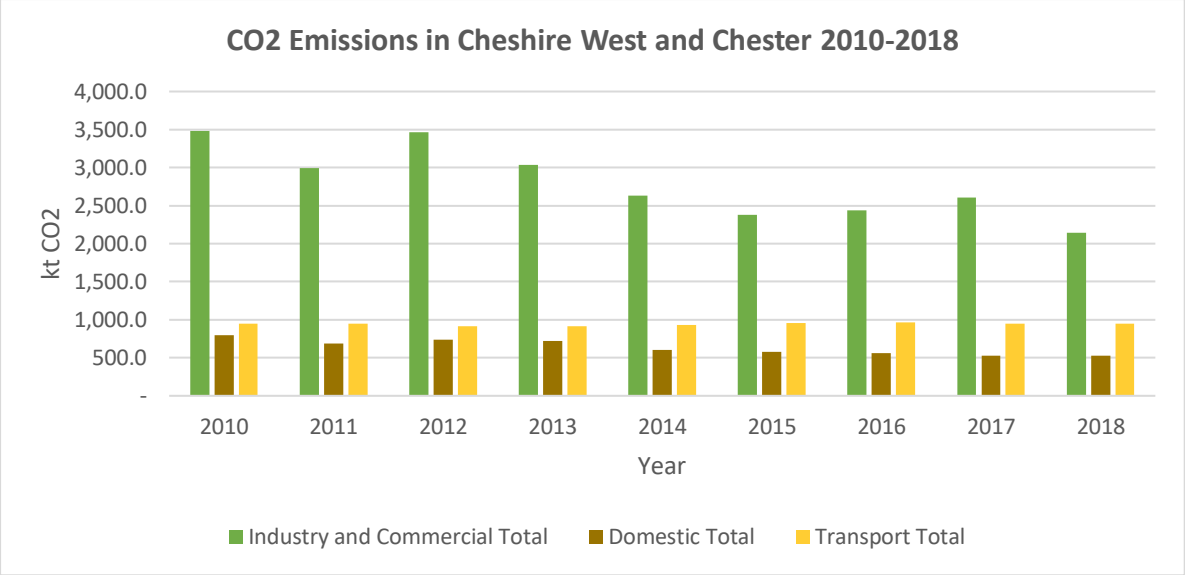
Source: Local Authority territorial CO2 emissions estimates 2005-2018

Cheshire West and Chester

The table below provides data on CO_2 emissions in Cheshire East by sector/activity in 2018 at a higher level of disaggregation than is given above. Emissions from 'Large Industrial Installations' (1,274kt of CO_2) are more than three times higher than any of the other individual categories although all the Transport categories, taken together, total to 950kt of CO_2.

CO_2 Emission in Cheshire West and Chester by Sector/Activity, 2018	
Sector Name	**CO_2 (kt)**
Industry & Commercial Electricity	373
Industry & Commercial Gas	315
Large Industrial Installations	1,274
Industrial & Commercial Other Fuels	148
Agricultural Combustion	37
Domestic Electricity	130
Domestic Gas	345
Domestic Other Fuels	55
Road Transport (A roads)	392
Road Transport (Motorways)	321
Road Transport (Minor roads)	179
Diesel Railways	10
Transport Other	48
LULUCF Net Emissions	-7
Total for all sectors	3,620
Source: National Atmospheric Emissions Inventory [***https://naei.beis.gov.uk/laco2app/***](https://naei.beis.gov.uk/laco2app/)	

Considered over time (2010-2018) emissions in Cheshire West and Chester from 'Industry and Commercial' sources have declined by 38%, emissions from 'Domestic' sources have declined by 34%, whilst emissions from 'Transport' have remained a broadly the same level over this time period (a slight decrease of 0.7kt between 2010 and 2018).



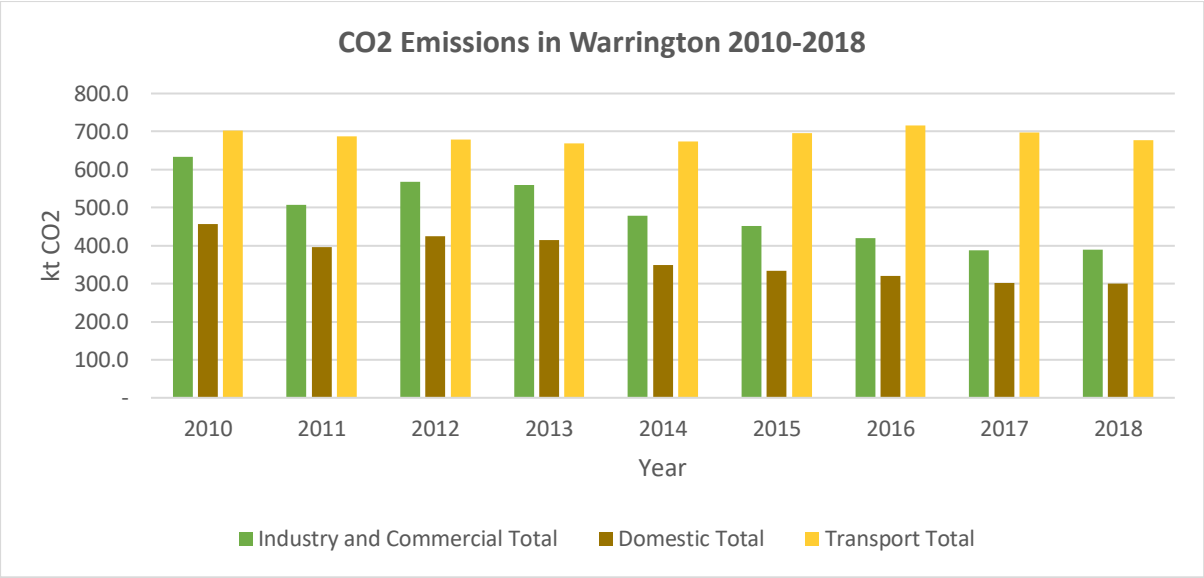
Source: Local Authority territorial CO2 emissions estimates 2005-2018

Warrington

The table below provides data on CO_2 emissions in Warrington by sector/activity in 2018 at a higher level of disaggregation than is given above. Emissions from 'Road Transport (motorways)' at 424kt of CO_2 accounts for more than 30% of Warrington's total CO_2 emissions and all Transport categories taken together account for 49% of the total.

CO_2 Emission in Warrington by Sector/Activity, 2018	
Sector Name	**CO_2 (kt)**
Industry & Commercial Electricity	139
Industry & Commercial Gas	210
Large Industrial Installations	4
Industrial & Commercial Other Fuels	33
Agricultural Combustion	3
Domestic Electricity	72
Domestic Gas	216
Domestic Other Fuels	12
Road Transport (A roads)	123
Road Transport (Motorways)	424
Road Transport (Minor roads)	116
Diesel Railways	12
Transport Other	3
LULUCF Net Emissions	12
Total for all sectors	1,379
Source: National Atmospheric Emissions Inventory [***https://naei.beis.gov.uk/laco2app/***](https://naei.beis.gov.uk/laco2app/)	

Considered over time (2010-2018) emissions in Warrington from 'Industry and Commercial' sources have declined by 38%, emissions from 'Domestic' sources have declined by 34%, whilst emissions from 'Transport' have seen a slight decline of 4% in this time.



Source: Local Authority territorial CO2 emissions estimates 2005-2018

5. LOW CARBON JOBS IN CHESHIRE AND WARRINGTON

Introduction

This section of the report focusses on the low carbon and renewable energy economy (LCREE) in Cheshire and Warrington with a discussion of its likely current size and structure, and forecasts for LCREE growth in Cheshire and Warrington by 2030. There is also a short discussion regarding the construction industry and construction skills in Cheshire and Warrington, as much of the expected increased demand for labour and skills in the LCREE will be in the construction sector. An alternative classification of 'Green Jobs', the 'Environmental Goods and Services Sector' (EGSS) is also briefly discussed with a focus on the likely current structure of EGSS in Cheshire and Warrington.

The low carbon and renewable energy economy in Cheshire and Warrington

The Government began to measure key dimensions of the national low carbon and renewable energy economy (LCREE) in 2014 (first reported in 2015).[22] Collected by way of a survey, these statistics provide annual estimates of low carbon and renewable energy economy activity in the UK: turnover, employment, exports, imports, and number of businesses. The table below sets out the LCREE groups with a description of each. A fuller breakdown of the 17 LCREE sectors can be found at Annex 2.

