

9. Appendices

9.1 Region Maps

The below figures illustrate the regional sectoral breakdown in the North West.

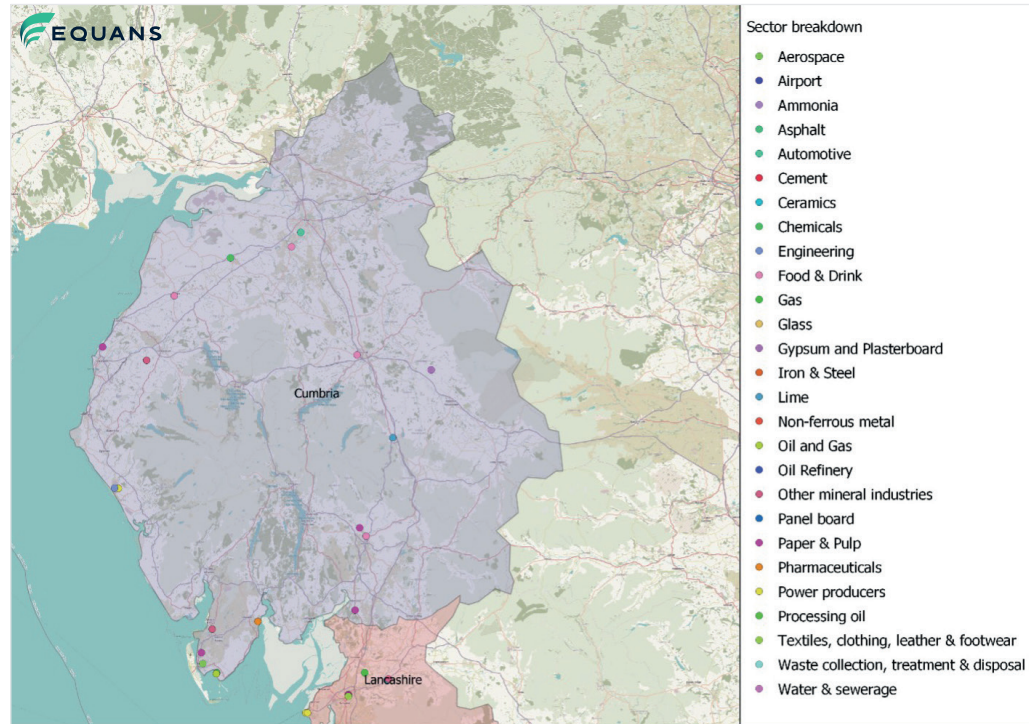


Figure 125 Cumbria sector breakdown of industrial sites

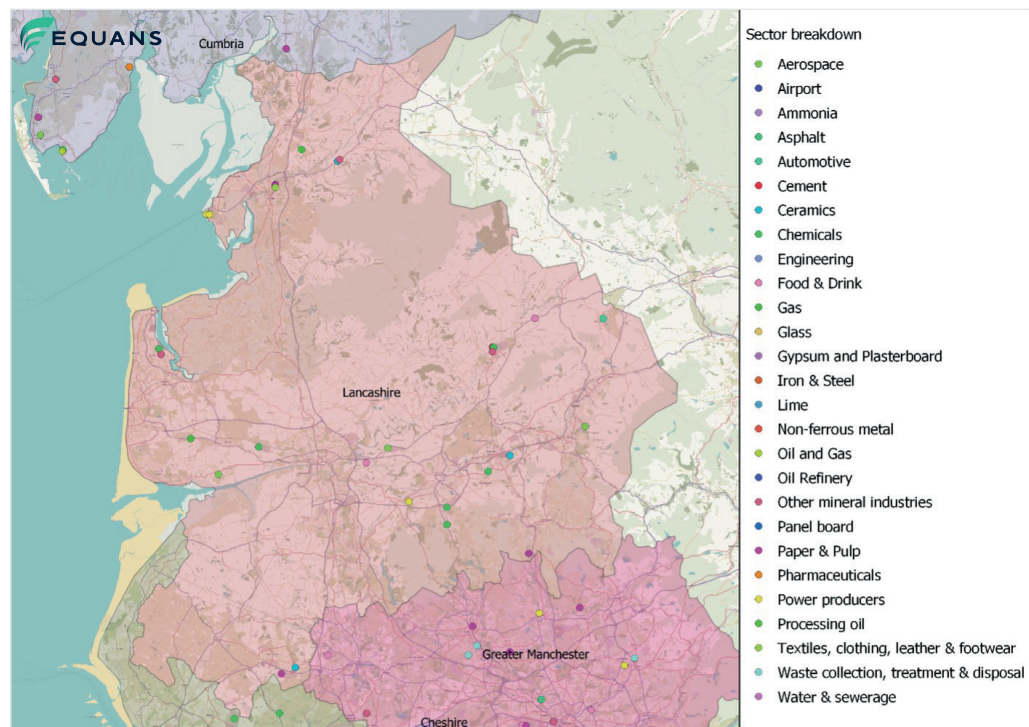


Figure 126 Lancashire sector breakdown of industrial sites

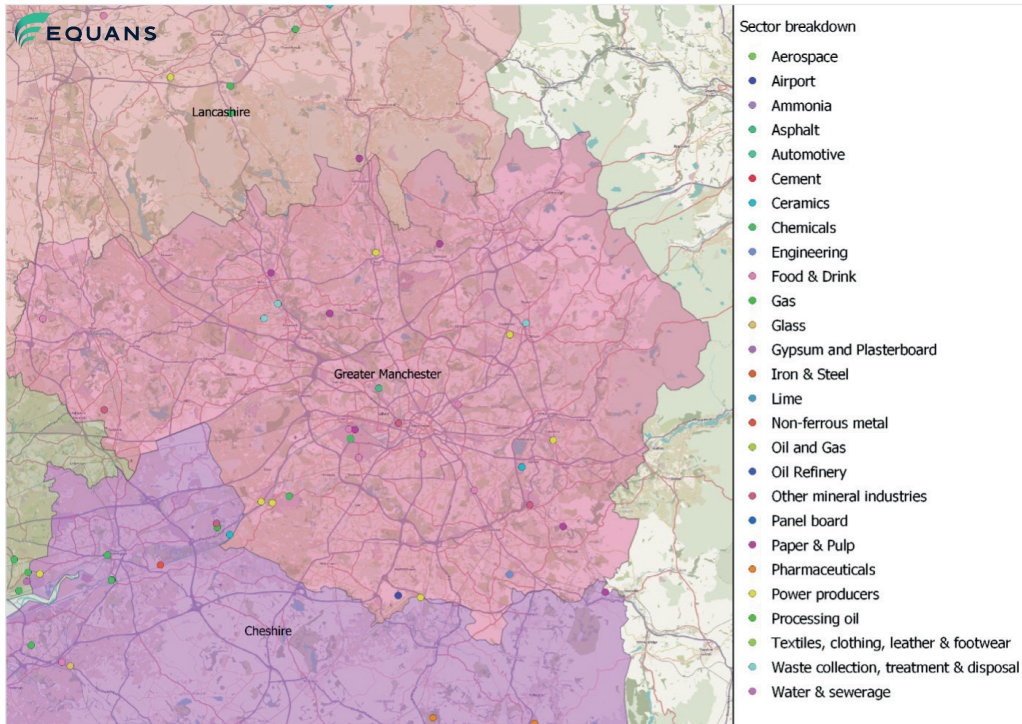


Figure 127 Greater Manchester sector breakdown of industrial sites

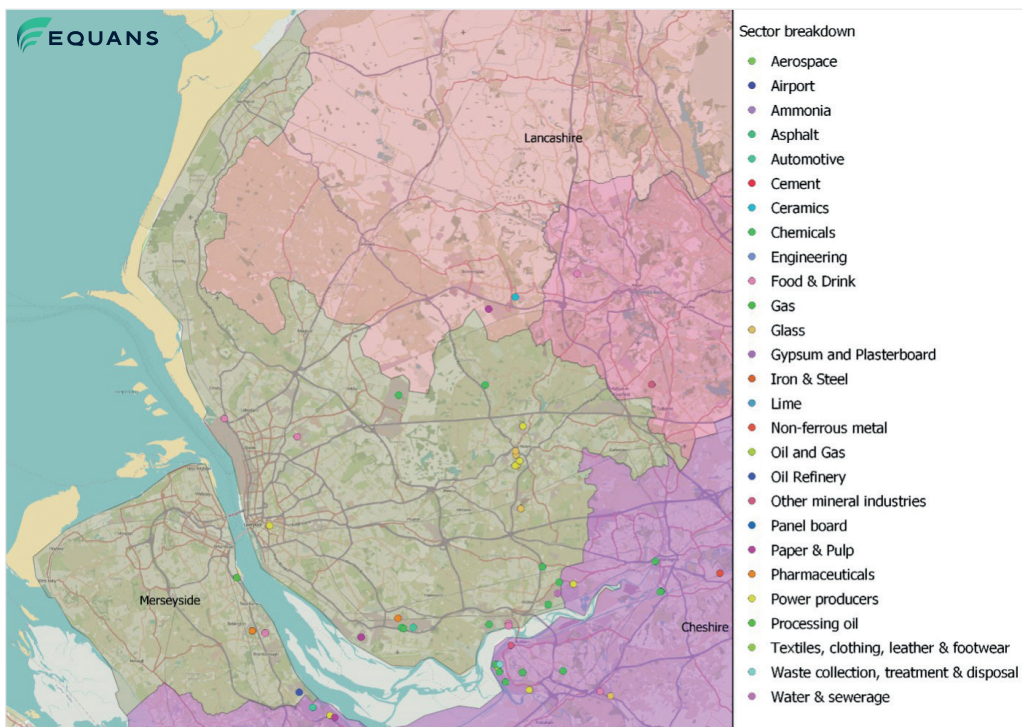


Figure 128 Merseyside sector breakdown of industrial sites

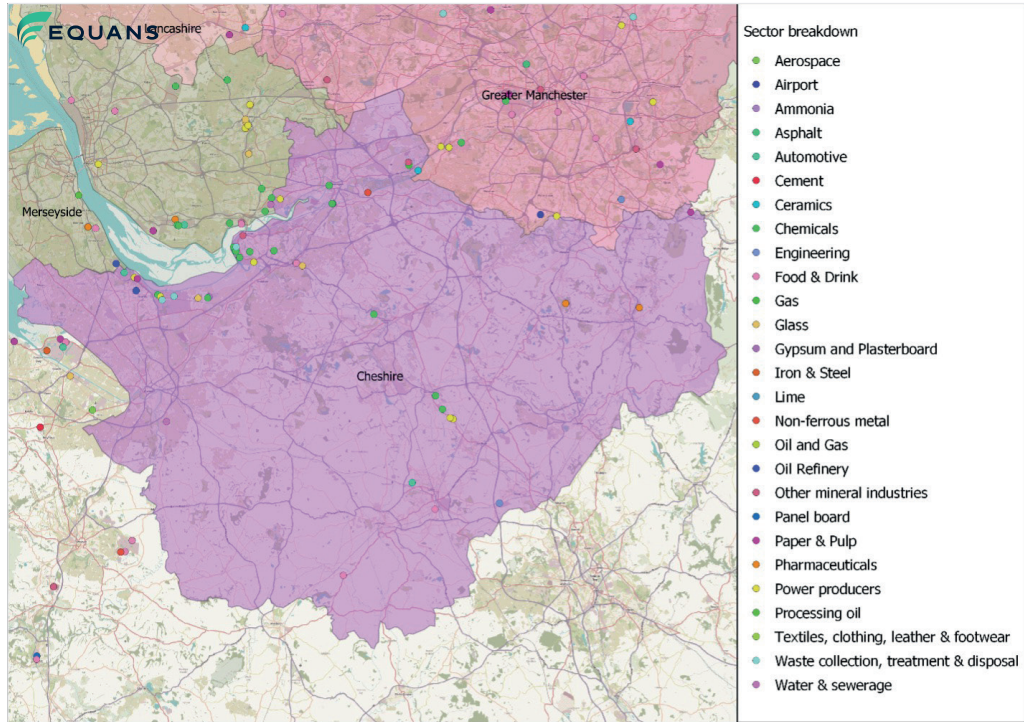


Figure 129 Cheshire sector breakdown of industrial sites

9.2 Local Energy Partnerships

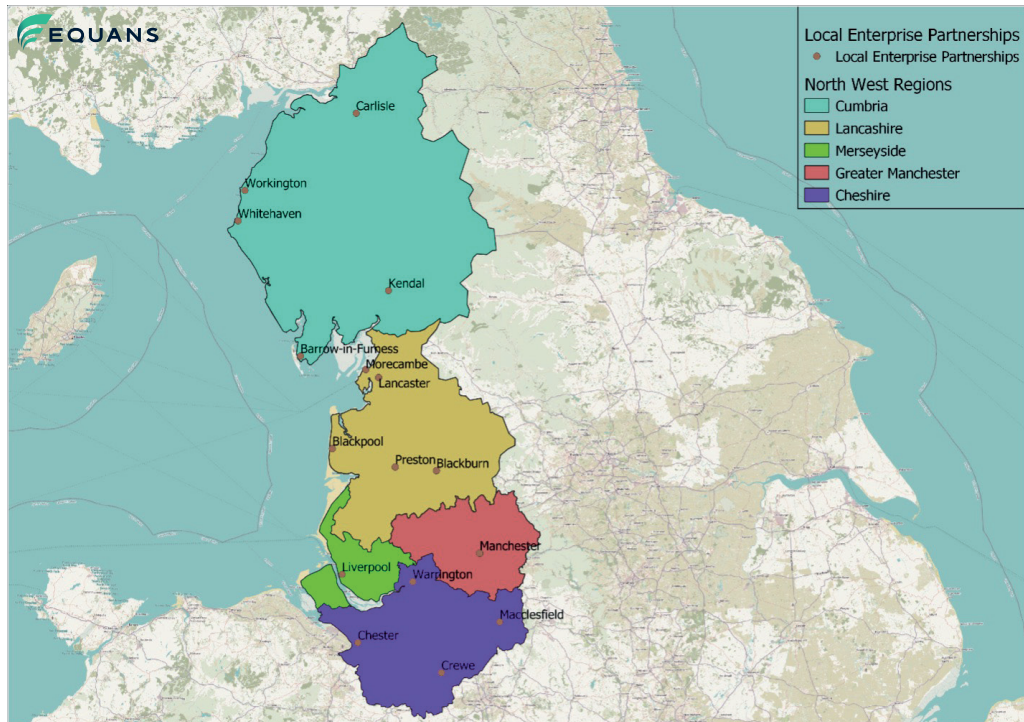


Figure 130 Local Energy Partnerships

