



OXFORD
ECONOMICS

THE ECONOMIC IMPACT OF SELLAFIELD

JUNE 2017

Oxford Economics

Oxford Economics was founded in 1981 as a commercial venture with Oxford University's business college to provide economic forecasting and modelling to UK companies and financial institutions expanding abroad. Since then, we have become one of the world's foremost independent global advisory firms, providing reports, forecasts and analytical tools on 200 countries, 100 industrial sectors and over 3,000 cities. Our best-of-class global economic and industry models and analytical tools give us an unparalleled ability to forecast external market trends and assess their economic, social and business impact.

Headquartered in Oxford, England, with regional centres in London, New York, and Singapore, Oxford Economics has offices across the globe in Belfast, Chicago, Dubai, Miami, Milan, Paris, Philadelphia, San Francisco, and Washington DC. We employ over 230 full-time people, including more than 150 professional economists, industry experts and business editors—one of the largest teams of macroeconomists and thought leadership specialists. Our global team is highly skilled in a full range of research techniques and thought leadership capabilities, from econometric modelling, scenario framing, and economic impact analysis to market surveys, case studies, expert panels, and web analytics. Underpinning our in-house expertise is a contributor network of over 500 economists, analysts and journalists around the world.

Oxford Economics is a key adviser to corporate, financial and government decision-makers and thought leaders. Our worldwide client base now comprises over 1000 international organisations, including leading multinational companies and financial institutions; key government bodies and trade associations; and top universities, consultancies, and think tanks.

June 2017

All data shown in tables and charts are Oxford Economics' own data, except where otherwise stated and cited in footnotes, and are copyright © Oxford Economics Ltd.

This report is confidential to **Sellafield Limited** and may not be published or distributed without their prior written permission.

The modelling and results presented here are based on information provided by third parties, upon which Oxford Economics has relied in producing its report and forecasts in good faith. Any subsequent revision or update of those data will affect the assessments and projections shown.

TABLE OF CONTENTS

Definitions.....	3
Executive summary	4
1. Introduction.....	5
2. Sellafield Ltd’s GVA contribution.....	8
2.1 Total contribution.....	8
2.2 GVA per job at Sellafield Ltd.....	9
2.3 Sellafield Ltd’s supply chain.....	11
2.4 Local contribution	13
2.5 Sectoral contribution	14
3. Sellafield Ltd’s jobs contribution.....	18
3.1 Total contribution.....	18
3.2 Wages at Sellafield Ltd	19
3.3 Local contribution	21
3.4 Sectoral employment	23
4. Sellafield Ltd’s tax contribution.....	27
5. Sellafield Ltd’s investment in R&D	28
6. The outlook.....	30
6.1 Transforming Sellafield Ltd	30
6.2 Labour market outlook	30
6.3 GVA outlook	33
6.4 Population growth	34
6.5 Strengths, weaknesses, opportunities and threats	36
7. Conclusions.....	38
Annex A: sectoral specialisms	39
Annex B: Modelling approach	41

DEFINITIONS

Annual Site Funding Limit: This refers to the annual budget needed to run Sellafield Ltd

Direct impacts: refer to the direct activity of Sellafield Ltd and includes all employees, their wages and output.

FTE: FTE stands for full-time equivalent and is a measure of employment.

GVA: GVA measures the value of goods and services produced in an economy, sector or market. It is essentially GDP plus subsidies and minus taxes.

Indirect impacts: refer to activity support through supply chain spending by Sellafield Ltd and the subsequent rounds of supply chain spending.

Induced impacts: refer to activity support through the consumer spending of those employed directly or indirectly by Sellafield Ltd.

Productivity: is measured as GVA per job.

Tier 2: Tier 2 spending refers to supply chain spending by Sellafield Ltd. Companies receiving this first round of supply chain spending are defined as Tier 2 companies.

Tier 3: Tier 3 spending refers to the second round of supply chain spending by Tier 2 companies.

EXECUTIVE SUMMARY

Sellafield Ltd plays a considerable role in the UK, especially Cumbria. It directly employs more than 11,000 people of which more than 86 percent are based in Seascale in Copeland.

£2.1bn

Estimated GDP contribution in the UK in 2016/17

Along with some 43,800 jobs

We estimate it made a GVA¹ contribution to GDP of £2.1 billion (in 2013 prices) in 2016/17, with a direct contribution of £720 million. A further £960 million in GVA was generated from its UK supply chain, with a further £430 million in GVA generated through those directly and indirectly employed spending their income.