LCREE groups and description of activity	
Group	Description
Low- carbon electricity	Offshore wind, onshore wind, solar photovoltaic, hydropower, other renewable electricity, nuclear power, carbon capture and storage
Low- carbon heat	Renewable heat, renewable combined heat and power
Energy from waste and biomass	Bioenergy, alternative fuels
Energy-efficient products	Energy-efficient products, energy-efficient lighting, energy monitoring, saving or control systems
Low-carbon services	Low-carbon financial and advisory services
Low-emission vehicles and infrastructure	Low-emission vehicles and infrastructure, fuel cells and energy storage systems
Source: ONS	

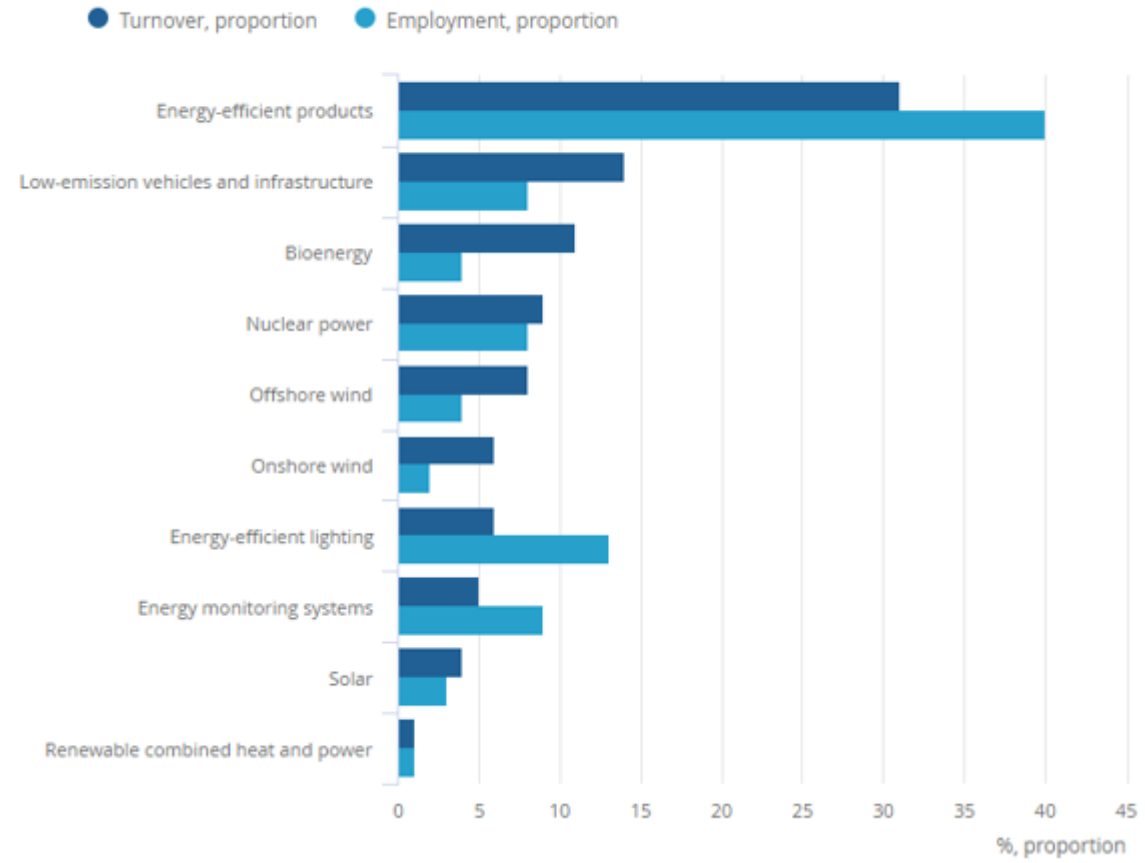
In 2018, the UK Government projected that LCREE could grow by 11 per cent per year up to 2030, which is substantially higher than the projected growth rate for the whole economy (estimated at 1-2% per year), illustrating the potential for green growth as driven by international, national, and local climate change targets. However, the LCREE overall has seen no significant change in size since the Office for National Statistics began publishing statistics on the sector in 2014.

Turnover in the UK LCREE was estimated to be £42.6 billion in 2019. Employment in the UK LCREE was estimated to be 202,100 full-time equivalent (FTE) jobs in 2019. Businesses classified within the manufacturing, energy supply and construction industries accounted for 82% of all UK LCREE

22 https://www.ons.gov.uk/economy/environmentalaccounts/datasets/lowcarbonandrenewableenergyeconomyfirstestimatesdataset

turnover in 2019, and 74% of all employment. The chart below from the ONS provides information on the overall share (turnover and employment) of selected sectors within the LCREE.

Proportion of low carbon and renewable energy (LCREE) turnover and employment, selected sectors, UK 2019



Source: ONS LCREE Survey, 2019

LCREE statistics do not disaggregate to regional, LEP or local authority level. The survey sample sizes are too small. There is, therefore, no official data on the size or composition of the LCREE in Cheshire and Warrington. What can be said with a reasonable degree of certainty is that, like the UK, the current low carbon and renewable energy economy in Cheshire and Warrington does not employ large numbers of people.

However, the official LCREE statistics do disaggregate across national industry sectors. One way of estimating the size and structure of the low carbon and renewable energy economy in Cheshire and Warrington is to assume that the national proportion of LCREE employment in industry sectors applies to those sectors in Cheshire and Warrington. This method clearly lacks precision, but it is one way of currently understanding what the overall size of LCREE in Cheshire and Warrington might be and what the composition of the LCREE in Cheshire and Warrington might look like.

This method has been used to generate the data in the table below. On this basis, the LCREE in Cheshire and Warrington might currently employ in the region of 4,000 people. This is less than 1% of all those employed in Cheshire and Warrington. Using this approach, most of the LCREE jobs in Cheshire and Warrington are likely to be in manufacturing, construction and professional, scientific and technical activities; with (very) small numbers employed in other sectors.

Low Carbon and Renewable Energy Economy (LCREE) estimates, employment by industry, Cheshire and Warrington, 2018	
Sector	Jobs
A : Agriculture, forestry and fishing	24
B : Mining and quarrying	2
C : Manufacturing	1562
D : Electricity, gas, steam and air conditioning supply	205
E : Water supply; sewerage, waste management and remediation activities	83
F : Construction	1345
G : Wholesale and retail trade; repair of motor vehicles and motorcycles	66
H : Transportation and storage	5
J : Information and communication	13
L : Real estate activities	4
M : Professional, scientific and technical activities	562
N : Administrative and support service activities	122
P : Education	4
S : Other service activities	13
Total	4012
Source: Brennan Wilson Ltd analysis of Low Carbon and Renewable Energy Economy (LCREE) survey estimates, UK, 2014 to 2018, (ONS) and BRES	

In 2015, Gyron produced a Low Carbon Action Plan for Cheshire and Warrington LEP[23]. In this report, it was estimated that Low Carbon industries employed 2,874 people and Renewable Energy industries employed 2,945 people. This gives an estimate for employment in these sectors 1,800 higher than the estimate generated by the analysis above.

The Environmental Goods and Services Sector in Cheshire and Warrington

Whilst the focus of this section of the report is on the low carbon and renewable energy economy in Cheshire and Warrington, it is worth pausing to briefly consider other ways of defining 'green jobs'. The environmental goods and services sector (EGSS) framework, adopted under the UN System of Environmental Economic Accounting, provides a set definition and specification of activities that start to represent the green economy. A wide variety of sources are used for the collation of ONS EGSS estimates.

The environmental goods and services sector is made up of areas of the economy engaged in producing goods and services for environmental protection purposes, as well as those engaged in conserving and maintaining natural resources. Excluded from the scope of EGSS are goods and services produced for purposes that, while beneficial to the environment, primarily satisfy technical, human, and economic needs or that are requirements for health and safety. Goods and services related to minimising the impact of natural hazards and those related to the extraction, mobilisation and exploitation of natural resources are also excluded.

[23] http://www.871candwep.co.uk/content/uploads/2015/11/CW_LCAP_Technical_Report_06Oct2015.pdf, P12-13

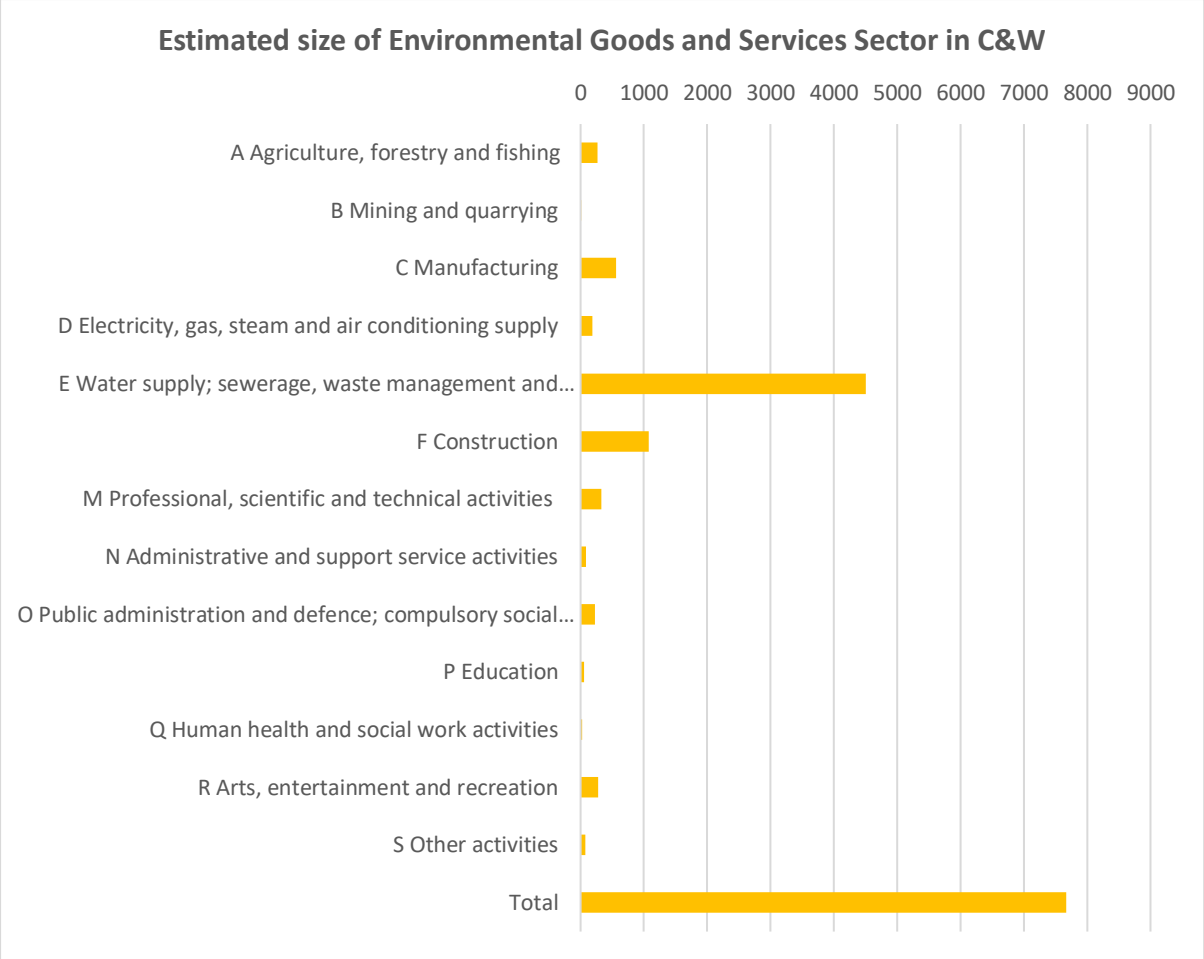
In the UK, the EGSS comprises 17 different types of activity shown in the table below.

