



Quantifying the Low Carbon and Environmental Goods Sector in Northumberland

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Introduction and Methodology

The objective of this report is to assess the size and value of Northumberland's low carbon and environmental economy and to provide some forecasts of how the low carbon sector might grow over time. Throughout this section of the report we use the term 'low carbon and environmental economy' to mean industries that produce goods and services aimed at addressing environmental objectives, and in particular, the objective of lowering carbon emissions. The measurement approach adopts a broad definition of environmental and low carbon activity in that it includes both industries involved in the direct supply of relevant goods and services, such as the operators of wind farms, but also industries that are likely to be indirectly involved in supply, such as the manufacturers of gears and bearings for wind turbines.

The most accurate way of quantifying low carbon activity would be to implement a 'bottom up' approach - that is, to survey a sample of companies in order to determine the extent to which environmental and low carbon activities form part of their business. Whilst accurate, the approach is likely to be resource intensive and may fail to deliver results that can be readily contextualised or replicated.

The second way of quantifying low carbon activity is to adopt a 'top down' methodology. Essentially this approach would define low carbon activity according to a set of Standard Industrial Classifications (SIC) and form quantitative estimates of activity from secondary data sources. Whilst this method may be relatively easy to implement across different geographies, it is likely to be relatively inaccurate in its quantification.

We apply a hybrid methodology – one that applies a top-down methodology to available bottom-up data. In this way we aim to derive a higher degree of accuracy than a purely top-down approach whilst maintaining generality and ease of implementation.

The source of the bottom-up data is the analysis conducted by Innovas (2009) *Low Carbon and Environmental Goods and Services: an Industry Analysis* for the Department of Business Innovation and Skills. This report provides survey-based estimates of environmental and low carbon goods and services for the UK and the Government Office regions (e.g. the North East of England) for the year 2007. Moreover, the report provides growth forecasts for those industries.

Our approach takes the Innovas non-standardised definitions of low carbon and environmental sectors and links them to detailed Standard Industrial Classifications (4 digit, SIC2003). In order to identify relevant SICs, we refer to a wide range of industry sources regarding the nature of supply chains in low carbon and environmental industries. Inevitably we rely upon judgement and interpretation, particularly in terms of assessing the extent to which activity in any given SIC is partially involved in the production of low carbon and environmental goods and services. Our methodology starts by mapping the Innovas non-standardised sectors and SICs for the UK. This mapping is then modified to meet the

estimates for Government Office Regions using an iterative scaling algorithm. The resulting map of low carbon and environmental sectors for the North East is subsequently applied to secondary data sources for the Northumberland. A schematic mapping of GB low carbon and environmental goods and services to SICs can be found in Appendix 1; a schematic map of the importance of low carbon and environmental goods and services to each SIC group can be found in Appendix 2.

Innovas themselves acknowledge that their classification of the low carbon and environmental sector is imperfect because areas of economic activity naturally overlap. If the survey element of this work were to be revisited, we would recommend revising the Innovas sector definitions to better suit the local context.

It should also be noted that this schematic map has a relatively short shelf-life. The shares of each SIC group are those that fit the Innovas survey data of 2007. However, it is likely that the share of the low carbon and environmental sector is likely to grow in the future (and indeed will have been smaller in the past). Hence the mapping identified here is only applicable to a limited number of years and mapping outside that timeframe is likely to be problematic. In order to continue to use the hybrid methodology effectively, the 'bottom-up' element of the work (i.e. the survey) requires periodic revision.

The scheme also relates to SIC(2003) rather than the new SIC(2007) which has been adopted in National Statistics databases from 2008 onwards.

Section 1 of this report provides a benchmarking analysis of the low carbon and environmental goods and services industry in 2008. Section 2 presents employment forecasts for the low carbon and environmental goods and services industry between 2009 and 2020. Section 3 presents a summary of key points. The appendices detail the mapping between Innovas sectors and the SIC(2003)

Section 1 – Benchmarking for 2008

Employment in Low Carbon & Environmental Sectors in 2008

Table 1 presents estimates of employment in low carbon and environmental industries in 2008. The table shows that Northumberland had around 3,500 full-time equivalent (FTE) workers in low carbon and environmental industries, representing 0.4% of GB employment in the low carbon and environmental sector and 3.5% of Northumberland's total employment. Northumberland was therefore slightly over-specialised in low carbon and environmental industries, reflected in a location quotient of 1.11 (3.5% / 3.2%). The North East region is estimated to be more specialised in low carbon and environmental industries than both Northumberland and GB as a whole.

Table 1: Estimated Employment in Low Carbon and Environmental Industries, 2008

Employment, 2008	NH	NE	GB
FT	2843	33970	756765
PT	396	3463	101848
Jobs	3239	37433	858614
FTEs	3501	41284	855846
% share of GB employment	0.4	4.8	--
% of all industry	3.5	3.9	3.2
Location Quotient	1.11	1.23	--

Chart 1 and Table 2 give further details of employment in low carbon and environmental sectors, utilising the classification scheme used by the Innovas (2009) report¹ for the Department for Business Innovation and Skills. Sectors are split into three broad groups containing a number of sub-groups.

