Article

Exploring regional estimates of activity in the low carbon and renewable energy economy, UK and regions of England: 2020

Exploring methods to estimate turnover and employment in the low carbon and renewable energy economy (LCREE) in the UK by combining data from the LCREE Survey and the Inter-Departmental Business Register, including estimates for the different regions of England. Experimental statistics.

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1 . Main points

- This article sets out an experimental method to estimate regional low carbon and renewable energy economy (LCREE) data in England, using 2020 LCREE Survey data and information on business structure and location.

- This method has some caveats, in particular that it assumes LCREE activity takes place at all sites associated with businesses that have reported LCREE activity when responding to the LCREE Survey; the ONS would welcome feedback on this approach.

- Experimental estimates of LCREE turnover in 2020 ranged from £5.1 billion (15% of all LCREE turnover in England) in both the East of England and the South East to £2.7 billion in the North East (8%).

- Experimental estimates of employment (full-time equivalent) in 2020 ranged from 29,300 in the South West (17% of LCREE employment in England) to 7,600 (4%) in the North East.

- The level of uncertainty around these experimental survey-based estimates means these estimates for each region are indicative only.

Estimates included in this release are experimental and should be interpreted with caution. All estimates in this bulletin are given in current prices with no adjustments made to account for the effects of inflation.

2 . The UK's low carbon and renewable economy in 2020

Existing estimates of the low carbon and renewable energy economy (LCREE)

The Office for National Statistics (ONS) currently produces annual official estimates of the size of the UK's low carbon and renewable energy economy (LCREE) at a UK-wide and UK country level using data collected from the LCREE Survey.

This survey of approximately 24,000 businesses is currently required to produce estimates of the size of the LCREE, rather than using other existing surveys or administrative sources of business data, given that:

- the LCREE is spread across a wide range of industries and so LCREE sectors are not split out by current statistical classifications such as the Standard Industrial Classification (SIC)

- LCREE activity is often secondary rather than primary for many businesses

- many businesses have their reporting office, which is usually captured in other sources of business data such as the Inter-departmental Business Register (IDBR), at a different location to where their LCREE activity takes place

The LCREE Survey addresses these problems by asking businesses across a wide range of industries to:

- report if they have activity (turnover, imports, exports, employment, and acquisitions and disposals of capital assets) in any of the 17 LCREE sectors, defined in consultation with key stakeholders

- report what proportion of this activity takes place in the different countries of the UK

Challenges of calculating regional estimates from the LCREE Survey

There is increasing demand for regional data on the low carbon and renewable energy economy. At present, businesses are only asked to report the country in which their activity has taken place when answering the LCREE Survey. We are currently investigating the feasibility of asking businesses to provide a more precise location.

In the meantime, we have explored an experimental method for providing regional estimates of LCREE activity by combining LCREE Survey data with data from the IDBR.

Because LCREE activity is spread across a wide range of industries and is often a business's secondary activity, the accuracy of the estimates at lower levels, such as some of the smaller LCREE sectors, is variable. This expected level of uncertainty will also be present in any regional estimates. As such, regional estimates within this article, particularly when broken down by sector, should be interpreted with caution.

In this article, we consider LCREE activity in terms of turnover and employment only. The latest official estimates of these and other aspects of activity from the LCREE Survey, along with estimates of the level of uncertainty associated with them (confidence intervals and coefficients of variation), are available in the dataset published with the annual LCREE release.

Confidence intervals and coefficients of variation

Confidence intervals (CI), which are a standard way of expressing the statistical accuracy of a survey-based estimate, are provided in the LCREE dataset. CIs represent a range that we are 95 percent confident the true value of an estimate lies within. If an estimate has a high sample error level, the corresponding CI will be very wide. Coefficients of variation (CVs), which represent the size of any sampling error relative to the estimate itself, can also be found in these datasets.