Activities delivered by the Environmental Goods and Services Sector in the UK
Waste
Production of renewable energy
Recycling
Wastewater
Water quantity management
Environmental charities
Managerial activities
Management of forest ecosystems
Insulation activities
In-house environmental activities
Organic agriculture
Envrionmental related education
Energy Saving and Sustainable Energy Systems
Environmental Consultancy and Engineering
Environmental Related Construction
Environmental low emission vehicles, carbon capture and inspection and control
Production of industrial environmental equipment
Source: ONS

A diverse range of industries are involved in the production of environmental goods and services. The ONS provide breakdowns of EGSS estimates by standard industrial classification (SIC)[24]. Using a similar approach to that used for the LCREE above, it is possible to estimate the size and structure of the EGSS in Cheshire and Warrington by assuming that the national proportion of EGSS employment in industry sectors applies to those sectors in Cheshire and Warrington. The chart below has been produced on this basis.

From this we might estimate that the EGSS employs approximately 7.5k people (1.5% of the workforce) in Cheshire and Warrington, with over half of those being employed in the "Water supply; sewerage, waste management and remediation activities" sector; with some additional employment in construction and manufacturing.

[24] https://www.ons.gov.uk/economy/environmentalaccounts/bulletins/ukenvironmentalaccounts/2010to2015



Source: Brennan Wilson Ltd analysis of BRES and ONS EGSS Estimates

Drivers of new employment opportunities

Whilst the type of top-down estimates discussed above have some utility in establishing the overall size and structure of the LCREE and EGSS in Cheshire and Warrington, they lack the granularity required to inform partner action. Another approach is to consider the likely, or confirmed, pipeline of activities that will drive the future demand for labour in the LCREE in Cheshire and Warrington.

All large-scale renewable energy projects will require planning permission. The Department for Business, Energy & Industrial Strategy (BEIS) publishes a Renewable Energy Planning Database (REPD). The database tracks the progress of renewable electricity through the following stages:

- inception
- planning
- construction
- operation
- decommissioning

The intention of BEIS is that the REPD provides an accurate and comprehensive as possible snapshot of renewable electricity projects and progress across the technology sectors. The REPD is updated during the month following the end of each quarter. The data is sourced mostly from the web and developers.

The table below sets out details of the Operator, Technology and Development Status of all renewable energy projects in Cheshire and Warrington for which a planning application had been submitted/approved, or where the project is awaiting construction or is under construction.

Renewable Energy Projects in Cheshire and Warrington (Operator, Technology and Development Status) as of Feb 2021			
Cheshire West and Chester			
J H Willis & Son Ltd	Holme Farm	Anaerobic Digestion	Awaiting Construction
SEP Elton	Land at Elton Farm	Solar Photovoltaics	Application Submitted
SEP Puddington	Land West of Vicarage Lane	Solar Photovoltaics	Application Submitted
This is Protos (Peel Environmental)	Plot 8 Protos/Ince Marshes (resubmission)	Energy from waste (EfW) Incineration	Under Construction
Engie	CF Fertilizer site	Anaerobic Digestion	Awaiting Construction
Barnstone Estate	Crewe Hill Farm	Anaerobic Digestion	Awaiting Construction
UK Power Reserve	Oil Sites Road	Battery	Awaiting Construction
Peel Environmental / Waste2tricity	Protos Plastics to Hydrogen Facility (Ince)	Advanced Conversion Technologies	Awaiting Construction
Cheshire East			
Green Switch Solutions - Liquidated	Hatherton Lodge	Solar Photovoltaics	Awaiting Construction
TGC Renewables/NESF	Land at Moss Farm (South)	Solar Photovoltaics	Awaiting Construction
TGC Renewables/NESF	Land at Moss Farm (North)	Solar Photovoltaics	Awaiting Construction
Energy Demand and Response	Leighton Hall Farm	Battery	Awaiting Construction
Intelligent Alternatives	Drury Lane	Solar Photovoltaics	Awaiting Construction
Warrington			
SBC Renewables	Johnson's Lane (resubmission) - Warrington	Solar Photovoltaics	Awaiting Construction
Amazon UK Services / Push Energy	Amazon Omega Business Park	Solar Photovoltaics	Awaiting Construction
Source: Renewable energy planning database			

There are a number of other significant projects in the pipeline, some of which have not yet reached the planning permission stage. Many of these are set out on the Net Zero North West website[25].

[25] https://netzeronw.co.uk/projects/

They include:

E-Port

E-Port will deliver a blueprint for unlocking capital investment in a net zero carbon industrial cluster in the Ellesmere Port region over a 10-year period. It will define a range of future local energy system designs to inform a range of potential capital investment opportunities in infrastructure, energy generation/distribution/storage, control systems, and related products and services able to provide secure, low carbon, affordable energy.

HyNet

HyNet offers a low cost, low risk route to decarbonise the North West industrial cluster and other sectors of the regional economy. Kick starting the hydrogen economy, it will deliver a material contribution to Net Zero and considerable economic benefit. Repurposing Liverpool Bay gas fields infrastructure will provide a low capital entry for CCUS deployment of 1 million tonnes of CO2 per year with incremental growth to 10 million tonnes per year and beyond. Operations will start in 2025 subject to consenting and Government Business Models for Low Carbon Hydrogen and CCUS.

Protos

Protos is a strategic cluster of energy generation and energy intensive industry in Cheshire. With over 54 hectares consented and a wider masterplan extending to 280 hectares. Existing infrastructure includes a 50 MW wind farm and 26MW biomass facility. Protos has the opportunity for carbon capture and storage and will provide multi energy vector local networks to support energy intensive industry.

Project Vanguard

Storengy UK in partnership with Cheshire East Council will be building a green hydrogen refuelling station in Middlewich, Cheshire. The facility will produce hydrogen in the greenest way possible – using an electrolyser connected to solar panels. This will provide safe, clean hydrogen fuel, which will be pumped into dual-fuel bin trucks used by the council and a Storengy works vehicle. The project will see a reduction of diesel usage by more than 10,000 litres per year, reducing CO2 emissions and improving local air quality benefits.

Focus on Construction

The future demand for labour associated with the development of the low carbon and renewable energy economy will arise firstly from the establishment of the infrastructure required to deliver the LCREE in Cheshire and Warrington and secondly from delivery itself. In the short-run opportunities typically relate to the construction and installation of technologies, whereas medium- to longer-term opportunities also relate to production and R&D related to these technologies.

The sequencing suggested in the paragraph above helps us to consider what the demand for labour in the infrastructure development phase will look like in the coming years, for example:

- For **housing energy efficiency**, the installation of loft insulation; solid wall insulation; cavity wall insulation; floor insulation; and high efficiency glazing.
- For **solar photovoltaics**, Level 3 Electrical Installations qualifications will be required to install grid connected solar.
- For **nuclear**, there will be demand for construction workers that have non-nuclear specific skills (including highly skilled roles in, for example, welding), as well as civil contractors and mechanical engineers.
- For **anaerobic digestion** (AD) there will be a requirement for specialist grid-connection engineers and operators who ensure grid connections are safe.

- For low carbon **heat pumps**, the current challenge is primarily one of training and upskilling the 133,000 existing Gas Safe engineers in the country.
- For **carbon capture, utilisation and storage** (CCUS) and hydrogen, there will be a requirement for the construction and operation of scale pilot projects for hydrogen production (eg Hynet) and the construction and operation of CCUS infrastructure in high emitting industrial clusters.
- For **Electric Vehicles** (EV), the construction and operation of EV charging infrastructure and the transition in manufacturing.
- For **active travel equipment and infrastructure**, the construction and operation of: walking schemes and networks; cycling infrastructure schemes and networks; and traffic calming schemes.
- For **natural capital**, creating, maintaining or restoring non-woodland ecosystems (e.g. wetlands); woodland ecosystems; saltmarshes and peatlands for carbon sequestration; and parks and urban green space.

An important subset of the construction activity discussed above is the need to decarbonise the built environment. Decarbonisation of the built environment can be split into new-build and existing buildings. 95% of emissions from the built environment over the next 30 years could come from buildings that exist today[26]. Most of the effort to decarbonise the built environment must therefore be focused on the energy efficiency retrofit of existing buildings. In March 2021, the Construction Industry Training Board (CITB) published a report that focussed on the skills needed to decarbonise the built environment[27]. CITB estimate that retrofit will be required on 27 million domestic properties and 2 million other buildings.

Using data from the Climate Change Committee (CCC)'s balanced scenario[28], CITB modelling suggests that nationally, an additional 350,000 FTE workers will be needed by 2028, to be mainly involved in delivering improvements to existing buildings that will reduce energy demand. That represents an increase of around 13% on the current size of the construction workforce, based on current technologies and ways of working.