9.3 Sector Description

9.3.1 Aerospace

The UK aerospace industry designs and produces engines, helicopters, wings, structures, and aircraft systems (including landing gear). The UK also designs and manufactures wings for all Airbus aircraft platforms and has a maintenance, repair, and overhaul sector (MRO). The sector had approximately a 16% global market share in 2020 and 97% of domestic aerospace is exported. More than 3,000 aerospace companies operate in the UK (111). NZNW has five aerospace sites as part of the cluster, which represents 0.13% of the UK market and account for 53,968 tCO₂e total emissions, representative of 0.4% cluster total. UK aviation emissions for 2019 have been estimated to be 39.6 MtCO₂e. (112)

9.3.2 Airport

There are over 250 register airports (113) in the UK, with circa.58% being used for public aviation. Heathrow, the leading airport in the UK classed as a "small city", emitted 2.09 MtCO₂e (114) across Scopes 1-3 in 2018. The industry sector definition includes businesses operating international, national, or civil airports or public flying fields. It also includes operators that support airports by offering services such as air traffic control and ground service activities, as well as services to military air operations.

NZNW has one airport site as part of the cluster – Manchester Airport – which accounts for 6,648 tCO₂e emissions, which is less than 0.05% of total cluster emissions.

9.3.3 Ammonia

Ammonia, also known as NH₃, comes in the form of liquid and gas, and is predominantly used in the following sectors across the globe:

- Agriculture (dominant, ca.80%)
- Textiles
- Mining
- Pharmaceuticals
- Refrigeration

Although ammonia is itself not a greenhouse gas, following deposition to soil it may be converted to nitrous oxide, an important contributor to climate change, of which 272,000 tonnes in 2019 were emitted in the UK. (8)

The ammonia market is estimated to reach 197,216.85 kilo tons by 2026, registering a CAGR of 2.03% during the forecast period

(2021-2026). (115) Ammonia production currently accounts for around 1.8% of global carbon emissions. NZNW has two sites producing ammonia, with a total emissions output of 710,047 tCO₂e, representing 5.8% of the cluster .