3 . Experimental regional estimates of LCREE turnover and employment in England

The design of the low carbon and renewable energy economy (LCREE) Survey means it is not possible to use respondents' information on the location of their LCREE activity to calculate estimates below UK country level.

To calculate experimental estimates of regional LCREE, we have developed a method using information about businesses structure and geographic locations as captured on the Inter-departmental Business Register (IDBR). For businesses that reported activity in the LCREE, their turnover and employment was split among all sites, known as local units and captured on the IDBR.

This method makes the assumption that, for businesses that reported LCREE activity, this activity took place at all locations attached to that business, as registered on the IDBR.

The business' LCREE turnover and employment was split between these locations based on total employment size at each of the businesses' locations relative to the businesses' total employment per the IDBR.

More detail on this method and its limitations are described in Section 7: Data sources and quality.

Inter-Departmental Business Register (IDBR)

The IDBR is a database of all businesses in the UK registered for VAT and/or the Pay As You Earn (PAYE) income tax system. There are approximately 2.7 million businesses on the IDBR. The IDBR is the register of UK businesses used as a sampling frame for Office for National Statistics (ONS) business surveys. It contains a wide range of variables defining the characteristics of each business including the business' structure and the addresses of its different sites known as "local units", and their turnover, employment, standard industrial classification, birth and death dates. You can also access more detailed information on the IDBR (PDF, 60KB).

Experimental LCREE turnover and employment in the regions of England

Figure 1 shows experimental estimates of total turnover and employment in the LCREE by region in England in 2020.

In 2020, turnover and employment in the LCREE was generated within all regions of England. Turnover ranged from £2.7 billion (8% of estimated LCREE turnover in England) in the North East to £5.1 billion (15%) in both the East of England and South East.

Employment (full-time equivalents) ranged from 7,600 (4% of estimated LCREE employment in England) in the North East to 29,300 in the South West (17%).

These differences in turnover and employment by region will likely be affected by the size and industrial make up of the economies in those regions. The expected level of uncertainty around these experimental and survey-based estimates means that estimates for each region are indicative only. The level of uncertainty is likely to be influenced by size of the overall economies in those regions and differences in sample sizes between regions.

Confidence intervals (CIs) and coefficients of variation (CVs) for LCREE Survey-based estimates are available for the main LCREE estimates in this dataset. Subject to user demand in feedback on these experimental estimates, we may calculate these in future for the experimental LCREE and IDBR-based estimates.

Figure 1: Turnover and employment in the low carbon and renewable energy economy was likely to vary across regions of England

Experimental LCREE turnover and employment in England, by region, 2020

Notes:

1. The expected level of uncertainty around these experimental and survey-based estimates means that estimates for each region are indicative only. Confidence intervals (CIs) and coefficients of variation (CVs) for country-level LCREE Survey-based estimates are available in the dataset and may be calculated for the experimental LCREE- and IDBR-based estimates in future, subject to user feedback on these experimental estimates.

2. Data may not sum because of rounding.

Download the data

.xlsx

Experimental estimates of LCREE turnover and employment in the regions of England by sector of activity

We focus on the two largest LCREE sectors in England in this section. The energy efficient products (excluding energy efficient lighting) and low emission vehicles (LEV) sectors were the largest sectors in the LCREE economy in 2020 based on estimates from the LCREE Survey. They accounted for £9.8 billion and £6.1 billion, which is 30% and 19% of total LCREE turnover in England, respectively.

The energy efficient products sector was also particularly important in terms of employment, accounting for 43% (73,400 full-time equivalent) of total LCREE employment in England.

These sectors remain the largest sectors of the LCREE in England when using experimental LCREE Survey and IDBR-based estimates (see Section 4: Experimental estimates of turnover and employment in the UK and constituent countries).

Figure 2 shows experimental estimates of turnover and employment in these two largest LCREE sectors by region in England in 2020.

The indications were that the East Midlands (28% of total turnover in this sector in England), East of England (23%) and the West Midlands (16%) were particularly important to turnover in the low emission vehicles sector of the LCREE in England.