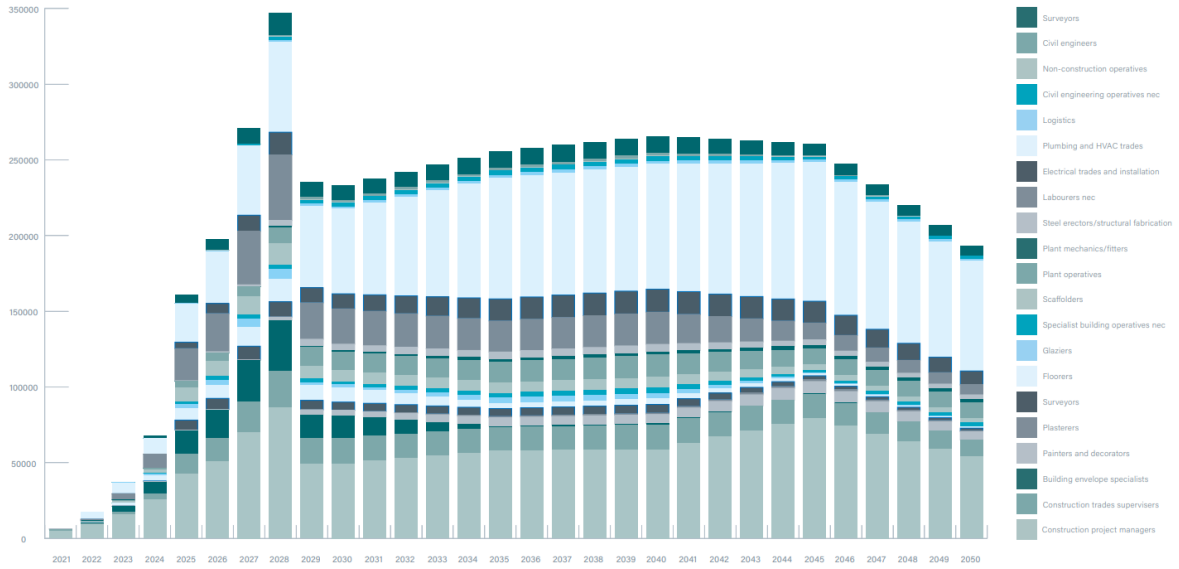
CITB is concerned that "the training sector is predominantly demand-led, so a likely rapid increase in the need for low-carbon skills in the long term, particularly in retrofit, will not be met unless that demand is created….. We will need Government to provide clearer signals about future pipelines of work, and a rapid response from the training sector to deliver the right skills."

CITB estimate that an additional 59,000 plumbers and heating, ventilation and air conditioning (HVAC) workers will be required, primarily in the installation of heat pumps by 2028. The CITB research also highlights that there is a requirement of just over 86,000 project managers by the same date, this includes specific roles like Retrofit Coordinator. The requirement for building envelope specialists, including insulation installers, will be 27,000 in 2028.

The chart below is taken from the CITB report and models the additional national demand for construction specialists to 2050, based on the CCC central scenario published alongside its sixth carbon budget.

[26] UK Green Building Council, quoted in "Building Skills for Net Zero", CITB
[27] https://www.citb.co.uk/about-citb/construction-industry-research-reports/search-our-construction-industry-research-reports/sustainability/building-skills-for-net-zero/
[28] https://www.theccc.org.uk/publication/sixth-carbon-budget/

Employment requirement for Net Zero



Source: CITB Net Zero Report

The CITB report discusses the skill requirements associated with five pathways:

- Hydrogen
- Fabric First
- Heat Pumps
- Heat Networks
- On-site energy

The CITB analysis is summarised below.

Hydrogen

The high-hydrogen pathway requires that affordable, low-carbon hydrogen can be generated and delivered to households and businesses through the existing gas network. CITB conclude that any hydrogen pathway could be accommodated within the existing workforce for installation. The issues for the short, medium, and long-term are summarised in the table below which is taken from the report.

Hydrogen Skills Summary

Timeframe	Skills Summary
1-4 years	Existing gas installers will be able to re-train and install hydrogen-ready boilers, with an additional 200 FTE per year on average
5-10 years	Existing gas installers can continue re-fitting with hydrogen-ready boilers and begin conversion as hydrogen becomes available. 1,500 additional FTE per year average.
10 years plus	Continuation of re-fit and conversion programmes until all connected properties are converted. Workers then employed in maintenance. Steady reduction in numbers required - 500 FTE average

Source: CITB Net Zero Report

Fabric First

It is this pathway that causes significant concern to CITB because improving the fabric energy efficiency of every building in the country is a colossal task. Some of the required roles, such as surveying and designing each project, require deep knowledge of building systems, considerable experience, and specialised training. However, many of the installation tasks can be delivered with lower levels of training. CITB argue that "there is no time to lose in developing the capacity to deliver the training required". The CITB model suggests that there is a requirement the region of 12,000 new workers to be trained every year for about the next seven years, resulting in an increase over this period of about 100,000 workers. However, there is then a significant fall off in the demand for labour in this area.

The issues for the short, medium, and long-term are summarised in the table below which is taken from the report.

Fabric First Skills Summary

Timeframe	Skills Summary
1-4 years	A very rapid development of training facilities and courses is required, to train around 12,000 people a year.
5-10 years	Continuing growth in training requirement at around 30,000 a year, the balanced scenario has a sharp drop-off in the requirement toward the end of this period, as all opportunities to undertaken certain measures (e.g. cavity wall insulation) are exhausted.
10 years plus	No further training required. A continuing decline in the numbers required, as opportunities for further measures are exhausted.

Source: CITB Net Zero Report

Heat Pumps

Heat pumps are almost certain to be a key technology in decarbonising the built environment. The skills required to install them are different from those required to install conventional heating systems. They are also more efficient when installed alongside improved energy efficiency, distribution and management systems, so a familiarity with these disciplines among heat pump installers would be an advantage. A major effort will be required to train enough competent installers but for most pathways, the scale is within the capacity of existing training resources. A balanced scenario would require between 7,500 and 15,000 heat pump installers a year to be trained over the next seven years, resulting in an additional resource of around 60,000 workers. These workers would then be required for most of the next twenty years, with demand gradually tailing within the range of natural attrition.

The issues for the short, medium, and long-term are summarised in the table below which is taken from the report.

Heat Pumps Skills Summary

Timeframe	Skills Summary
1-4 years	A rapid increase in training will be required, of around 7,500 installers a year. This is within the capacity of existing training facilities.
5-10 years	An increase in the rate of training, up to a peak of around 15,000 a year. Towards the end of this period, this will exceed existing training capacity but increasing this within this period is manageable.
10 years plus	Ongoing work for the workforce, with a gradual reduction in the requirement for installers, as new installations give way to maintenance work. Limited ongoing training requirement.

Source: CITB Net Zero Report

Heat Networks

Significant deployment of heat networks will require a sharp increase in training, as the sector is currently under-staffed and skills required are typically technical, requiring existing experience and long training courses. The main skills gaps include strategic level project planners, engineers and developers, design engineers and control systems / PLC specialists, and at an installation level, welders, and general installers.

Heat Networks Skills Issues

Timeframe	Skills Summary
1-4 years	Significant additional training capacity, 9500 average additional FTE per year, including predominantly specialist and technical skills.
5-10 years	Reduction in rate of training to 866 average additional FTE per year
10 years plus	Reduction in numbers required - 1200 FTE per year

Source: CITB Net Zero Report

On-site energy

This area includes a wide range of technologies, many of which bring new opportunities for decarbonisation. These include on-site generation, energy storage and smart systems, as well as the interaction between them. In CITB's view, on-site energy systems are often straightforward to install, requiring at most conventional electrical and plumbing skills. Widespread deployment will not present a significant skills challenge.

The issues for the short, medium, and long-term are summarised in the table below which is taken from the report.

On-site energy

Timeframe	Skills Summary
1-4 years	Limited additional training required. 5000 average additional FTE per annum
5-10 years	Limited additional training required. 450 additional FTE per annum
10 years plus	Limited additional training required. -750 annual average reduction in numbers required

Source: CITB Net Zero Report

Demand for labour in construction in C&W

What the above highlights is that much of the initial employment generated in the LCREE will be in the construction sector. The construction industry in Cheshire and Warrington employs 21,000 people in 4,665 establishments, with a current location quotient of 0.85. In other words, if the Construction sector in Cheshire and Warrington had the same share of employment as it has nationally, the sector would employ a further 3,700 people in the sub-region.

The table below disaggregates this data by subsector, ranked by location quotient (LQ). A sector with a high LQ indicates competitive advantage in that type of activity for the place concerned.

The sub-sector with the highest LQ in Cheshire and Warrington is "Construction of Utility Projects for Electricity and Telecommunications" with an LQ of 2.32. This sector class includes the construction of distribution lines for electricity and telecommunications and related buildings and structures. This will include civil engineering constructions for long-distance and urban communication and power lines and power plants. It seems highly probable that many renewable energy projects in Cheshire and Warrington and beyond will involve this type of construction company.

Similarly, Cheshire and Warrington has a competitive advantage in "Construction of Other Civil Engineering Projects n.e.c." (LQ of 1.27) which includes construction of industrial facilities (except buildings) such as refineries and chemical plants. It is likely that hydrogen/CCUS projects, for example, will involve this type of construction company.

Conversely, Cheshire and Warrington has relatively low location quotients for "Electrical Installation" (LQ of 0.7) and "Plumbing, Heat and Air-conditioning Installation" (LQ of 0.4) and so may be less well positioned for construction activities related to, for example, heat pumps and photovoltaic.