Of the total £2.1 billion GVA contribution made by Sellafield Ltd, some 70 percent or £1.47 billion was generated in Cumbria and Warrington, 8.9 percent of all GVA in the economy. However, much is concentrated in Copeland where it sustains 59.4 percent of Copeland's GVA. It is also highly productive. GVA per job levels are some 40.9 percent higher than the UK average and 11.9 percent higher than UK manufacturing. Consequently, Copeland boasts a strikingly high productivity level, which is almost 35 percent above the regional average.

58.7

percent

Of Copeland's jobs

And 59.4 percent of GVA

From an employment perspective, it sustains 43,800 FTE² jobs, of which 27,950 jobs (63.8 percent) are in Cumbria and Warrington. As with GVA, Sellafield Ltd is extremely important to employment in Copeland sustaining an estimated 58.7 percent of local jobs. It also offers well paid employment. The average salary in Sellafield Ltd was over £43,000 in 2016/17 (compared to the mean annual pay for all full-time employee jobs in the UK at £34,451).

The outlook for Cumbria is challenging and its local economies face several weaknesses and threats. Amongst the Cumbrian economies, Copeland is forecast to experience the largest contraction in employment and the slowest GVA growth. It also suffers from relatively poor skills and a declining working population.

Sellafield Ltd is planning to transform the organisation and over the next 4 to 5 years expects a reduction in 3,000 roles which will have implications for the local economies of Cumbria and Warrington. Despite this, Sellafield Ltd hopes to play a role in revitalising local economies by working with local stakeholders and its supply chain.

¹ Gross Value Added

² Full time equivalent

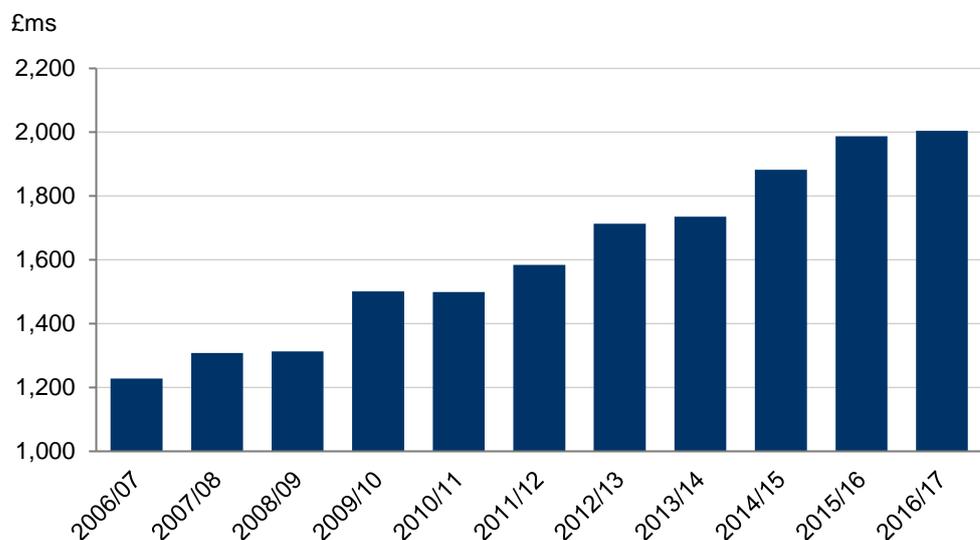
1. INTRODUCTION

Sellafield Ltd is the company responsible for safely delivering decommissioning, reprocessing and nuclear waste management activities on behalf of the Nuclear Decommissioning Authority. It operates several sites in Cumbria—by far the largest is near Seascale in Copeland.

The company plays a considerable role in the economy of the North West of England, especially Cumbria. At the end of the 2016/17 financial year the organisation employed 11,012 (or an average of 10,976 over the year). More than 86 percent of this workforce is based in Seascale in Copeland. Warrington accounts for a further 9.5 percent with Whitehaven accounting for the remaining 4.3 percent.

The economic contribution of the company is felt not just in the jobs it provides and the wages it pays its employees, but in the considerable amount it spends procuring goods and services, both in the local area and beyond. Sellafield Ltd provides a substantial injection of demand into the UK economy. Its annual operating budget (Annual Site Funding Limit) was just over £2 billion in the 2016/17 financial year, a figure which has grown by over 63 percent in the previous 10 years, as shown in Fig. 1. This is spent on labour costs, taxes, and supply chain spending.