Turnover in the energy efficient products sector in England appeared to be more evenly spread across the regions of England, with the largest proportions of turnover generated in the East of England (20%) and South East (19%).

Employment in the energy efficient products and low emissions vehicles sector was generated in all regions of England (Figure 2).

Figure 2: Turnover and employment generated by the energy efficiency products and low emissions vehicles sector was likely to vary across regions of England

Proportion of experimental LCREE turnover and employment in English regions, low emission vehicles and energy efficient products sectors, 2020

Notes:

1. The expected level of uncertainty around these experimental and survey-based estimates means that estimates for each region are indicative only. Confidence intervals (CIs) and coefficients of variation (CVs) for LCREE Survey-based estimates only are available in the dataset and can be calculated in future for the experimental LCREE- and IDBR-based estimates, subject to user feedback on these experimental estimates.

2. For full sector definitions of what is included in each LCREE sector, please see Table 2 of the Quality and Methodology Information Report.

3. Experimental regional estimates for other sectors of the LCREE are available in the dataset.

4. The proportion of low emission vehicles sector turnover in England of 1% shown on this figure for Yorkshire and The Humber is equal to less than 1%.

Download the data

.xlsx

4 . Experimental estimates of turnover and employment in the UK and constituent countries

This section provides context to the experimental estimates of low carbon and renewable energy economy (LCREE) turnover and employment in the regions of England provided in [Section 3: Experimental regional estimates of LCREE turnover and employment in England](#).

It considers, at a country level, the impact of using the experimental estimates based on Inter-departmental Business Register (IDBR) information on businesses' structure and geographic locations instead of the existing LCREE Survey estimates that are based on the UK country or countries that a business reports LCREE activity in on that survey.

In 2020, based on businesses' responses to the LCREE Survey only, the UK LCREE in total generated £41.2 billion in turnover, with employment of 207,800 full-time equivalent (FTE) employees. The majority of this was in England (£32.6 billion and 171,100 FTEs) but with significant activity in Scotland (£5.5 billion and 20,500 FTEs), Wales (£2.2 billion and 11,300 FTEs) and Northern Ireland (£0.9 billion and 5,000 FTEs).

Table 1 shows the impact of using the experimental estimates combining LCREE and IDBR data to allocate UK LCREE turnover and employment among the constituent countries of the UK.

Table 1: Using experimental LCREE and IDBR-based estimates of geographic location allocates UK low carbon turnover and employment away from Scotland

Total LCREE turnover and employment estimates, UK and constituent countries, LCREE-based or experimental LCREE and IDBR-based, 2020

	Turnover (£ billion)				Employment (full-time equivalent)			
	LCREE-based estimate	Experimental LCREE and IDBR-based estimate	Difference		LCREE-based estimate	Experimental LCREE and IDBR-based estimate	Difference	
			(£ billion)	%			(FTE)	%
UK	41.2	41.2	0	0	207,800	207,800	0	0
England	32.6	34.7	2.1	6	171,100	172,200	1,100	1
Scotland	5.5	3.1	-2.4	-44	20,500	16,500	-3,900	-19
Wales	2.2	2.8	0.5	23	11,300	14,300	3,000	26
Northern Ireland	0.9	0.7	-0.2	-19	5,000	4,700	-200	-4

Source: Office for National Statistics - Low Carbon and Renewable Energy Economy Survey and Inter-Departmental Business Register

Notes

1. The expected level of uncertainty around both the LCREE-based and the experimental LCREE and IDBR-based estimates means that estimates for each country are indicative only. Confidence intervals (CIs) and coefficients of variation (CVs) for LCREE-based estimates only are available in the dataset and can be calculated in future for the experimental LCREE and IDBR-based estimates, subject to user feedback on these estimates.