Demand for skills: Construction sub-sectors in Cheshire and Warrington				
Sub-sector	2021 Jobs	Avg. Wages Per Job	2021 LQ	2020 Establishments
Construction of Utility Projects for Electricity and Telecommunications	597	49192	2.32	13
Test Drilling and Boring	111	33788	1.95	2
Construction of Roads and Motorways	1270	40307	1.57	84
Construction of Railways and Underground Railways	374	43584	1.41	61
Construction of Other Civil Engineering Projects n.e.c.	2456	38998	1.27	220
Other Specialised Construction Activities n.e.c.	2024	32474	1.14	333
Floor and Wall Covering	338	32749	1.09	109
Construction of Residential and Non-residential Buildings	6407	38338	0.99	976
Other Construction Installation	627	31508	0.83	128
Construction of Water Projects	28	32528	0.79	4
Roofing Activities	388	31191	0.78	106
Demolition	113	29913	0.78	12
Electrical Installation	2652	32892	0.70	615
Painting and Glazing	450	27248	0.69	163
Site Preparation	213	37142	0.66	39
Development of Building Projects	878	33844	0.58	736
Joinery Installation	472	27224	0.43	329
Plumbing, Heat and Air-conditioning Installation	1165	30620	0.40	434
Other Building Completion and Finishing	386	27123	0.39	231
Construction of Utility Projects for Fluids	31	30228	0.35	10
Plastering	47	32084	0.26	59
Construction of Bridges and Tunnels	0	0	0.00	0
Source: EMSI Analyst				

Supply of skills in construction

There were 21,582 apprenticeship starts in Building and Construction in England in 2019/20. This equated to 9.2 starts per 10,000 employees. The equivalent figures for Cheshire and Warrington were 370 starts equivalent to 9.3 starts per 10,000 employees. The table below provides data on the level of Construction Apprenticeship starts in 2019/20 in Cheshire and Warrington. 45% were at Level 2, 38% were at Level 3 and 16% were at Level 4 and above.

Apprenticeship starts in building and construction by C&W residents, 2019/20, by level		
Intermediate Apprenticeship	Advanced Apprenticeship	Higher Apprenticeship
168	142	60
Source: DfE		

All apprenticeship frameworks/standards in building and construction with more than 10 starts by Cheshire and Warrington residents in 2018/19 are set out in the table below.

Supply of skills: building and construction starts on apprenticeship frameworks and standards (>10 starts) in Cheshire and Warrington, all ages, 2019/20	
Framework/Standard	**Starts**
Advanced Carpentry and Joinery	14
Bricklayer	26
Carpentry and Joinery	59
Chartered Surveyor (Degree)	26
Civil Engineer (Degree)	12
Construction Management	12
Construction Skills	107
Maintenance and Operations Engineering Technician	34
Science Industry Maintenance Technician	31
All starts	**370**
Source: DfE	

In 2019/20, there were 207 AEB-funded learning aim enrolments in building and construction at levels 2-7 by residents of Cheshire and Warrington who were aged 19 and over. There were only four learning aims with more than 12 enrolments. These are set out in the table below. The L3 electrical installations qualification, if achieved alongside other qualifications (eg wiring regulations, inspection and testing), does provide entry to work as an electrician. The L2 doesn't. L3 is the minimum prior achievement requirement for training in the NICEIC qualification for PV installation[29]. Similarly, fully qualified plumbers need to achieve L3, although the minimum prior achievement requirement for taking the NICEIC heat pump qualification is at L2[30].

AEB funded learning aim enrolments (>12) at level 2 and above in building and construction in C&W 2019/20		
Learning Aim Title	**Level 2**	**Level 3**
Diploma in Electrical Installations (Buildings and Structures)	42	30
Diploma in Plumbing Studies	28	14
All starts	**135**	**70**
Source: DfE		

[29] https://www.niceic.com/contractor/training-courses/renewables-courses/solar-photovoltaic-(pv)
[30] https://www.niceic.com/contractor/training-courses/renewables-courses/heat-pumps

Both NICEIC qualifications mentioned above meet the requirements of the Microgeneration Certification Scheme (MCS)[31]. The independent MCS Charitable Foundation was created by the government to protect and conserve the environment, by increasing confidence and awareness amongst the UK public of the value of renewables and low carbon technology. MCS certifies low-carbon products and installations used to produce electricity and heat from renewable sources.

Qualified electricians and plumbers can become MCS certified installers by taking short courses in:

- Solar Photovoltaic (PV)
- Solar Photovoltaic (PV) Maintenance
- Solar Thermal Hot Water
- Heat Pumps

These courses are typically 5 days in duration and cost between £500 and £1000.

In 2019/20, there were 317 AEB-funded learning aim enrolments in building and construction at level 1 by residents of Cheshire and Warrington who were aged 19 and over. There were only five learning aims with more than 12 enrolments. These are set out in the table below.

AEB funded learning aim enrolments (>12) at level 1 in building and construction in C&W 2019/20	
Learning Aim	**Enrolments**
Certificate in an Introduction to Construction (RQF)	12
BTEC Certificate in Construction	17
Diploma in Plumbing Studies	18
Diploma in Carpentry and Joinery	19
Award in Construction Crafts	180
Total enrolments	**317**
Source: DfE	

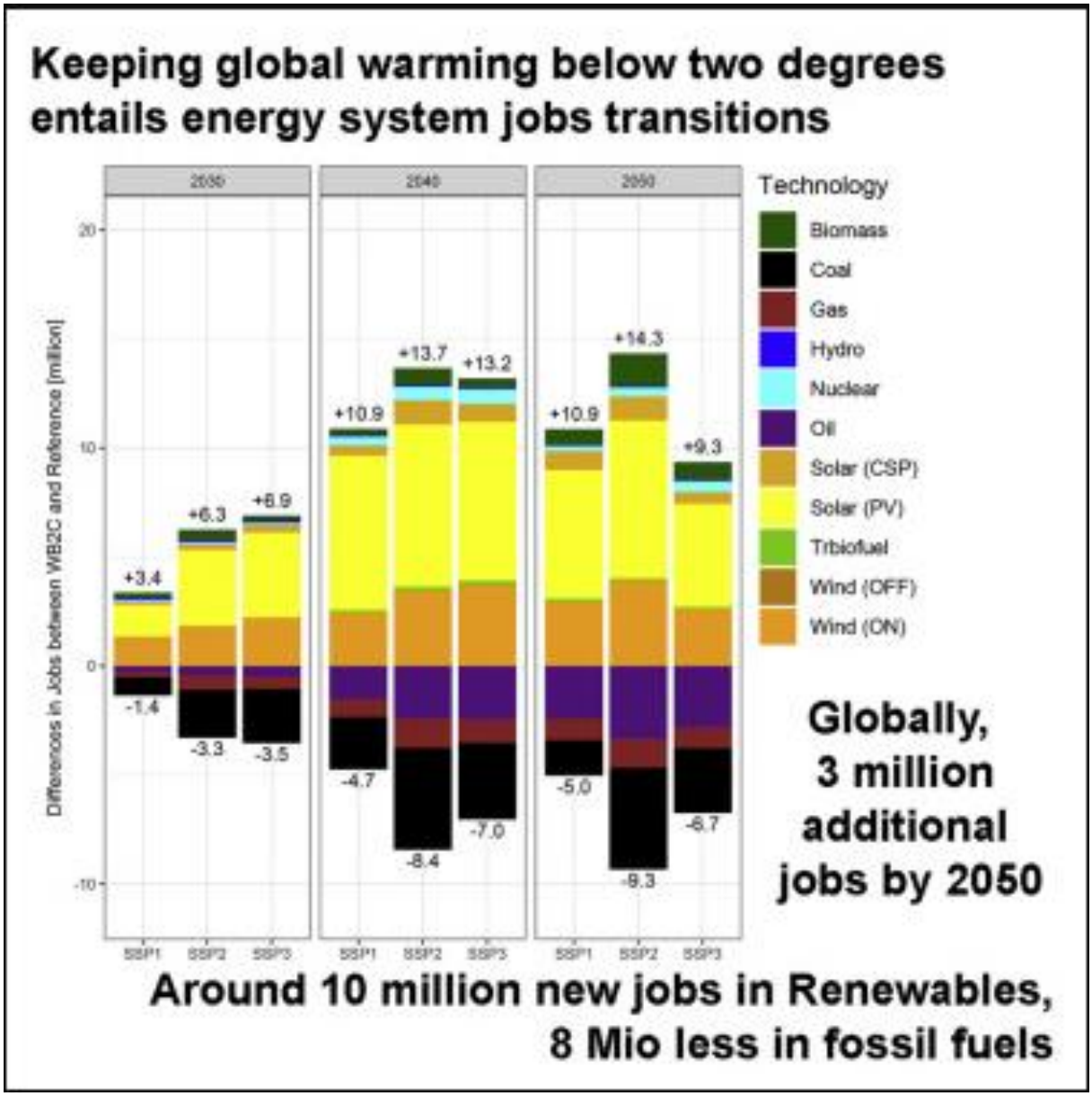
The impact of low carbon on energy sector jobs globally

Research focussing on 11 energy sectors[32] published in the Journal 'One Earth'[33] suggests that by 2050, energy sector jobs would grow from today's 18 million to 26 million under a "well below 2°C" (WB2C) scenario compared with 21 million under the current policy scenario. Fossil fuel extraction jobs would rapidly decline, but losses will be compensated by gains in solar and wind jobs, particularly in the manufacturing sector (totalling 7.7 million in 2050). The analysis includes three scenarios for WB2C: a middle-of-the road scenario (SSP2), where socioeconomic trends and technological change follow historical trends; a fossil-rich world (SSP3), where climate change mitigation becomes a larger challenge; and, a sustainable world rich in green technologies (SSP1). The findings of the research are illustrated in the figure below.

[31] https://mcscertified.com/about-us/

[32] Coal; Gas; Oil; Nuclear; Hydropower; Solar (PV); Solar (CSP); Traditional biofuels; Wind (onshore); Wind (offshore); and Solid biomass.

[33] https://www.cell.com/one-earth/fulltext/S2590-3322(21)00347-X



LCREE job growth forecasts for Cheshire and Warrington

In 2020, the Local Government Association published a report commissioned from Ecuity Consulting which estimated the total number of low-carbon jobs generated by England's net zero transition by 2030 and 2050[34]. The number of direct jobs estimated covered the value chain from manufacturing, construction and installation to operation and maintenance. This research found that there could be as many as 694,000 direct jobs employed in the low-carbon and renewable energy economy by 2030 in England, rising to over 1.18 million by 2050.