Fig. 1. Annual site funding limit of Sellafield Ltd

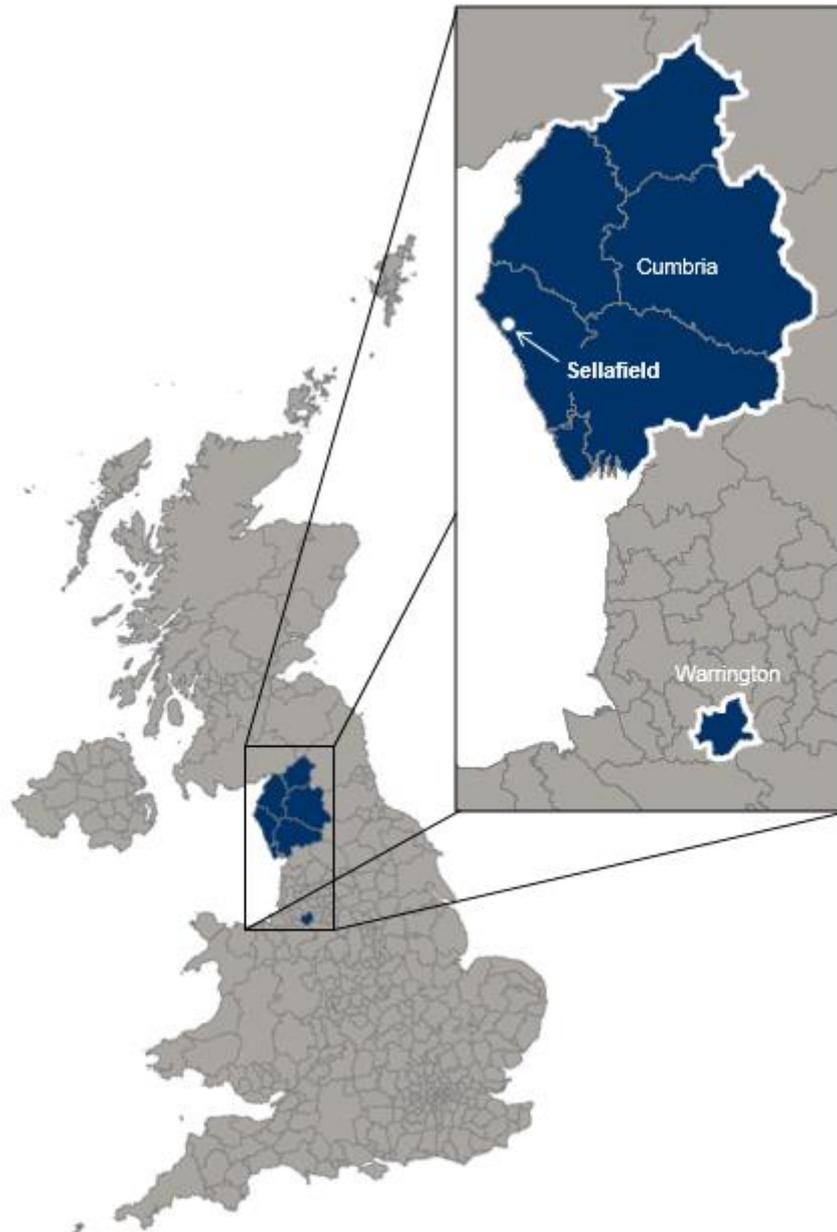


The impact of the company can be quantified in the contribution the company makes to national and Cumbrian GDP, the jobs it sustains, and in the taxes that its activities generate for the Exchequer. Beyond this, the investment Sellafield Ltd makes in research and development (R&D) has important spill-over effects, helping to drive innovation, productivity and growth in the UK economy.

This report quantifies the current economic contribution of Sellafield Ltd in the UK, and its impact on the six local authorities that make up Cumbria (Allerdale, Barrow-in-Furness, Carlisle, Copeland, Eden and South Lakeland) and Warrington (Fig. 2). Its presence there, especially in Copeland, makes it a vital

economic asset locally. To understand the scale of its local impact, the contribution of the company is set within an exploration of the local economy in terms of its recent performance, demographic trends, sectoral and skills structure and capacity to grow in the coming decade.