- **Environmental Industries**
Such as pollution control, waste collection, recycling, water supply and treatment;
- **Renewable Energies**
Such as hydroelectricity, biomass and geothermal;
- **Emerging Carbon Industries**
Such as vehicle manufacture, manufacture and supply of alternative fuels for vehicles and the manufacture and supply of other alternative fuels (including nuclear energy).

The estimates show that Northumberland is generally under-specialised across renewable energy sectors but has relatively strong representation in environmental industries and emerging carbon industries. Its main strength in environmental industries is in water and water treatment. In emerging industries, Northumberland has strength in low carbon vehicles and vehicle fuel, other low carbon fuels and building technologies. Both

¹ Innovas (2009) *Low Carbon Environmental Goods and Services: an Industry Analysis*, Department for Business Innovation and Skills

Northumberland and the North East have very low representation in carbon finance, a sector which is strongly concentrated in London.

Chart 1 : Full Time Equivalent Workers in Broad Classification of Low Carbon and Environmental Sectors, 2008

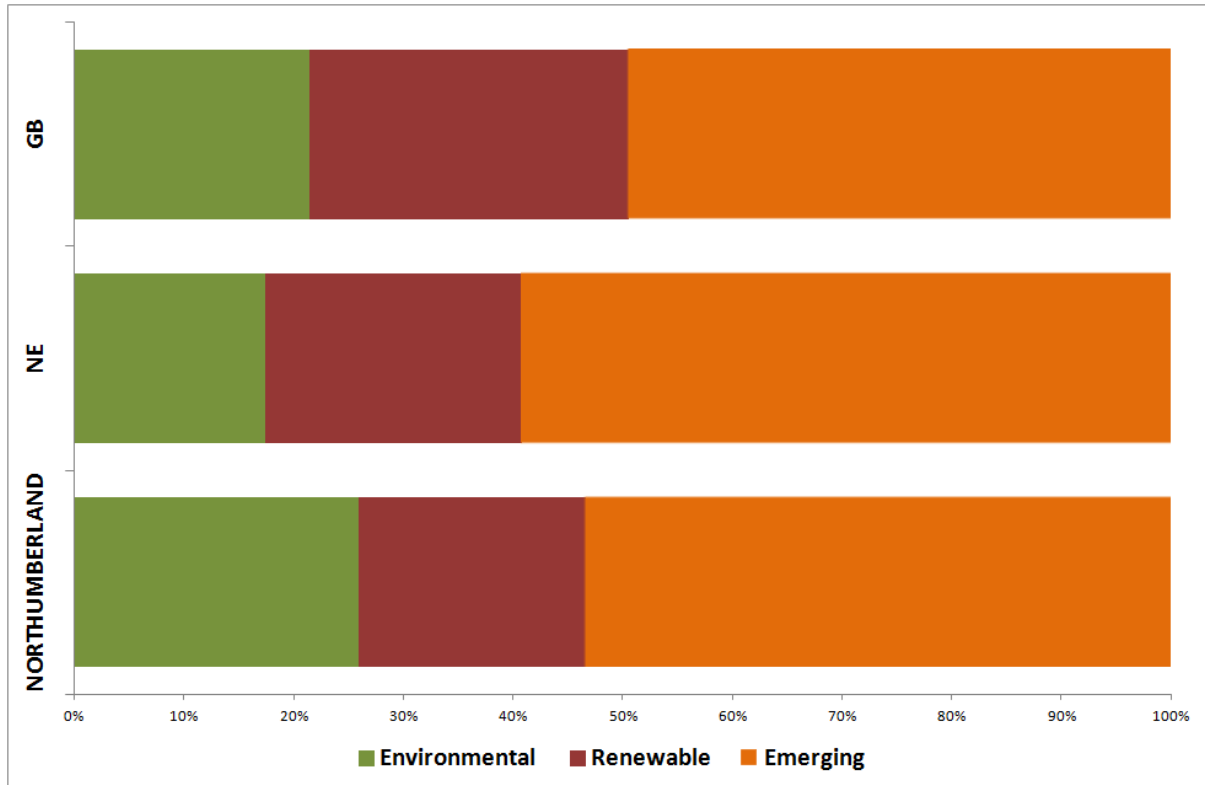


Table 2: FTE and Location Quotient in Narrow Low Carbon and Environmental Sectors, 2008