2. Data may not sum because of rounding.

When estimates of activity are allocated based on the experimental method that uses a business' structure and geographic locations as captured on the IDBR, estimates of turnover in England's and Wales' LCREE in 2020 are higher by £2.1 billion (6% higher) and £0.5 billion, respectively, and lower in Scotland (£2.4 billion or 44% lower) and Northern Ireland (£0.2 billion or 19% lower).

The picture is similar for employment. Employment in England is higher by 1,100 FTEs (1% higher) when reporting using the IDBR address and higher in Wales by 3,000 FTEs (26% higher). Estimates of employment are lower by 3,900 FTEs (19% lower) in Scotland.

This suggests that LCREE turnover and employment in Scotland and Northern Ireland may be contributed to by businesses that have sites in England and/or Wales.

This may be because businesses who have reported LCREE activity in Scotland and Northern Ireland in the LCREE Survey have sites in other parts of the UK where LCREE activity does not take place, but which has been attributed to them by this experimental method. Further work is required to fully understand this difference.

Activity in different LCREE sectors in the UK and constituent countries

In England, Wales and Northern Ireland, the largest contributing sector to LCREE turnover and employment in 2020 was the energy efficient products sector.

The onshore wind sector is the largest LCREE sector in Scotland, although the energy efficiency products sector is also a large contributor to LCREE turnover and employment.

Table 2 shows the LCREE sectors that appear to drive the changes in turnover and employment observed in the constituent countries of the UK when using the experimental LCREE Survey and IDBR method of estimation compared with the estimation based only on the LCREE Survey.

The largest contributing sector to the lower Scottish turnover and employment observed when using experimental LCREE and IDBR-based estimates is the onshore wind sector, which is £1 billion and 1,000 FTE jobs lower, with this activity largely re-allocated to England (Table 2). This might reflect that while wind turbines may be physically located in Scotland, the business they are owned and supported by may have a presence throughout the UK.

Table 2: Using experimental LCREE and IDBR-based estimates leads to lower total LCREE turnover estimates in Scotland largely because of re-allocating onshore wind turnover to other UK countries

Difference in turnover and employment in selected LCREE sectors when using experimental LCREE and IDBR-based estimates to report turnover and employment compared with LCREE-based estimates only, UK and constituent countries, 2020

	Difference in turnover (£ billion)				Difference in employment (full-time equivalent)			
	England	Wales	Scotland	Northern Ireland	England	Wales	Scotland	Northern Ireland
Energy efficient products	0.2	0.2	-0.3	-0.1	600	800	-800	-500
Low emission vehicles	-0.2	0.1	<0.05	<0.05	-300	100	100	100
Onshore wind	1.1	-0.1	-1.0	-0.1	1,100	100	-900	-100
Offshore wind	0.4	-0.1	-0.3	<0.05	200	300	-800	300
Nuclear power	0.3	<0.05	-0.3	<0.05	<50	500	-500	100
Bioenergy	-0.2	0.1	0.1	<0.05	-200	200	<50	<50
Energy-efficient lighting	-0.1	0.2	-0.1	<0.05	-100	300	-300	100
Hydropower	0.4	<0.05	-0.4	<0.05	500	-100	-400	<50
Other sectors	0.2	<0.05	-0.1	-0.1	-600	700	100	-100
Total	2.1	0.5	-2.4	-0.2	1,100	3,000	-3,900	-200

Source: Office for National Statistics - Low Carbon and Renewable Energy Economy Survey and Inter-Departmental Business Register

Notes

1. A positive change in turnover or employment represents a higher turnover or greater number of employees in a region when using experimental LCREE and IDBR-based estimates.

2. Figures may not sum due to rounding.

3. Differences shown in the table of less than 0.05 (£ billions of turnover) or less than 50 (full-time equivalent employment) may be positive or negative.

5 . Exploring regional estimates of activity in the low carbon and renewable energy economy data

[Experimental low carbon and renewable energy economy dataset](#)
Dataset | Released 14 April 2022
Experimental estimates of turnover and employment in the low carbon and renewable energy economy (LCREE) in the UK, its constituent countries and regions of England using data from the LCREE Survey and the Inter-Departmental Business Register.