Fig. 2. The study area



Source: Oxford Economics

INTRODUCING ECONOMIC IMPACT ANALYSIS

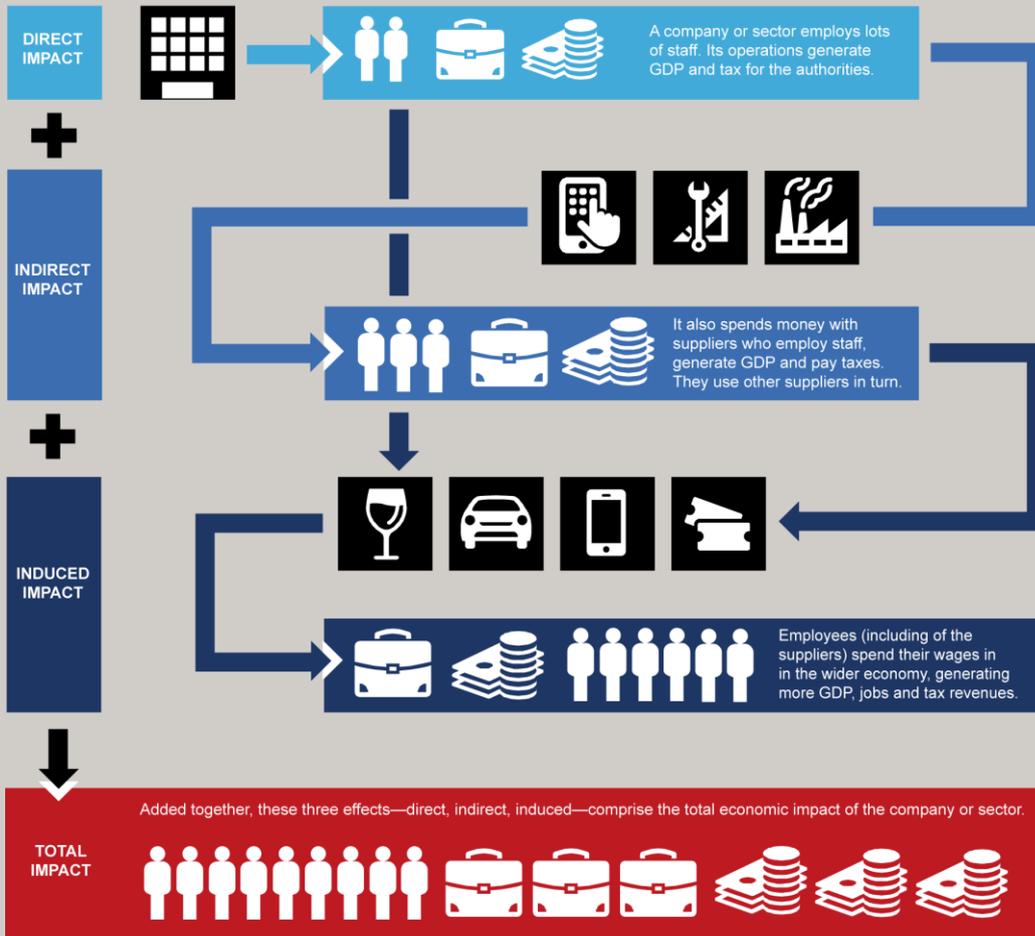
The economic impact of a company is measured using a standard means of analysis called an economic impact assessment. The report quantifies the three 'core' channels of impact that comprise the organisation's 'economic footprint':

- **Direct impact**, which is the economic activity that Sellafield Ltd generates at its UK offices and plants because of its operational spending;
- **Indirect impact**, or supply chain impact, that occurs because Sellafield Ltd buys inputs of goods and services from UK businesses; and the
- **Induced impact**, which relates to the wider economic benefits that arise when employees of Sellafield Ltd and its supply chain spend their wages in the consumer economy, for example in local retail establishments.

We analyse these channels of impact using three core metrics:

- **Employment**, measured on a headcount basis so that it is possible to make comparisons to national statistics;
- **Gross value added** contribution to UK GDP; and,
- **Tax receipts** generated by the UK activity and employment supported by Sellafield Ltd.