Ecuity estimated that nearly half (46%) of the total low-carbon jobs by 2030 will be in clean electricity generation and providing low-carbon heat for homes and businesses. These jobs will range from manufacturing wind turbines, deploying solar PV, constructing nuclear reactors, installing heat pumps and maintaining energy-system infrastructure. Over one-fifth (21%) of jobs by 2030 will be involved in installing energy efficiency products ranging from insulation, lighting, and control

[34] https://www.ecuity.com/press-release/local-green-jobs-accelerating-a-sustainable-economic-recovery

systems. Around 19% of jobs in 2030 will be involved in providing low-carbon services (financial, legal and IT) and producing alternative fuels such as bioenergy and hydrogen. A further 14% of jobs will be directly involved in manufacturing low-emission vehicles and the associated infrastructure. These jobs will range from manufacturing electric vehicles (and hydrogen vehicles), manufacturing EV batteries from the proliferation of gigafactories in England and sustaining low-carbon mobility by installing electric vehicle charge-points and hydrogen refuelling stations.

As part of this research, Ecuity interviewed industry stakeholders on a range of issues, including the skills gaps that are expected to emerge. Those sub-sectors that are considered to have key near-term (2020 – 2025) skills gaps are coloured red in the figure below, those that are considered to have a skills gap emerging in the longer-term (2025 – 2035) are coloured yellow.

Sub-sector		Comment on skill gap areas	Time horizon
Low-carbon electricity	Solar	Supply chain considered relatively secure, however an uptick in demand would require technicians to be trained at **NVQ level 3** equivalent to develop a larger installer base to deliver grid connected solar for utility scale/decentralised generation.	
Low-carbon electricity	Nuclear	Entire supply chain in need of upskilling to meet emerging demand; **NVQ level 1 – 3** for construction; **NVQ level 4+** for design and planning.	
Low-carbon heat	Heat pumps	Key skills gap area to meet increasing demand is in the design, specification and installation of heat pumps; **NVQ level 2 – 3.**	
Alternative fuels	Anaerobic digestion	To meet forecasted demand, higher skill levels would be required **NVQ 4+** to design and connect AD plants to the grid and ensure biomethane is of sufficient quality for DNOs.	
Alternative fuels	Hydrogen fuel cells	Highly skilled jobs (**NVQ level 4+)** for R&I required in future; a good stock of technicians expected to be available from existing automotive sector to meet manufacturing demand (i.e. NVQ 1 – 3).	
Energy efficient products	Smart controls	Highly skilled **NVQ level 4+** in software engineering is considered as a key skill to enable future innovations within the sub-sector; good stock of manufacturing technicians expected to be available (NVQ 1 – 3) for manufacturing demands.	
Low-carbon services	Consultancies and financial services	Highly skilled **NVQ level 4+** demand is ongoing and required to ensure service sector organisations can exploit emerging opportunities.	
Low emission vehicles and infrastructure	Electric vehicles	Sector is expected to preserve jobs across all NVQ levels as existing, large automotive capacity in UK switches to ULEV technology. Ongoing R&I activities demands highly skilled researchers **NVQ Level 4+.**	

Key		
	Sub-sectors that are considered to have key near-term (2020 – 2025) skills gaps	
	Sub-sectors considered to have a skills gap emerging in the longer-term (2025 – 2035)	

Source: Ecuity/LGA, Local green jobs – accelerating a sustainable economic recovery

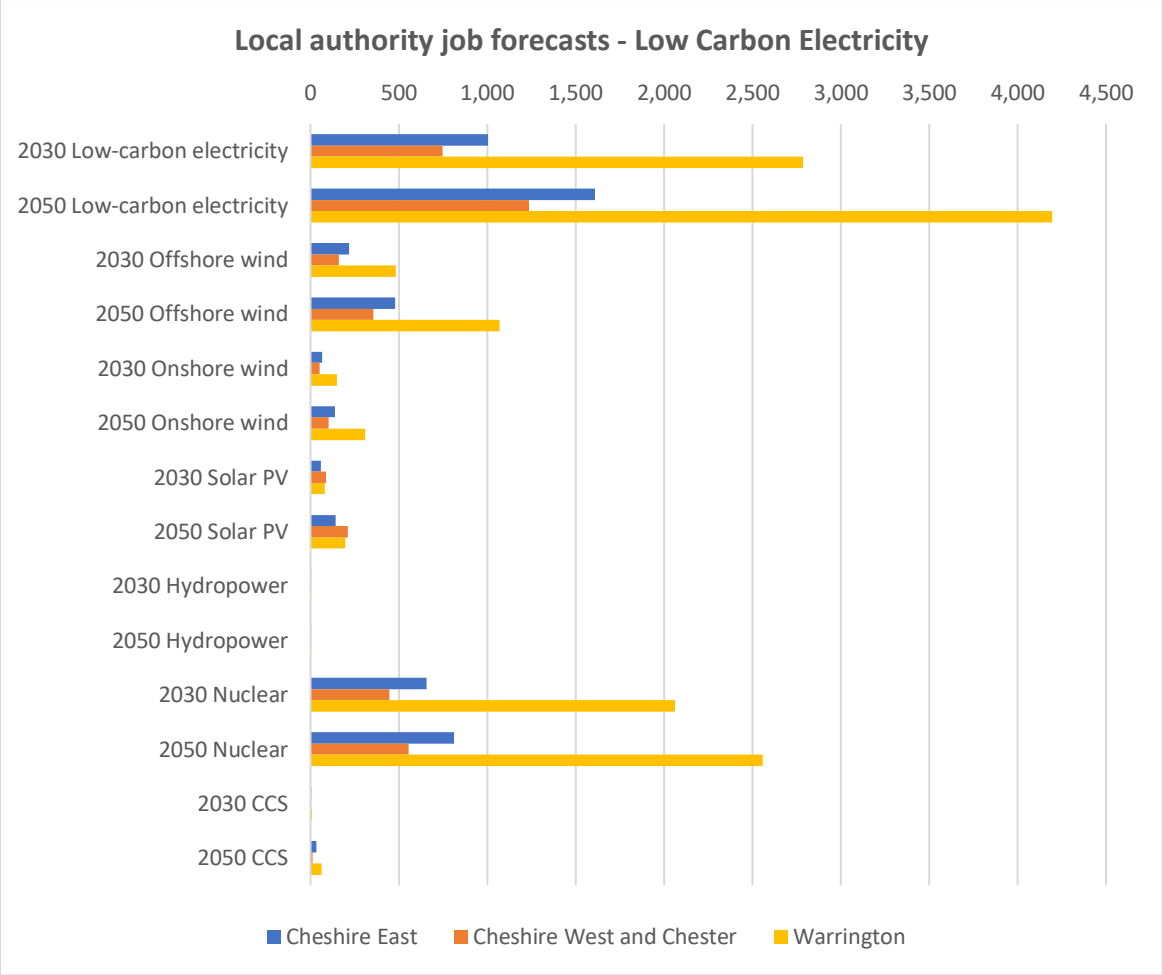
The LGA has also published a local-authority level disaggregation of the Ecuity forecasts[35]. There are several issues with these forecasts. Firstly, they do not include a baseline, so it is not possible to establish the extent to which the forecast 2030 demand for labour is additional to the current situation. Secondly, it is questionable whether a methodology that disaggregates national forecasts based on current industrial structures (as the Ecuity forecasts do) can be regarded as robust. The Ecuity methodology pays no regard to local initiatives. Thirdly, job creation in this area is highly sensitive to the policy context, so when policy changes (as it did in April 2021 with the adoption of a new UK 2035 target), the likely job impacts will also change. Fourthly, an increase in the volume of jobs in the low carbon and renewable energy economy does not necessarily lead to a net increase in jobs in the wider economy. For example, more plumbers will be installing hydrogen but fewer will be installing gas central heating. Fifthly, forecasting jobs volumes disaggregated by industry and location to 2050 can, at best, be described as ambitious.

However, in the absence of any other local forecasting of labour demand in the LCREE at a local level, the forecasts to 2030 are discussed below. The charts below also include the 2050 data provided by Ecuity (for information). Ecuity forecast that there will be c15,000 jobs in Cheshire and Warrington in the low carbon and renewable energy economy in 2030. This is almost four time the estimate of current volumes (c4,000) reported above. These are forecast to split approximately 6,000 jobs in Cheshire East, 4,000 in Cheshire West and Chester, and 5,000 in Warrington.

Low Carbon Electricity

Ecuity forecast that there will be c4,500 jobs in Cheshire and Warrington in low carbon electricity by 2030 with over half of those (c2,800) located in Warrington and over two thirds (c3,200) being in nuclear.