9.3.4 Asphalt

Asphalt is the surfacing material for over 95% of all UK roads as well as for footpaths, playgrounds, cycle paths and car parks. Over 25 million tonnes of asphalt are produced every year by 275 plants in the UK and is 100% recyclable. The total UK carbon footprint associated with the asphalt industry is estimated at 786,000 tCO₂/ annum which is the equivalent to 5,000 km driven by a million average family cars. (116) NZNW has one site working in the asphalt sector, whose emissions output is 4,824 tCO₂e, representative of 0.03% of the overall cluster emissions.

9.3.5 Automotive

The automotive sector is a vital part of UK industry attributing £15.3 billion value to the economy. More than 30 manufacturers build more than 70 different models in the UK which accounts for 13% of total UK export of goods. (15) With the future of EV vehicles on the increase, the automotive industry is needed more than ever to help meet the UK's net zero targets.

There are six automotive sites at NZNW which makes up 0.61% of total cluster emissions (84,836 tCO₂e):

9.3.6 Chemicals

The chemical industry is one of the largest in the UK and is a top manufacturing exporter. It adds almost £25 billion of value to the economy with 3,700 business providing over 500,000 jobs. It also has the one of the highest labour productivity rates of £123k GVA per employee. (16)

There are thirty-seven sites associated to the chemical sector at NZNW at 1,022,506 tCO₂e, this sector is the fourth highest contributor to the overall cluster emissions (7.3% representative). 9.3.7 FOOD and DRINK

9.3.7 Food and drink

Food and drink accounts for 20% of total UK manufacturing. The Food and Drink Federation (FDF) organisation has stated that in 2018, the sector contributed almost £29 billion to the UK economy, equivalent to 2.3% national GVA. Over 440,000 people are directly employed by the industry across every region and nation, and it has a very complex supply chain. (17)

On 6th October 2021, environmental charity WRAP (Waste and Resources Action Programme) stated “Gas emissions must be a key priority for COP26” (117) as industry emissions are equivalent to 35% of the UK total.^{iv}

There are twenty-five sites across the NZNW cluster producing a variety of human and pet food and beverages. This sector emits 584,761 tCO₂e, representing 4.2% of total cluster emissions.

9.3.8 Engineering

Engineering is the designing, testing, and building of machines, structures and processes using maths and science. According to The Engineering Council (118), 18% of the UK working population work in engineering roles. This sub-sector integrates with many other industry sectors from Aerospace to Agriculture, Food and Drink to Pharmaceutical, therefore is paramount to the climate change crisis. There are 3 major engineering sites based at the NZNW cluster, at 11,836 tCO₂e, these sites account for a minor (0.1%) proportion of the total cluster emissions.

9.3.9 Oil and Gas

This sector comprises, oil and gas extraction, mining (except oil and gas), and support activities for mining. The term mining is used in the broad sense to include quarrying, well operations, beneficiating (e.g., crushing, screening, washing, and flotation), and other preparation.

According to the 2019 UK Greenhouse Gas Emissions, Final Figures, (23) the report states:

“[this sector] is estimated to have been responsible for 21% of UK greenhouse gas emissions in 2019, with carbon dioxide being by far the most prominent gas for this sector (94%)”.

For comparison purposes, it should be noted this categorisation includes emissions from electricity generation and other energy production activities such as mining, refining, and manufacturing fuels.

At NZNW, there are twenty-three sites sub-categorised under this sector. Collectively, the sites account for 2,619,657 tCO₂e, or 18.7% cluster emissions respectively. Site specific detail is further drawn out below.

9.3.9.1 Gas

There are five operating gas terminals/stations at NZNW they account for 258,793

tCO₂e, or 1.9% of total cluster emissions.

9.3.9.2 Oil Refinery

There are three refineries two at Stanlow, and one located at Nynas. Their combined emissions stand at 2,201,520 tCO₂e which is equivalent to 15.6% of total cluster emissions.