	Full Time Equivalents, 2008			Location Quotient	
	NH	NE	GB	NH	NE
ENVIRONMENTAL INDUSTRY	908	7221	184191	1.34	1.00
Air pollution	82	563	7272	3.06	1.97
Environmental consultancy	13	204	4403	0.82	1.18
Environmental monitoring	6	54	1176	1.49	1.17
Control of marine pollution	4	57	674	1.81	2.14
Noise and vibration control	5	66	1472	0.87	1.15
Contaminated land	52	410	7187	1.95	1.45
Waste management	70	779	37463	0.51	0.53
Water & waste water treatment	465	2916	66723	1.90	1.11
Recovery & recycling	210	2172	57820	0.99	0.96
RENEWABLE ENERGY	728	9651	249302	0.79	0.98
Hydroelectricity	5	145	4428	0.32	0.84
Wave & tidal	2	21	502	1.01	1.07
Biomass	91	1230	44629	0.55	0.70
Wind	259	3250	86698	0.81	0.95
Geothermal	238	3008	72284	0.89	1.06
Renewable consulting	7	141	3870	0.47	0.93
Photovoltaic	128	1856	36892	0.94	1.28
EMERGING LOW CARBON	1864	24412	422353	1.20	1.47
Low carbon vehicles & vehicle fuel	457	8565	97914	1.27	2.23
Other low carbon fuels	716	8493	164418	1.18	1.31
Development of new energy	19	679	9977	0.52	1.73
Carbon capture & storage	14	295	4357	0.89	1.72
Carbon finance	2	41	20557	0.03	0.05
Energy management	39	769	18604	0.56	1.05
Building technologies	618	5569	106528	1.58	1.33
TOTAL	3501	41284	855846	1.11	1.23

Gross Value Added and Productivity in Low Carbon and Environmental Sectors in 2008

Gross Value Added (GVA) is a standard measure of economic output for industries. It is largely comprised of wage cost but also includes industry profits and depreciation.

Table 3 presents estimates of Gross Value Added in the low carbon and environmental sectors in 2008. The table shows that these sectors contributed £199m to Northumberland's economy, representing 5.8% of its economic output. In value terms, both Northumberland and the North East were over-specialised in low carbon and environmental industries, reflected in location quotients of above unity.

Table 1 suggests that employment in the low carbon and environmental sector is generally high value added. Every worker in a low carbon or environmental industry in Northumberland contributed around £56,845 in GVA in 2008 which was around two-thirds higher than the Northumberland average. A higher than average level of productivity was also apparent in the North East and GB sectors. This general feature largely reflects the high capital intensity of energy generating sectors.

Northumberland's productivity in low carbon and environmental sectors lags some way behind the national average at around 67% of the GB figure. However, estimates of worker productivity relative to Great Britain in Northumberland's wider economy show a similar gap². Productivity in low carbon and environmental industries was higher in the North East than Northumberland but still behind the GB average.

Table 3 : Gross Value Added and Productivity in Low Carbon and Environmental Industries, 2008

GVA, 2008	NH	NE	GB
GVA (£m)	199	2741	72071
% of GB	0.3	3.8	--
% of all industry	5.8	6.6	5.3
Location Quotient	1.11	1.25	--
Productivity (£/FTE)	56845	66394	84210
Productivity vs all industry	1.66	1.70	1.67

Chart 2 and Table 4 provide further detail of GVA and productivity for the low carbon and environmental sectors in 2008. Chart 2 emphasises the relative dominance of the environmental sector within the Northumberland low carbon and environmental goods industry, representing around 40% of its composition compared to just over 20% for GB.

² ONS Regional Accounts data suggest GVA per head of population in Northumberland in 2008 was 61.5% of the UK average.

Table 4 breaks down the GVA analysis to the narrow definitions of low carbon and environmental sectors. Water and water treatment makes up nearly three quarters of the environmental sector output and has the second highest productivity of any low carbon and environmental industry. Northumberland’s productivity lags considerably behind that of the nation in almost all sectors of significance – water and waste water treatment and recovery and recycling being the only sector of any size where productivity is comparable.

Chart 2 : Gross Value Added in Broad Classification of Low Carbon & Environmental Sectors, 2008