6 . Glossary

Co-efficient of variation

A co-efficient of variation (CV) is the size of any sampling error for an estimate relative to the size of the estimate itself. These provide another indicator of the quality of estimates. A CV greater than 0.5 (or 50%) corresponds with a Confidence Interval that includes the value 0.

Confidence interval

Confidence intervals (CIs) are a standard way of expressing the statistical accuracy of survey-based estimates. A 95% confidence interval is the range within which the true population value would fall for 95% of the time, if the survey were repeated. If an estimate has a high sampling error level, the corresponding confidence interval will be very wide.

Employment

Employment is measured in terms of full-time equivalent (FTE) employees, where one FTE employee may be thought of as equivalent to one person working full time for one year.

"Green jobs"

There is currently no agreed definition that the Office for National Statistics (ONS) can use to produce statistics on green jobs. Various UK and international organisations use a [range of definitions](#). However, estimates of employment in the low carbon and renewable economy (LCREE) using the LCREE Survey are often used as a measure of the number of green jobs in the UK. You can read [our "Green jobs", current and upcoming work article](#) , which outlines further upcoming research and analysis.

Inter-departmental Business Register (IDBR)

The IDBR is a database of all businesses in the UK registered for VAT and/or the Pay As You Earn (PAYE) income tax system. There are approximately 2.7 million businesses on the IDBR. The IDBR is the register of UK businesses used as a sampling frame for the ONS business surveys.

Low carbon and renewable energy economy (LCREE)

Economic activities that deliver goods and services that are likely to help the UK generate lower emissions of greenhouse gases, predominantly carbon dioxide.

Low carbon and renewable energy sector

The LCREE Survey asks UK businesses to self-classify themselves into 17 low carbon and renewable energy sectors, which are:

- offshore wind

- onshore wind

- solar photovoltaic

- hydropower

- other renewable electricity

- bioenergy

- alternative fuels

- renewable heat

- renewable combined heat and power

- energy efficient lighting

- other energy efficient products

- energy monitoring, saving or control systems

- low carbon financial and advisory services

- low emission vehicles and infrastructure

- carbon capture and storage

- nuclear

- fuel cells and energy storage

A business can be active in more than one sector.

Turnover

This is the amount received in sales from goods and services in a defined time period. It is a useful measure of the health of a business or an economy.

7 . Data sources and quality

Data sources

Experimental estimates method

Experimental estimates shown in this article were produced by combining data on businesses who had indicated activity in this part of the economy on the low carbon and renewable energy economy (LCREE) Survey, and their estimates of UK and country-level turnover and employment, with detailed information about these businesses available from the Inter-departmental Business Register (IDBR) in early 2022. This information was regarding the:

- current structure of each business, including any "local units" associated with each business

- the region of each of these local units (derived from their postcode)

- the full-time equivalent (FTE) employment in each "local unit" of a business

An assumption was made that the LCREE turnover and employment of a business is contributed to by all "local units" attached to a business, as captured on the IDBR, with the relative contribution of each of a business' locations based on the amount of employment at each of a business' locations relative to its total employment.

This approach to regional allocation is consistent with the approach that has been used to produce other Office for National Statistics (ONS) regional-level estimates, such as estimates of imports of services to subnational areas of the UK using the International Trade in Services Survey and other supplementary sources.