Fig. 3. Economic impact assessment



2. SELLAFIELD LTD'S GVA CONTRIBUTION

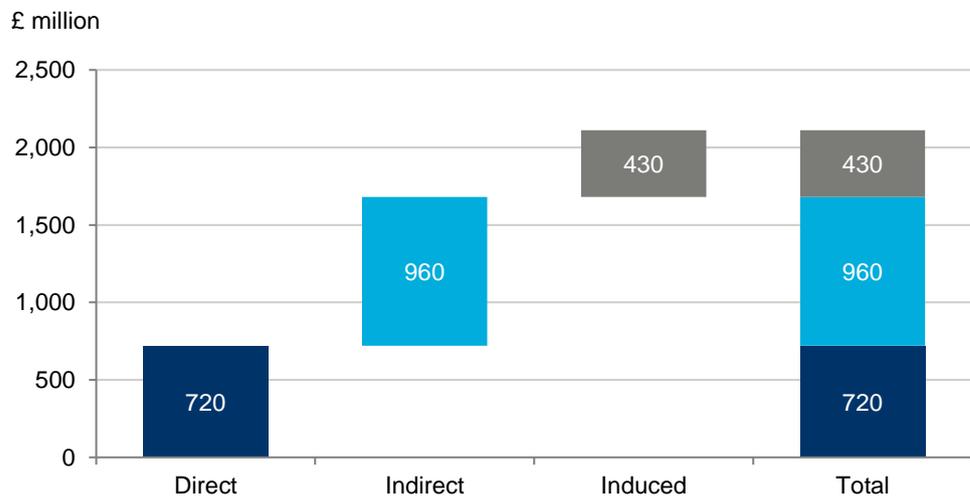
2.1 TOTAL CONTRIBUTION

Sellafield Ltd has a considerable economic footprint in the UK. Thousands of people work at its facilities in Cumbria and Warrington. The purchases Sellafield Ltd makes from its suppliers support further activity throughout the UK, sustaining thousands more jobs across the country. Finally, the wages paid to its own employees, and those employed in its supply chain, fund consumer spending and deliver additional economic benefit to the UK.

In the next three chapters, we quantify Sellafield Ltd's economic footprint in terms of its contribution to GDP, the employment it supports and the tax revenues it generates for the UK government, and set this within the context of local economic strengths and weaknesses.

Overall, Sellafield Ltd made a Gross Value Added (GVA)³ contribution to GDP of £2.1 billion (in 2013 prices) in 2016/17. Its direct contribution amounted to £720 million of this. A further £960 million in GVA was generated from the activity that Sellafield Ltd supported in its UK supply chain. Finally, as its staff and employees within its supply chain spend their wages, a further £430 million in GVA was generated.

Fig. 4. Sellafield Ltd's GVA contribution to GDP 2016/17 (2013 prices)



Source: Oxford Economics

In total this means that for every £1 of public sector funding it receives, Sellafield Ltd generates another £1.58 of output in the rest of the economy. Or for each £1 of GVA contribution to the economy, Sellafield Ltd generates a

³ GVA measures the contribution to the economy of each individual producer, industry or sector in the United Kingdom. GDP is equal to GVA plus taxes, minus subsidises.

further £1.93 in the rest of the economy. Indeed, when benchmarked against 80 sectors of the economy, Sellafield Ltd has the ninth highest GVA multiplier.

Fig. 5. Top 10 GVA multiplier's, Sellafield vs two digit sectors

	GVA
Manufacture of chemicals and chemical products	4.5
Manufacture of fabricated metal products, except machinery and equipment	4.1
Manufacture of beverages	3.6
Manufacture of other transport equipment	3.6
Manufacture of furniture	3.5
Forestry and logging	3.4
Postal and courier activities	3.1
Water collection, treatment and supply	3.1
Sellafield	2.9
Electricity, gas, steam and air conditioning supply	2.9

Source: Oxford Economics

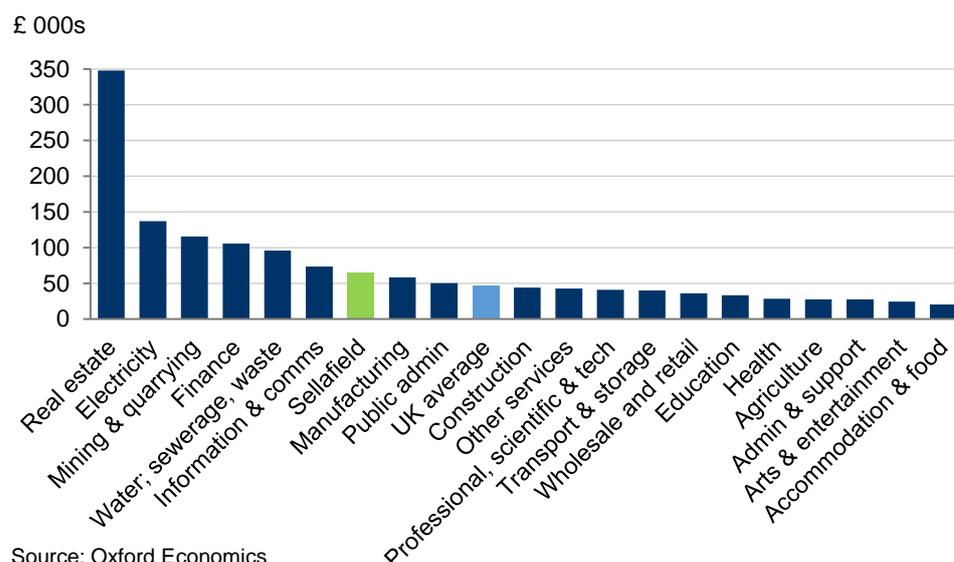
2.2 GVA PER JOB AT SELLAFIELD LTD

A further means of placing Sellafield Ltd's impact into perspective is to explore the GVA produced per job. Sellafield Ltd's employees are highly skilled and able to produce high levels of GVA. On average, each Sellafield Ltd employee created a £65,000 gross value added contribution to UK GDP in 2016/17 (in 2013 prices). That is nearly 41 percent higher than the average across all UK employees, which was £46,100.⁴ It is also nearly 12 percent higher than average across the UK manufacturing sector (£58,100 per worker).