9.3.9.3 Oil and Gas

There is just one oil and gas terminal. Total emissions equate to 0.7% (99,095 tCO₂e) cluster representative.

9.3.9.4 Processing Oil

There is just one processing oil terminal. It has a low representation of cluster emissions (<1%) at 3,390 tCO₂e.

9.3.9.5 Other Mineral Industries

There are ten operators across twelve sites working in a wide range of construction supplies and minerals. Together they account for 56,319 tCO₂e, or 0.4%, of total cluster emissions.

9.3.10 Materials

The UK manufactures and distributes many types of raw and synthetic materials needed to produce products. The UK’s material footprint was estimated as 971 million tonnes in 2018, equivalent to 14.6 tonnes per person, and is increasingly a net importer of materials. (119)

9.3.10.1 Cement

Cement is used in construction to bind other materials together. Cement emissions contribute to climate change as approximately 50% of emissions of cement production come from limestone (CaCO₃) calcination, which happens at high temperatures in a cement kiln to produce lime (CaO). This leads to a release of waste in the form of CO₂, called process emissions. A further 40% of cement emissions come from burning fossil fuels to heat kilns for the calcination process, and around 10% from fuels needed to mine and transport raw materials. There are twelve manufacturing and two grinding/ blending plants in the UK cement industry contributing £1 billion to the UK economy. There are six cement sites accounting for the second highest sector contributor of CO₂ emissions (2,734,941 tCO₂e; 19.6% representative total emissions) at NZNW:

- Padeswood Works
- Ribblesdale Works

^{iv} Emissions from production, consumption, and overseas imported food.

- Hindlow
- Hindlow Lime
- Tunstead Lime
- Tunstead Cement

9.3.10.2 Ceramics

Ceramics is the broad term used to describe both natural and synthetic materials with a crystalline structure. Many products are made from clay and similar materials processed at high temperatures. Total UK ceramics sales amount to £2 billion, and 97% of ceramics businesses as SME's. (120)

The industry represents nearly a quarter of all UK emissions. (121)

There are five sites belonging to NZNW cluster, they account for 77,501 tCO₂e, or respectively 0.6% total cluster emissions.

9.3.10.3 Glass

The UK large scale glass manufacturing industry includes 10 companies with 17 sites throughout England, Scotland, and Northern Ireland. The glass industry employs around 6,000 direct staff and indirectly around 150,000 (18).

The glass industry is split into three categories:

1. **Container** – food and drink and pharmaceutical products.
2. **Flat glass** – used in commercial and residential buildings for glazing.
3. **Fibre** – used in numerous manufacturing applications such as wind turbine blades.

Emissions are reported as 1.5m tCO₂ of Emission Trading Scheme (ETS) (site emissions reported under the ETS). There are eight glass sites based at NZNW collectively they account for 473,258 tCO₂e, equivalent to 3.4% total cluster emissions (ninth highest).

9.3.10.4 Gypsum and Plasterboard

The industry manufacturers gypsum-based plaster products for use in construction. Main activities include:

- Plasterboard manufacturing
- Cornice and coving manufacturing
- Ceiling rose manufacturing
- Acoustic tile and ceiling plaster manufacturing
- Premixed and bagged plaster manufacturing

Market size of this industry is £900m with around 50 businesses. (122) Gypsum plasterboard is

commonly used for dry lining building solutions but causes approximately 3.5% of the UK's greenhouse gas emissions. (123)

There is one site at NZNW, home to the long-established plaster and plasterboard plant, and has manufactured Thistle plasters continuously since 1910.

9.3.10.5 Site

This site equates to 38,414 tCO₂e, or 0.3% of total cluster emissions. 9.3.10.5 Iron and Steel

In 2020, the UK steel industry contributed £2 billion to the UK economy in terms of (GVA). This was equivalent to 0.1% of total UK economic output and 1.2% of manufacturing output. There are 1,100 businesses in the UK steel industry and in 2019, produced 7 million tonnes of steel.

The steel industry is a significant contributor and is responsible for 13.5% of GHG emissions from manufacturing and 2% of total UK greenhouse gas emissions (19).