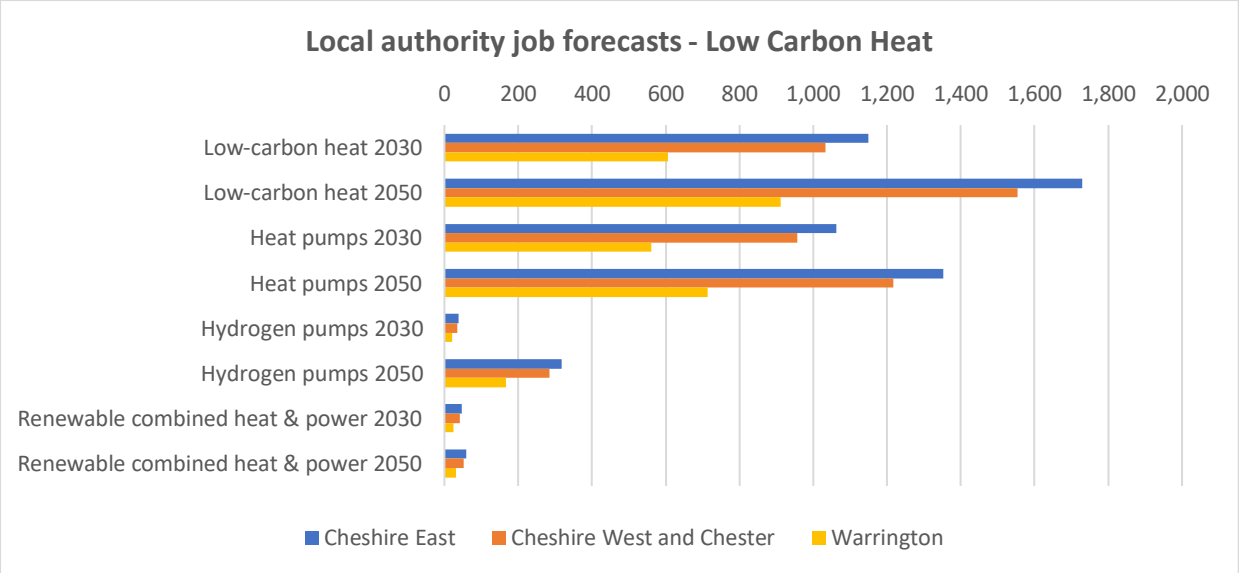
[35] https://lginform.local.gov.uk/reports/view/lga-research/estimated-total-number-of-direct-jobs-in-low-carbon-and-renewable-energy-sector?mod-area=E09000006&mod-group=AllBoroughInRegion_London&mod-type=namedComparisonGroup



Source: Ecuity/LGA, Local green jobs – accelerating a sustainable economic recovery

Low Carbon Heat

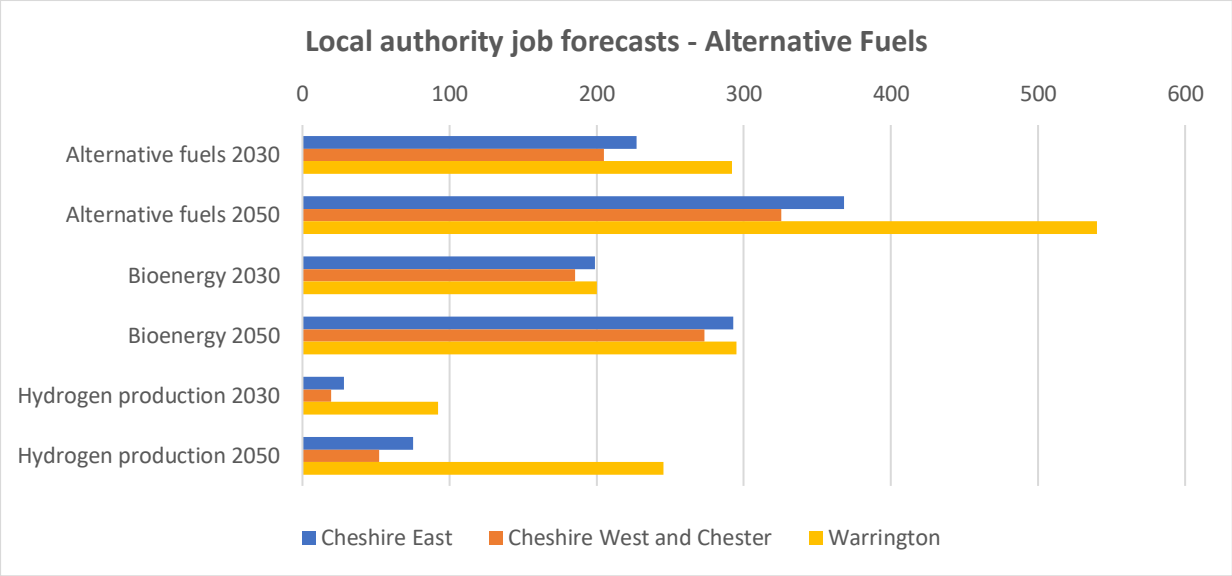
Ecuity forecast that there will be c2,800 jobs in Cheshire and Warrington in low carbon heat by 2030 with about 40% of those (c1,100) located in Cheshire East, almost all (c2,600) being in heat pumps.



Source: Ecuity/LGA, Local green jobs – accelerating a sustainable economic recovery

Alternative Fuels

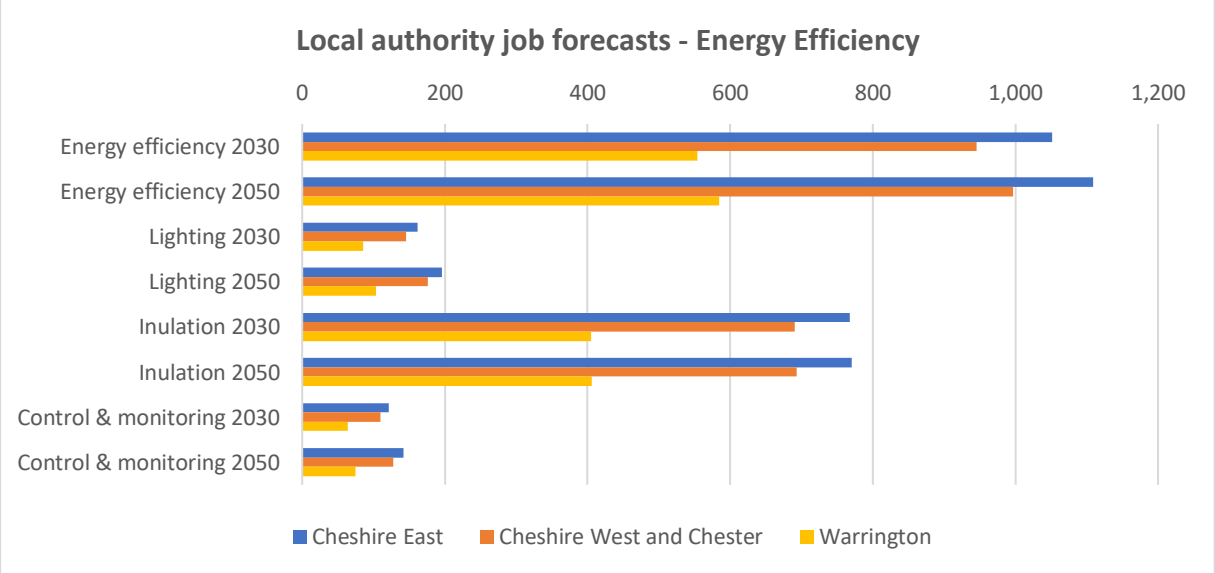
Ecuity forecast that there will be c700 jobs in Cheshire and Warrington in alternative fuels by 2030 with about 40% of those (c300) located in Cheshire East and most (c600) being in bioenergy. If the Hynet proposals were to come to fruition, there would likely be significantly more jobs in Hydrogen production than is forecast below.



Source: Ecuity/LGA, Local green jobs – accelerating a sustainable economic recovery

Energy efficiency

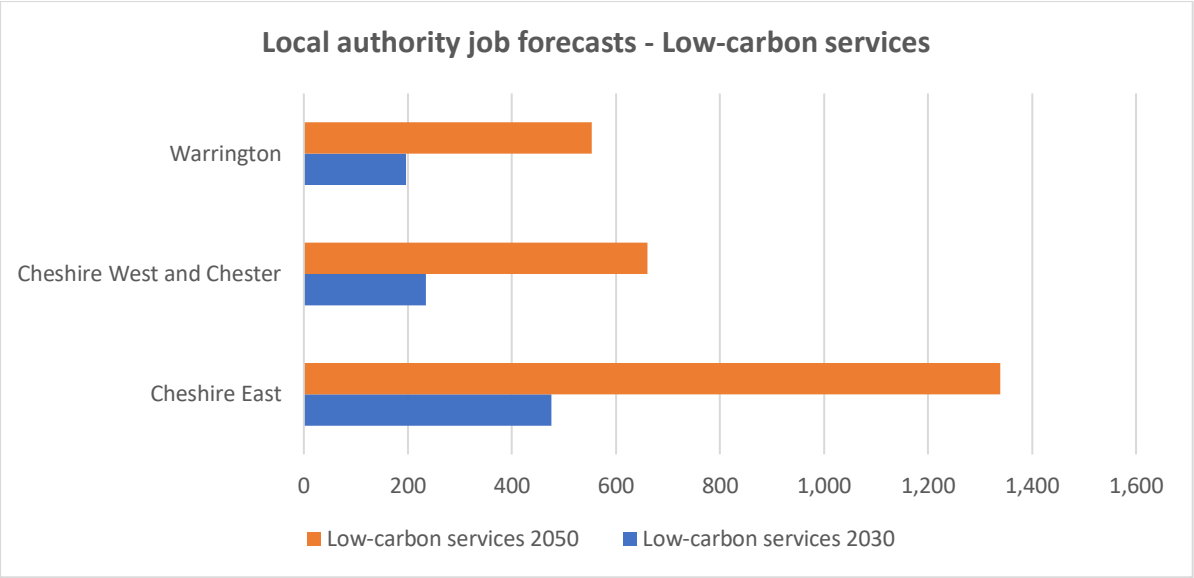
Ecuity forecast that there will be c2,500 jobs in Cheshire and Warrington in energy efficiency by 2030 with about 40% of those (c1,100) located in Cheshire East and most (c1,900) being in bioenergy.