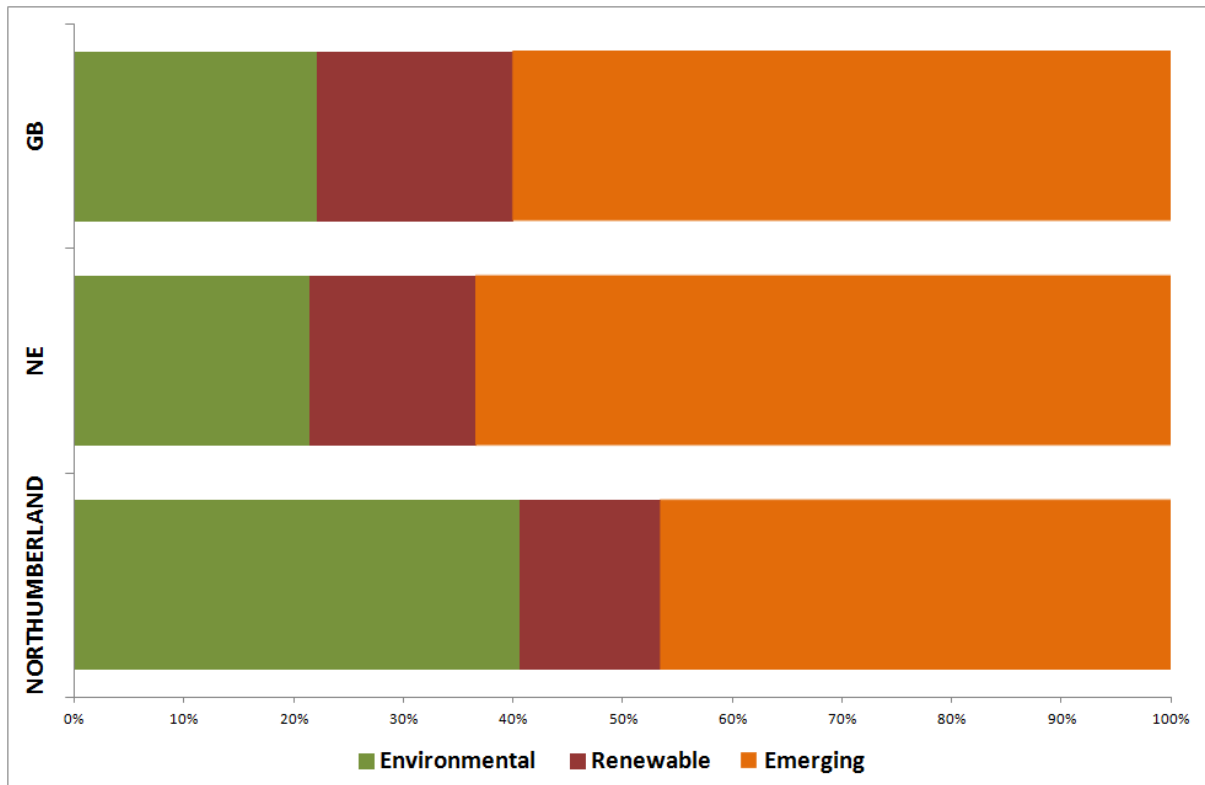


Table 4: GVA and Productivity in Narrow Low Carbon and Environmental Sectors, 2008

	GVA (£m, 2008)			Productivity (£000 per FTE)		
	NH	NE	GB	NH	NE	GB
ENVIRONMENTAL INDUSTRY	80.9	590	16000	89	82	87
Air pollution	1.9	17	345	23	30	48
Environmental consultancy	0.5	7	227	35	32	52
Environmental monitoring	0.2	2	62	25	41	53
Control of marine pollution	0.1	2	29	26	33	43
Noise and vibration control	0.1	3	74	31	44	50
Contaminated land	1.8	21	422	35	51	59
Waste management	5.7	52	2551	82	67	68
Water & waste water treatment	58.5	373	8599	126	128	129
Recovery & recycling	12.1	114	3691	58	52	64
RENEWABLE ENERGY	25.5	418	12907	35	43	52
Hydroelectricity	1.3	29	843	250	201	190
Wave & tidal	0.1	1	25	28	45	50
Biomass	4.5	57	2059	50	46	46
Wind	7.2	108	4115	28	33	47
Geothermal	8.1	126	3607	34	42	50
Renewable consulting	0.5	7	202	75	51	52
Photovoltaic	3.8	90	2057	30	48	56
EMERGING LOW CARBON	92	1733	43163	50	71	102
Low carbon vehicles & vehicle fuel	18.3	545	9698	40	64	99
Other low carbon fuels	46.6	832	24331	65	98	148
Development of new energy	1.4	39	1024	71	58	103
Carbon capture & storage	0.6	13	230	39	45	53
Carbon finance	0.1	1	1157	35	25	56
Energy management	2.5	40	1010	65	52	54
Building technologies	23.0	262	5712	37	47	54
TOTAL	199	2741	72071	57	66	84

FTE Employment in Low Carbon and Environmental Industry By Standard Industrial Classification, 2008

Table 5 shows the composition of the low carbon and environmental sector by FTE employment in terms of Standard Industrial Classification (SIC, 2003) for Northumberland, the NE and GB. The final two columns show location quotients for Northumberland and the NE relative to GB³, whilst Charts 3 and 4 show the composition graphically for Northumberland and GB respectively.

Manufacture is the largest of these industry classifications for all three geographies. Northumberland has a larger share of its low carbon and environmental sector concentrated in manufacture than GB, although the concentration is not as great as for the NE region. Agriculture and the water industry represent the industries where Northumberland's production of low carbon and environmental goods and services is most concentrated. By contrast, Northumberland has a somewhat lower concentration in low carbon and environmental industry in technical and engineering services, construction, sanitary services and education; it has a significantly lower representation in business services, R&D and the gas industry.

Table 5 : Composition of FTE Employment in Low Carbon and Environmental Sector by SIC, 2008

	%			Location Quotient	
	NH	NE	GB	NH	NE
Primary and secondary	9.2	2.5	3.4	2.73	0.75
Manufacture (incl recycling)	34.4	43.7	29.1	1.18	1.50
Electricity	1.2	3.2	2.0	0.61	1.62
Gas	0.2	1.1	2.2	0.08	0.51
Water	12.4	6.0	3.3	3.70	1.80
Sanitary services	3.1	2.6	7.0	0.44	0.36
Construction	8.0	8.5	9.7	0.82	0.87
Distribution, retail and transport	13.1	11.6	11.4	1.15	1.02
Business services	0.2	2.1	4.1	0.05	0.51
R&D	0.4	0.4	2.9	0.14	0.13
Civil engineering, architects, technical services	15.8	13.9	20.8	0.76	0.67
Public administration	0.5	0.7	0.7	0.70	0.97
Education services	1.6	3.7	3.5	0.45	1.07

³ The location quotient presented here is expressed in relation to the total employment in the low carbon and environmental sector, not total employment in all industries. In other words, the fact that Northumberland is relatively more specialised in low carbon and environmental industries *per se* is not reflected in these calculations.