Quality

Given the assumption that LCREE activity takes place across all of a business' "local units" and that available IDBR data used was of businesses' current structure and activity in 2022, a number of quality assurance steps were undertaken to help improve the accuracy and relevance of the IDBR data and enable its combination with LCREE survey data. These steps were:

- the removal of any "local units" with birth or death dates outside of the period the LCREE Survey estimates related to

- the removal of any "local units" with non-UK addresses because LCREE Survey estimates of activity only capture UK activity

- conducting desk research into the largest contributing businesses to the LCREE sectors to ensure the IDBR "local unit" information used provided as fair a reflection possible of LCREE activity; however, no evidence was found to adjust the regional allocations as proposed using the method described

A number of potential limitations with the experimental method of using IDBR data combined with LCREE Survey data to estimate turnover and employment across countries and regions of the UK should be noted. These potential limitations include that:

- an assessment of the accuracy of the experimental estimates is not provided in this publication, so please use the information on accuracy of the initial LCREE Survey-based estimates of LCREE activity for countries and sectors in the UK as a guide (see confidence intervals and coefficients of variation in this dataset) - this is something that the ONS can look to provide in future updates, subject to user feedback

- currently only English regions are considered given the smaller LCREE Survey sample sizes in other countries of the UK

- only the portion of turnover or employment of a business that directly relates to low carbon activities is captured from the LCREE Survey

- LCREE survey data for previous years are revised after each annual data collection, so data are subject to revision.

Revision of data can result from a variety of factors, including:

- the incorporation of additional data received from businesses who have been sampled in multiple years of the survey

- changes to data because of businesses revising their previous submissions

- developments in methodology

More quality and methodology information on the strengths, limitations, appropriate uses, and how the data are initially created from the LCREE Survey is available in our Low Carbon and Renewable Energy Economy (LCREE) Survey QMI.

More information on the IDBR sources, structure and updating is also available.

8 . Future developments

We would welcome any feedback on the experimental methods used or regional estimates of turnover and employment in this article. You can email us at environment.accounts@ons.gov.uk

Based on any feedback received and user demand, we will look to update this work in future. This could include:

- improvements to the methodology

- providing estimates of accuracy (coefficients of variation and confidence intervals) for the experimental estimates shown

- producing a longer back series of experimental estimates (2014 to 2019)

- repeating the analysis when future waves of the LCREE Survey are available

You can read about further upcoming research and analysis that are outlined in our "Green jobs", current and upcoming work article.

9 . Related links

Low carbon and renewable energy economy, UK: 2020
Bulletin | Released 17 February 2022
Estimates of the size of the UK's green economy from the Low Carbon and Renewable Energy Economy Survey, including turnover and employment.

Low Carbon and Renewable Energy Economy (LCREE) Survey QMI
Methodology | Released 17 February 2022
Quality and Methodology Information for the Low Carbon and Renewable Energy Economy (LCREE) Survey, detailing the strengths and limitations of the data, methods used, and data uses and users.

Comparing environmental economy estimates, UK
Methodology | Released 21 March 2022
A comparison of the methodology for the UK's two sets of environmental economy estimates. Including similarities and differences in coverage, how the estimates are calculated, and how to understand what the data show.

UK environmental goods and services sector (EGSS): 2019
Bulletin | Released 21 March 2022
First estimates of the UK environmental goods and services sector (EGSS) for 2019 and revised estimates for 2010 to 2018. Included are estimates of output, gross value added, employment and exports.

"Nature jobs" using environmental goods and services sector: 2019
Article | Released 21 March 2022
Assessing what the environmental goods and services sector (EGSS) framework shows about nature jobs in the UK for 2010 to 2019 and opportunities for further research.

The challenges of defining a green job
Blog | Released 7 April 2021
This article looks at how we define what constitutes a "green job" and the challenges of doing so. It assesses the different definitions in use, including ones for which the ONS currently produces data.

"Green jobs", current and upcoming work: March 2022
Article | Released 7 March 2022
How the ONS has contributed to understanding "green jobs" through regular estimates and research articles, and what our future work on "green jobs" will include.

Research into "green jobs": time spent doing green tasks, UK: 1997 to 2019
Article | Released 7 March 2022
This article provides new experimental estimates of the time spent doing green tasks, over time, by UK country and by industry. It uses a new method, based on task-level data from the O*NET database in the US.