Indeed, compared to the standard 19 sectors of the economy, Sellafield Ltd had the seventh highest GVA per job. Those with higher levels are typically capital-intensive industries with relatively small amounts of labour (e.g. Real Estate, Electricity, Mining, Finance, Water and Sewerage and Information and Communication).

⁴ We calculate productivity by dividing GVA by total employment in 2016.

Fig. 6. GVA per job (2013 prices), 2016



Source: Oxford Economics

GVA per job, otherwise known as productivity, is a particularly important measure since, in the long term, it is the key driver of economic growth. Strong growth in productivity will boost the economic competitiveness of an area in the medium to long term.

We estimate that average productivity in Cumbria and Warrington, reached £40,700 in 2016. This was slightly lower than the regional average and significantly below the average productivity of the UK. However, average productivity in Warrington—home to one of Sellafield Ltd’s sites— at just under £45,000 per job, was almost eight percent above the regional average. As we discuss later, the general structure of the economy explains why Warrington’s productivity is so high.

Copeland has a strikingly high productivity level, driven by its high employment concentration in manufacturing (which is no doubt boosted significantly by the activity of Sellafield Ltd). Overall productivity within that area averaged £55,600, almost 35 percent above the regional average—in part reflecting the contribution of the area’s nuclear sector. Elsewhere, all other local areas within Cumbria show below average levels of productivity.

Interestingly Copeland experienced the fastest rate of productivity growth from 2006 to 2016. This was driven by the fact that manufacturing accounted for an estimated 54 percent of Copeland’s economic output in 2016 and it has continued its gradual shift to capital intensive and higher value added activity.

Fig. 7. Productivity levels and growth rates, £ 2013 constant prices, 2006-2016, Cumbria and Warrington and regional and national benchmarks

	2016	Growth rates, % p.a.		
		2006-2016	2006-2009	2009-2016
Allerdale	33,247	0.8%	2.5%	0.0%
Barrow-in-Furness	38,365	2.6%	4.7%	1.7%
Carlisle	37,750	1.0%	0.5%	1.2%
Copeland	55,625	3.0%	10.0%	0.2%
Eden	33,533	-0.3%	-1.5%	0.2%
South Lakeland	35,576	-0.1%	-0.4%	0.1%
Cumbria	38,519	1.1%	2.4%	0.6%
Warrington	44,866	-0.1%	-1.9%	0.6%
Cumbria and Warrington	40,667	0.6%	0.7%	0.6%
North West	41,671	0.2%	-0.7%	0.6%
UK	46,133	0.5%	-0.5%	0.9%

Source: Oxford Economics

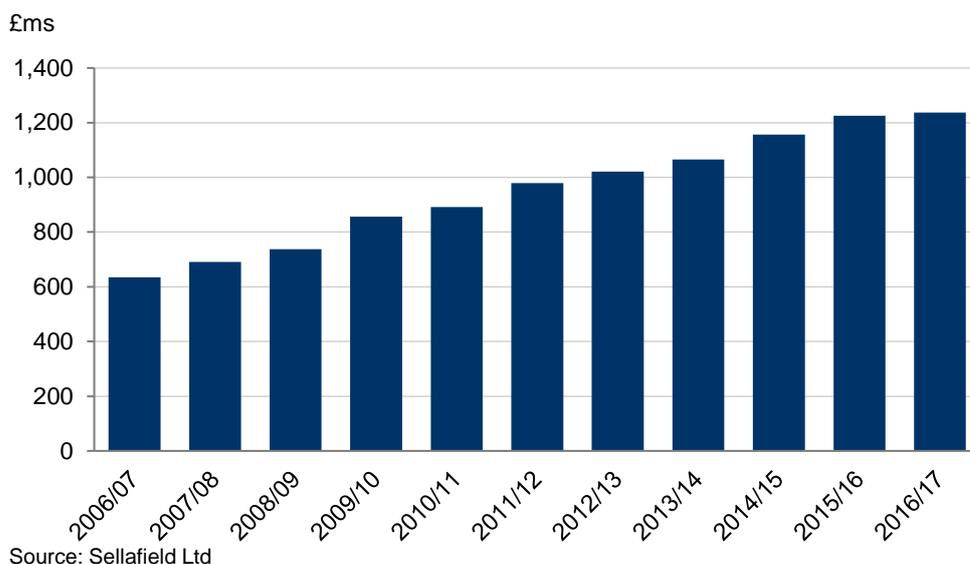
2.3 SELLAFIELD LTD'S SUPPLY CHAIN

To deliver its work Sellafield Ltd relies on a broad and diverse UK supply chain. UK businesses provide crucial inputs to its operations.