Chart 3 : Composition of FTE Employment in Low Carbon and Environmental Sector by SIC, NORTHUMBERLAND 2008

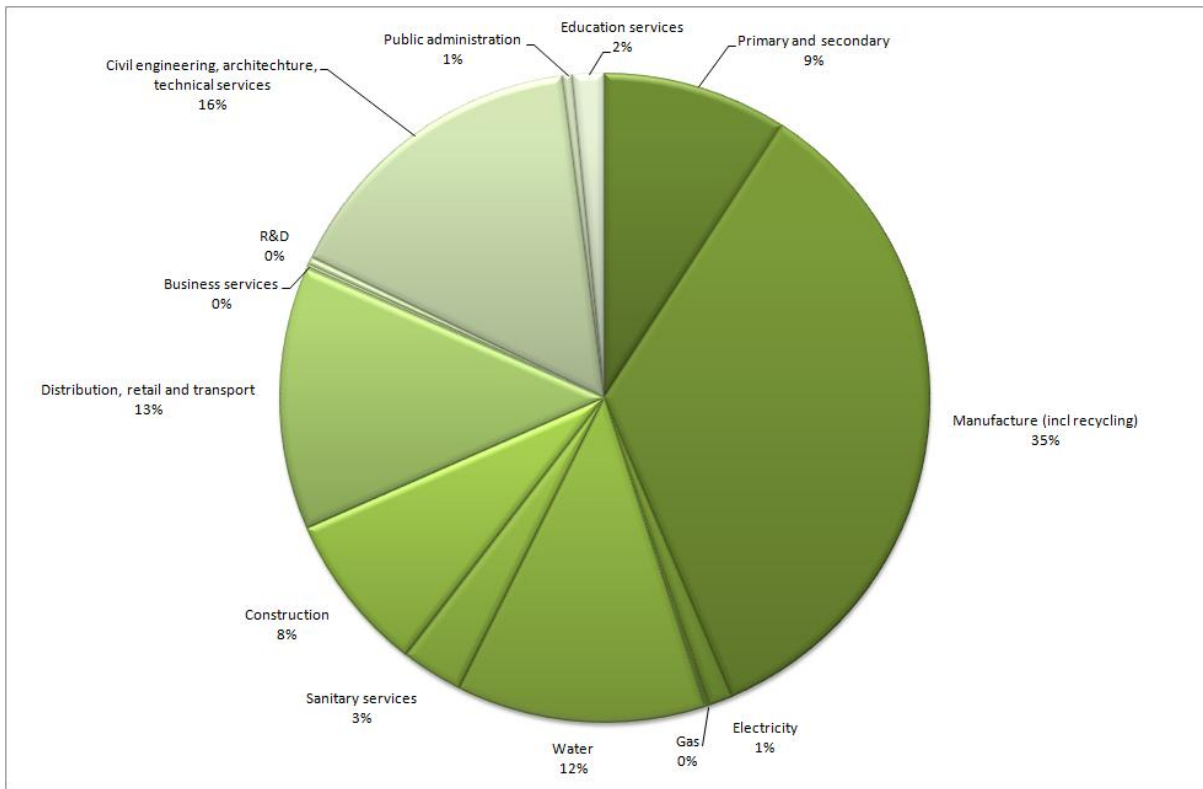
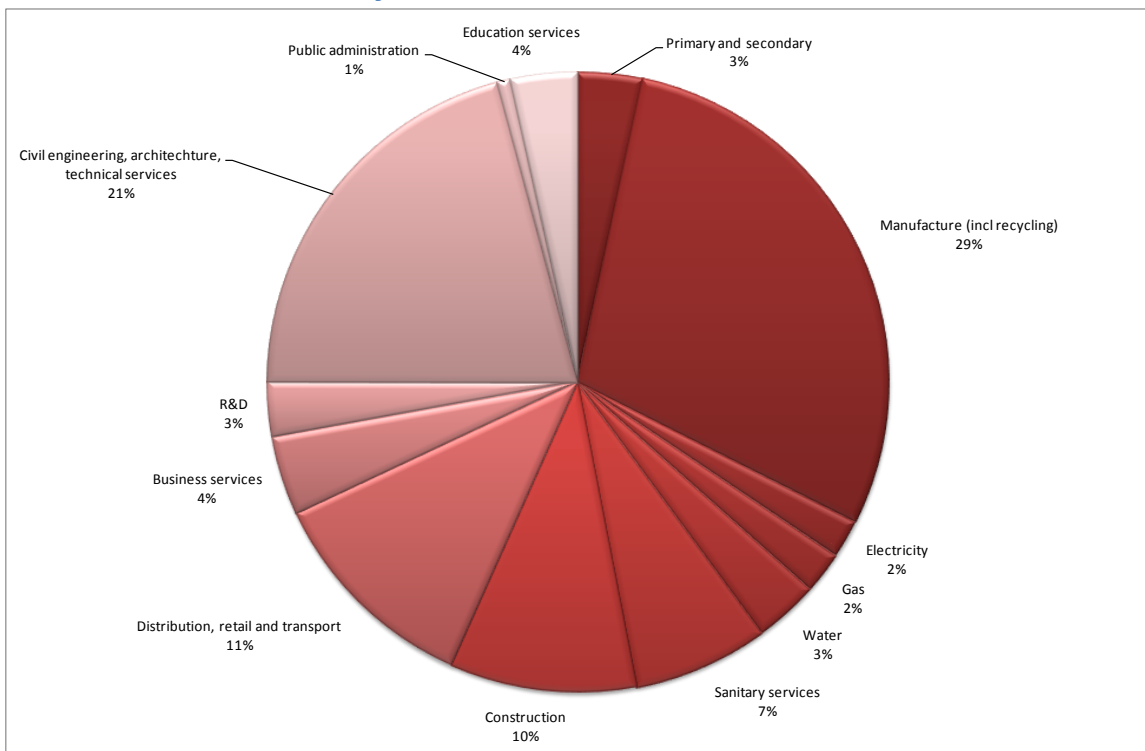