From our data set we have only identified one site in the North West England and North East Wales which manufactures approximately 500,000 tonnes of metallic coated and pre-finished steel per year. This site emits 54,913 tCO₂e, equivalent to 0.4% of total cluster emissions.

9.3.10.6 Lime

Lime is used in several applications from water purification to iron and steel manufacture, and environmental remediation and emissions clearing from waste plants and incinerators. The past decade has seen this sector significantly reduce its carbon emissions, waste, and the use of fossil fuels. (124) Currently, emissions from lime production average 1.1 MtCO₂e a year (2019) from 1.7 MtCO₂e (1998). (125)

There is one site working in this sector at NZNW, a limestone quarry supplying to Northern Britain. This site accounts for 184,116 tCO₂e, or 1.4% respectively of total cluster emissions.

9.3.10.7 Non-ferrous metal

Non-ferrous metals include aluminium, copper, lead, nickel, tin, titanium, and zinc, as well as copper alloys like brass and bronze. A non-ferrous metal is defined as metal that does not have a significant amount (<1% by weight) of iron in its chemical compound. The UK Metals Industry comprises 11,100 companies, employs around 230,000 people, and directly contributes £10.7bn to UK GDP. (126)

The Department for Business, Energy and Industrial Strategy (BEIS) have projected that Non-Ferrous Metals industry will reduce emissions from 0.510 MtCO₂e in 2020 to 0.23 3MtCO₂e by 2040. (20)

Two sites operate in this sector at NZNW. together they account for 59,012 tCO₂e, equivalent to 0.4% of total cluster emissions.

9.3.10.8 Panel Board

The panel board industry manufacturers and distributes wood-based panels that are used in a variety of industrial and domestic applications.

Carbon emissions vary for the Wood Panel Industry according to the wood source (Virgin, Recycled, Low Grade), local or import, and with/ without CHP applications (127) .

There are two units at NZNW that produce laminate flooring, wall panels, raw boards for construction, and products for furnishing and interior finishing. These sites emit 136,959 tCO₂e, equivalent to 1% of total cluster emissions.

9.3.10.9 Paper and Pulp

The pulp and paper industry comprises companies that use wood as raw material and produce pulp, paper, paperboard, and other cellulose-based products.

BEIS have projected that the paper, pulp and print industry will reduce emissions from 1.4 MtCO₂e in 2020 to 1.3 MtCO₂e by 2040 (20).

From our data set we identified 21 sites operated by 15 businesses in the North West cluster providing a variety of pulp, paper, and paperboard. Collectively they account for 555,131 tCO₂e, equivalent to 4% of total cluster emissions.

9.3.11 Pharmaceuticals

The pharmaceutical industry plays a pivotal role in the health of all lives. In 2019, the annual turnover of pharmaceutical wholesalers in the UK was over £51 billion. The UK pharmaceutical market is among the global top 10 national markets, holding 2.5% of the global pharmaceutical market (21).

The pharmaceutical industry has its own unique decarbonisation challenges: a new drug can take significant time and resources to develop, test and take to market. In addition, the varying number of chemical components means they have complicated supply chains. There is inconclusive evidence at this time to demonstrate whether the pharmaceutical industry understood its UK impact on climate change in the form of tonnes (t) or Mega tonnes (Mt) CO₂e from any baseline year, as findings indicate emission tools have been developed and rolled out but returned no high-level figure. Results indicate that this industry is greater than that of the automotive industry. The NHS estimates medicines account for 25% of total emissions from the health service, currently equivalent to 4% of England's total carbon footprint (22).

From our data set we identified 5 companies operating across 7 sites in the North West England and North East Wales, collectively they emit 139,120 tCO₂e, equivalent to 1% of total cluster emissions.