Sellafield Ltd's purchases of goods and services from UK businesses stimulate economic activity throughout the rest of the economy. The impact model we have constructed for this study enables us to map these linkages and quantify Sellafield Ltd's supply chain impact in the UK and in the local economies of Cumbria and Warrington. Using data on Sellafield Ltd's first round of supply chain spending (its tier two spending) and the subsequent round of spending by Sellafield Ltd's suppliers in their own supply chains (tier three spending), we can provide detailed analysis of the indirect and induced impact that arises from Sellafield's activity.

In total in 2016/17, Sellafield Ltd spent more than £1.2 billion on inputs of goods and services. Importantly, almost all the supply chain spending was spent in the UK (99.1 percent). The amount spent with tier two suppliers has nearly doubled since 2006/07 in nominal terms.

Fig. 8. Sellafield Ltd's supply chain, 2006/07 to 2016/17



Sellafield Ltd's procurement spending appears to be highly concentrated. Expenditure with its top 100 companies/organisations in 2016/17 accounted for 95.3 percent of all its supply chain spending. From a geographical perspective, spending was by far the highest in Copeland, with Warrington and Wolverhampton in second and third.

Fig. 9. Top 10 locations for Sellafield Ltd's tier two spending in 2016/17

Local Authorities	Total spend (£m)	Share of total
Copeland	£658.4	53.2%
Warrington	£110.9	9.0%
Wolverhampton	£55.0	4.4%
Windsor and Maidenhead	£46.4	3.8%
Allerdale	£44.0	3.6%
Stockton-on-Tees	£27.7	2.2%
Manchester	£25.3	2.0%
Halton	£19.2	1.6%
Rugby	£18.5	1.5%
Leeds	£18.5	1.5%
Top 10 total	£1,024.0	82.8%
Total tier 2 spending	£1,236.8	100.0%

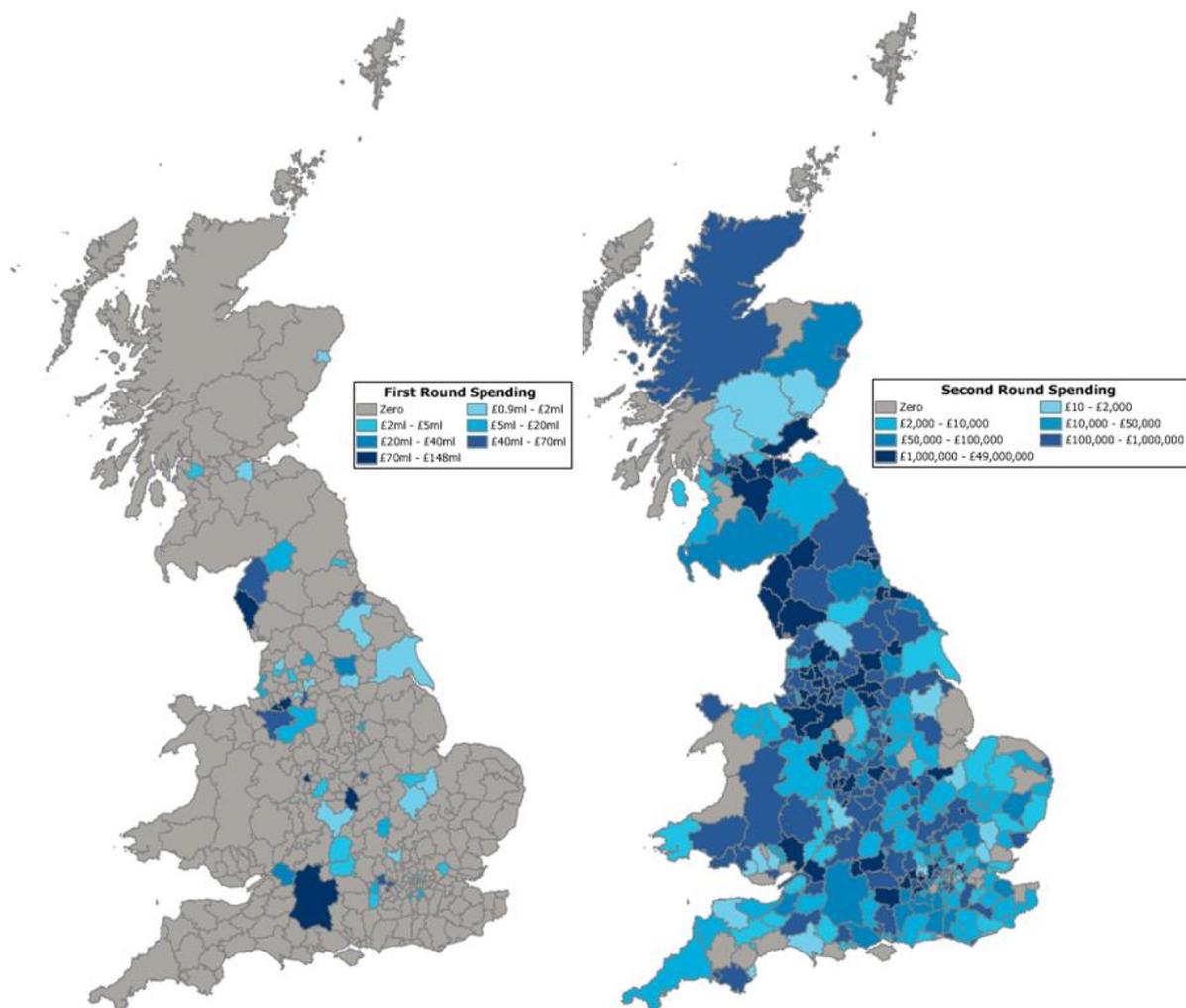
Source: Oxford Economics and Sellafield Ltd