Chart 4 : Composition of FTE employment in Low Carbon and Environmental Sector by SIC, GB 2008



Section 2 – Forecasts 2009-2020

Economic Forecasts for Low Carbon and Environmental Sectors, 2009-2020

Forecasts are made for GVA and FTE employment from 2009 to 2020. The approach makes use of the market forecasts that appear in the Innovas (2009) report. These forecasts are compiled from a range of sources across low carbon industries. We make several modifications to the Innovas forecasts. Firstly, given that the forecasts largely predate the global economic downturn, we adjust the forecasts to better reflect current market conditions. Secondly we modify the forecasts to accommodate recent changes in Government policy (e.g. reductions in feed-in tariffs to solar energy). Thirdly, the Innovas forecasts end in 2014 and we extend the period to 2020 using simple methods of extrapolation. Finally we translate Innovas market growth estimates into employment terms using assumptions about the relationship between output and employment growth.

It should be noted that the forecasts do not consider the possibility that Northumberland will embark on a strategy of actively developing its low carbon and environmental sector. Rather, these forecasts assume that Northumberland's low carbon and environmental sector will grow largely at the same rate as the corresponding national industries.

FTE Employment Forecasts, 2009-2020

Employment forecasts for the Northumberland low carbon and environmental industries are illustrated in Charts 5, 6 and Table 6.