Source: Ecuity/LGA, Local green jobs – accelerating a sustainable economic recovery

Low-carbon services

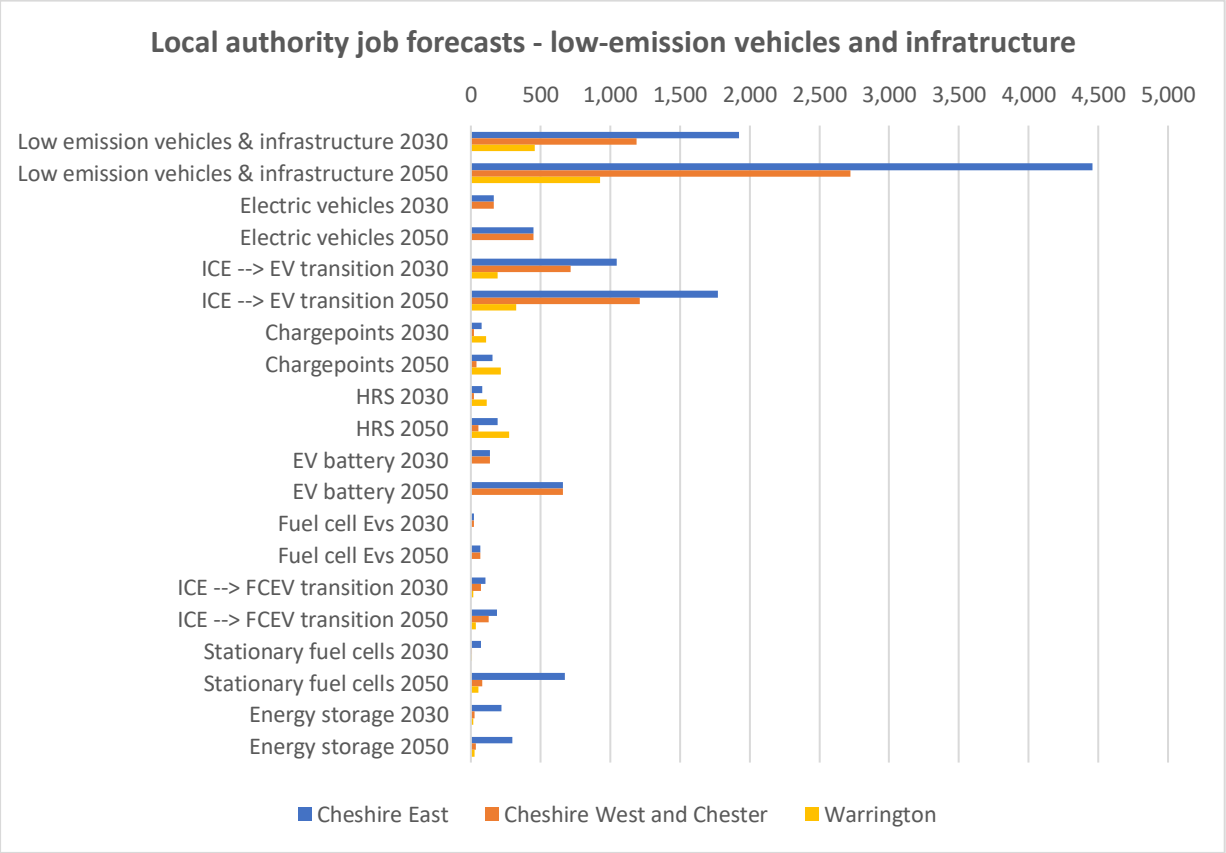
Ecuity forecast that there will be c900 jobs in Cheshire and Warrington in low carbon services by 2030 with over half of those (c500) located in Cheshire East.



Source: Ecuity/LGA, Local green jobs – accelerating a sustainable economic recovery

Low-emission vehicles and infrastructure

Ecuity forecast that there will be c3,600 jobs in Cheshire and Warrington in low emission vehicles and infrastructure by 2030 with over half of those (c1,900) located in Cheshire East and over half (c1,900) being in the transition from the internal combustion engine (ICE) to electric vehicles (EV).



Source: Ecuity/LGA, Local green jobs – accelerating a sustainable economic recovery

6. Conclusions and Recommendations

There may be up to a fourfold increase in the number of jobs employed in the low carbon and renewable energy economy in Cheshire and Warrington by 2030. This will be driven, in the first instance, by the reskilling of the existing workforce. For example, car manufacturers will transition from the assembly of cars with internal combustion engines to the assembly of cars with batteries; electricians will acquire the skills needed to install photovoltaic; plumbers will acquire the skills needed to install heat pumps; and oil might transition to the production of green hydrogen.

However, it will also be important to ensure that as new workers join the workforce, they are equipped with the skills and competences needed for a green 21st century, rather than those that were required for a brown 20th century. This will require that skills providers deliver an appropriate curriculum that encompasses the changed skillsets that the growth of the low carbon and renewable energy sector will bring. It also means that information and information resources about job opportunities and careers will need to reflect these changes.

It is therefore recommended that:

a) There should be support for short courses designed to facilitate the entry of already skilled workers to the LCREE. For example, supporting the training for trades people (electricians, plumbers etc) required to become MCS certified.

b) There should be support for employers that are introducing new process in response to the low carbon agenda to ensure that their workforce have the skills needed for implementation.

c) Partners should work with large-scale projects to ensure that there will be apprenticeship opportunities in both the construction phase (working with specialist construction companies) and the delivery phase.

d) Providers should review their curriculum (particularly for construction) to ensure that the learning aims offered have the content required for work in a low carbon future.

e) Providers should review and adapt their infrastructure to ensure that learning environments (workshops etc) are equipped appropriately and meet industry standards.

f) Providers should review their capacity to scale up delivery if Government takes the advice of CITB that low-carbon related construction skills training should be forecast-led rather than demand-led.

g) The Pledge partners should review and update resources on careers to ensure that the changing nature of some roles is reflected, and the best estimate of demand volumes is understood.

Annex 1 – The use of SIC in the Nesta taxonomy

Industry	Level of environmental activities	Level of carbon emissions	Category
Agriculture, forestry and fishing	0.199	0.497	Follower
Mining and quarrying	0.003	0.872	Laggard
Manufacturing	0.032	0.281	Follower
Electricity, gas and water supply	1.000	0.934	Follower
Construction	0.092	0.096	Follower
Wholesale and retail trade, repair of motor vehicles and motorcycles	0.000	0.078	Laggard
Transportation and storage	0.000	1.000	Laggard
Accommodation and food service activities	0.000	0.066	Laggard
Information and communication	0.000	0.014	Neutral
Financial and insurance activities	0.000	0.000	Neutral
Real estate activities	0.000	0.004	Neutral
Professional, scientific and technical activities	0.022	0.018	Leader
Administrative and support service activities	0.008	0.041	Neutral
Public administration and defence; compulsory social security	0.020	0.056	Leader
Education	0.011	0.030	Leader
Human health and social work activities	0.001	0.049	Neutral
Arts, entertainment and recreation	0.066	0.058	Leader
Other service activities	0.022	0.059	Follower
Median	0.009	0.058	

Source: Going Green: Preparing the UK workforce for the transition to a net-zero economy, Nesta

Annex 2 – LCREE Sectors

LCREE sectors and descriptions of activity	
Sector	**Description**
Offshore wind	The production of electricity and the design, production, and installation of infrastructure for this purpose, including operations and maintenance.
Onshore wind	
Solar photovoltaic	
Hydropower	
Other renewable electricity	The production of electricity from wave and/or tidal and/or geothermal renewable sources and the design, production, and installation of infrastructure for this purpose, including operations and maintenance.
Bioenergy	The production of energy (electricity and heat) and the design, production, and installation of infrastructure for this purpose, including operations and maintenance.
	Bioenergy is liquid biofuels, solid biomass and biogas, for example, bio methane, vegetable oil, peanut oil and energy crops. This sector includes gasification and anaerobic digestion.
Alternative fuels	The production of fuels for low-carbon and renewable energy use, which is not classified as bioenergy. Including hydrogen. Excluding compressed natural gas and liquefied petroleum gas.
Renewable heat	The design, production, and installation of infrastructure for generating heat directly through solar, thermal, geothermal or other means. Including operations and maintenance. Including ground source and air source heat pumps. Excluding generating electricity, which is then used to generate heat. Excluding heat from biomass, which is classified under bioenergy.
Renewable combined heat and power	The design, production and installation of infrastructure for generating heat directly through solar, thermal, geothermal or other means where the renewable sources both generate direct heat and electricity. Including operations and maintenance. Excluding heat and power from biomass, which is classified under bioenergy.
Energy-efficient lighting	The design, manufacture and installation of energy-efficient bulbs, tubes, fittings and so on, designed to use less energy to produce the same or greater amount of light.
Energy-efficient products	The design, manufacture and installation of energy- efficient products. Examples include: • energy-efficient doors and windows • heating and ventilation, such as condensing boilers, ventilation and heating recovery • insulation such as loft, external wall, roof insulation, reducing energy consumption for heat or air conditioning by minimising “leakage” of heat • energy-efficient building materials or technologies • sustainable buildings and architecture

	• materials with greater insulation properties or durability properties or those requiring significantly less carbon emission in their manufacture or recycling waste materials in their manufacture Exclude: “Smart” goods such as TVs and freezers.
Energy monitoring, saving or control systems	The design, manufacture and installation of systems that reduce energy consumption through effective heat or energy management. Include equipment and related systems for doing this. Examples include: • smart heating controls • condensation control • control system components • energy management systems • energy management software
Low-carbon financial and advisory services	Expert advice and education on: reducing carbon consumption, engaging in low-carbon industrial activities, carbon credits and funding systems for low-carbon activities and services. Include: environmental and/or energy consultants.
Low-emission vehicles and infrastructure	Design and manufacture of vehicles with specific technology to significantly reduce or remove emissions. Include: hybrid vehicles, electric vehicles, fuel cell vehicles or other technologies. Include installation of infrastructure to support these vehicles. Exclude: small efficiency improvements such as lighter bodywork or aerodynamics. Fuel-efficient, conventional vehicles are also excluded.
Carbon capture and storage	Capturing waste CO2 at point of emission and depositing it where it will not enter the atmosphere. Activity of doing this and the design, manufacture and installation of infrastructure for this purpose.
Nuclear power	The production of electricity from nuclear power and the design, production and installation of infrastructure for this purpose. Including operations and maintenance. Decommissioning and waste processing activities are excluded.
Fuel cells and energy storage systems	The design, manufacture and installation of energy storage systems, flywheel energy storage, fuel cells, batteries and any other form of energy storage system.
Source: Office for National Statistics	