9.3.12 Power Producers

There are several operational power stations in the UK categorised by generation type. The following graph is cited from **www.statista.com**: Figure 131 Number of operational power stations in the United Kingdom (UK) as of May 2020, by generation type (21)

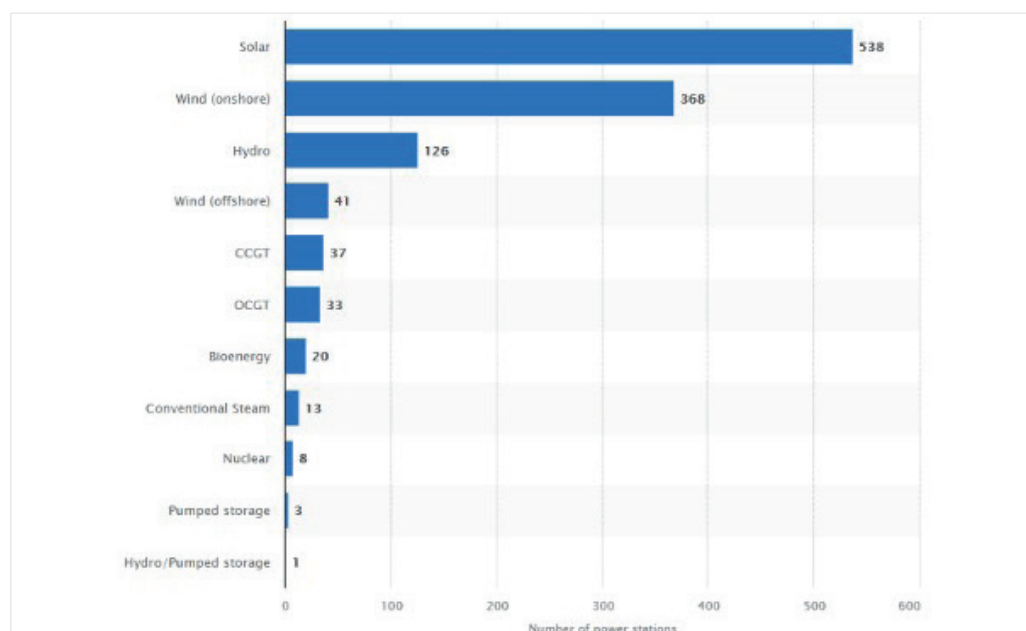


Figure 131 Number of operational power stations in the United Kingdom (UK) as of May 2020, by generation type (21)

According to the 2019 UK Greenhouse Gas Emissions, Final Figures, the report states:

"[this sector] is estimated to have been responsible for 21% of UK greenhouse gas emissions in 2019, with carbon dioxide being by far the most prominent gas for this sector (94%)". (23)

For comparison purposes, it should be noted this categorisation includes emissions from electricity generation and other energy production activities such as mining, refining, and manufacturing fuels.

From our data set we identified 20 power producers based in the North West England and North East Wales, collectively these sites emit 3,502,338 tCO₂e, equivalent to 25% of total cluster emissions – the highest emitting sector.

9.3.13 Textiles And Clothing

The clothing industry is indeed an intricate one when it comes to assessing carbon footprint, as it takes into consideration the lifecycle of singular items from production of components to landfill, as well as consumption of water and the biodiversity and health hazards it is known to create. According to Statista (125), the apparel and footwear market in the UK is projected to grow steadily in the coming years, and that revenues in 2020 were estimated to be around £52m GBP. Total footprint of clothing in use in the UK was 26.2m tCO₂ in 2016 and water footprint was around 8 billion m³. (128)

There is one clothing site operation based at NZNW, that are specialists in the supply of safety, technical, and harnessing equipment for industrial and recreational activities. They account for 11,450 tCO₂e, equivalent to <1% of overall cluster emissions or 0.0004% sector footprint.

9.3.14 Water And Waste

Every day, over 50 million household and non-household consumers in England and Wales receive good quality water, sanitation, and drainage services. These services are provided by 32 privately-owned companies in England and Wales. (129)

The waste management sector consists of emissions from waste disposed of to landfill sites, waste incineration, and the treatment of wastewater. It is estimated to have been responsible for around 4% of greenhouse gas emissions in the UK in 2019. (23) A report from 2008 revealed the water industry contributes 0.8% of annual UK greenhouse gas emissions. However, the emissions that result from heating water in the home increases this figure to 5.5%. (130). Water UK has recently published its Annual Emissions Report for 2021 (131) where they show gross emissions have fallen in the industry by 15%. There are 5 companies operating 8 sites at NZNW relating to water and sewerage services and waste collection, treatment, and disposal. These utility companies collectively emit 572,699 tCO₂e, equivalent to 4.1% of the total cluster emissions (seventh highest).