Chart 5 : Annual Compound Growth Rate in FTE Employment During Forecast Period

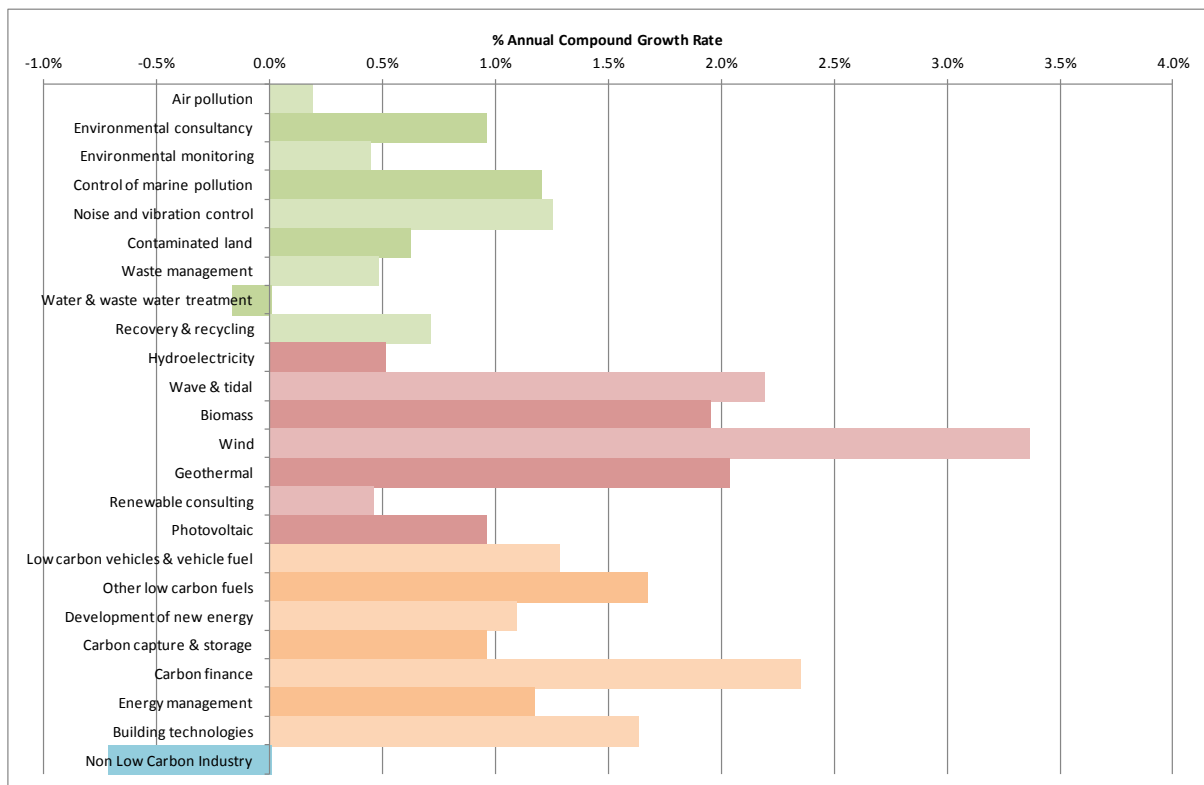


Table 6 shows that whilst Northumberland's general economy is expected to show steady decline over the forecast period, low carbon and environmental sectors are expected to show positive growth in 2011 and beyond. Employment in low carbon and environmental sectors is expected to reach a growth rate of around 2% by 2020. Chart 5 shows that the annual compound growth rate in non-low carbon and environmental industry is negative but above 0.5% for the majority of low carbon/environmental sectors.

Generally, growth rates in the environmental industry are forecast to be lower than in other industries, reflecting the fact that the environmental sector contains a number of 'mature' industries such as water supply.

The forecasts suggest there may be around 540 jobs created between 2011 and 2020 in Northumberland's low carbon and environmental sector. This would see the share of low carbon and environmental industries rise from 3.9% of total FTE employment in 2011 to 4.6% of total FTE employment in 2020.

It should be noted that these jobs are not necessarily additional to total employment and instead may result from existing firms refocusing their products on the environmental and low carbon sector. It is however difficult to estimate the degree to which substitution will take place.

Chart 8 : FTE Employment Index (2009=100) in Broad LC & Environmental Sectors and Non-LC & Environmental Industry, 2008-2020

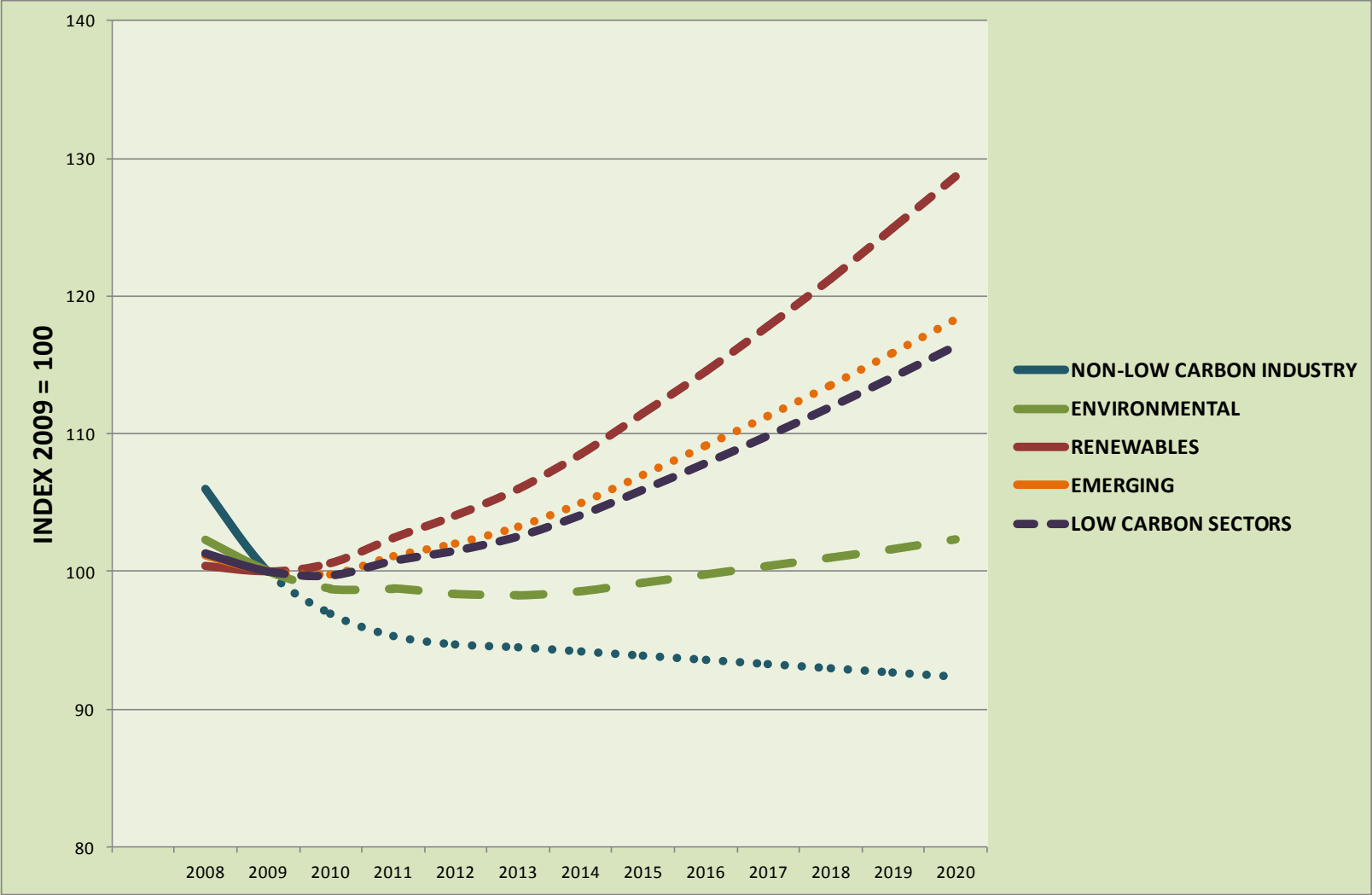


Table 7 : FTE Employment for Narrow Low Carbon and Environmental Sectors and % of Northumberland Economy, 2009-2020

FTE Workers	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
ENVIRONMENTAL INDUSTRY	888	877	877	874	872	875	881	886	891	897	902	908
Air pollution	80	79	79	79	78	79	79	80	80	81	81	82
Environmental consultancy	13	13	13	13	13	13	13	14	14	14	14	14
Environmental monitoring	6	6	6	6	6	6	7	7	7	7	7	7
Control of marine pollution	4	4	4	4	5	5	5	5	5	5	5	5
Noise and vibration control	5	5	5	5	5	5	5	5	5	5	5	5
Contaminated land	51	50	50	50	50	51	51	52	52	53	53	54
Waste management	69	68	68	68	68	69	69	70	70	71	72	72
Water & waste water treatment	454	447	445	442	440	440	441	442	443	444	445	446
Recovery & recycling	206	205	206	206	207	208	211	213	215	218	220	223
RENEWABLE ENERGY	726	730	743	755	769	788	809	832	855	880	906	934
Hydroelectricity	5	5	5	5	5	5	5	5	5	5	5	5
Wave & tidal	2	2	2	2	2	2	2	2	2	2	2	2
Biomass	90	90	91	92	94	96	98	100	103	105	108	111
Wind	259	262	270	277	285	295	306	318	330	344	358	373
Geothermal	236	236	240	243	247	252	258	265	272	279	286	294
Renewable consulting	6	6	6	6	6	6	7	7	7	7	7	7
Photovoltaic	128	129	129	130	130	131	133	135	136	138	140	142
EMERGING LOW CARBON	1843	1840	1863	1880	1903	1935	1972	2011	2052	2093	2136	2181
Low carbon vehicles & vehicle fuel	451	449	454	457	461	468	476	484	492	501	510	519
Other low carbon fuels	708	708	718	725	735	748	764	780	796	813	831	850
Development of new energy	19	19	19	19	19	19	20	20	20	21	21	21
Carbon capture & storage	14	14	14	14	14	14	15	15	15	15	15	16
Carbon finance	2	2	2	2	2	2	2	2	3	3	3	3
Energy management	38	38	38	38	39	39	40	40	41	42	42	43
Building technologies	611	610	618	625	632	644	657	670	684	699	714	730
TOTAL	3457	3447	3483	3509	3545	3598	3662	3729	3798	3870	3945	4023
% of All Northumberland FTEs	3.7%	3.8%	3.9%	3.9%	4.0%	4.1%	4.2%	4.2%	4.3%	4.4%	4.5%	4.6%

Section 3 - Summary

- Low Carbon and Environmental industries were estimated to employ around 3,500 FTE workers in 2008, representing 3.5% of Northumberland's total FTE employment.
- The value of the low carbon and environmental industry was estimated to be £199m in GVA at 2008 prices, representing 5.8% of Northumberland's total economic output.
- Northumberland was over-specialised in low carbon and environmental industries relative to GB reflected in location quotients for employment and output of around 1.11
- Low carbon and environmental industries in Northumberland were significantly more productive than the average industry. GVA per FTE was around £56,800, two thirds higher than the average of all industries in Northumberland.
- Nevertheless, Northumberland's productivity in low carbon and environmental sectors lagged behind that of the GB sector at around 67% of the GB average.
- Around 34% of low carbon and environmental industry employment in Northumberland was manufacturing-based compared to less than 30% in Great Britain.
- Northumberland has a particularly strong representation in low carbon and environmental industries related to water, agriculture and manufacturing industries.
- Forecasts suggest that growth in low carbon and environmental industries in Northumberland will outstrip growth in other industries by a significant margin between 2009 and 2020.
- Up to 540 jobs could be created in the low carbon and environmental industries between 2011 and 2020. These jobs may represent transition from non-low carbon goods and services to the low carbon sector.
- The importance of low carbon and environmental industries is likely to rise between 2011-2020: from employing 3.9% of workers in 2011 to 4.6% in 2020.