Note: Wolverhampton includes Sellafield Ltd's IT services and Windsor and Maidenhead include the ASW recruitment services.

The two maps below reveal the geographical distribution of Sellafield Ltd's supply chain spending. On the left is tier two spending by Sellafield Ltd in 2016/17. However, through the subsequent rounds of supply chain spending, Sellafield Ltd's procurement has a much wider impact across most parts of the

UK. The map on the right-hand side shows that the second round of supply chain spending (i.e. tier three spending by tier two companies) is more widespread. Though again Copeland and Warrington enjoy the largest supply chain spending.

Fig. 10. Location of tier two and tier three spending in 2016/17



Source: Oxford Economics and Sellafield Ltd

2.4 LOCAL CONTRIBUTION

An analysis of Sellafield Ltd's local economic contribution shows that of the total £2.1 billion GVA contribution made by Sellafield Ltd in 2016/17, some 70 percent or £1.47 billion of GVA was generated in Cumbria and Warrington. Consequently, Sellafield Ltd's total economic footprint accounts for an estimated 8.9 percent of GVA in the Cumbrian and Warrington economy.

Drilling down further, we can see that Sellafield Ltd is substantially more important to the Copeland economy sustaining nearly 60 percent of Copeland's GVA.

Fig. 11. Sellafield Ltd's GVA contribution by local authority, 2016/17

	Total GVA (£m, 2013 prices)	Share of economy GVA
Allerdale	60	4.4%
Barrow in Furness	10	1.0%
Carlisle	20	0.9%
Copeland	1,190	59.4%
Eden	0	0.1%
South Lakeland	0	0.2%
Warrington	180	2.9%
Cumbria and Warrington	1,470	8.9%

Source: Oxford Economics

2.5 SECTORAL CONTRIBUTION

From a sectoral perspective, the largest two digit⁵ sector for Tier 2 spending was “Architectural and engineering activities, technical testing and analysis” which received over £460 million (37.8 percent of all tier 2 spending in the UK)⁶. Indeed, it was more than double the next largest sector of “Specialised Construction activities”.

Fig. 12. Top 10 sectors for tier 2 spending in the UK in 2016/17

Sectors	Total spend (£m)	Share of total
71 Architectural and engineering activities; technical testing and analysis	£463.8	37.8%
43 Specialised construction activities	£196.2	16.0%
84 Public administration and defence; compulsory social security	£81.1	6.6%
62 Computer programming, consultancy and related activities	£58.3	4.8%
26 Manufacture of computer, electronic and optical products	£56.3	4.6%
78 Employment activities	£48.7	4.0%
82 Office administrative, office support and other business support activities	£41.0	3.3%
42 Civil engineering	£35.2	2.9%
41 Construction of buildings	£31.3	2.6%
28 Manufacture of machinery and equipment n.e.c.	£24.9	2.0%
Total	£1,225.7	100.0%

Source: Oxford Economics and Sellafield Ltd

Interestingly an analysis of the Tier 3 spending information collected by Sellafield shows similar sectoral concentrations of supply chain expenditure (though the data does not cover all Tier 3 spending). Again, “Specialised

⁵ Two digit sectors refer to the Standard Industrial Classification 2007 system for defining sectors of the UK economy.

⁶ When allocating tier 2 spend to sectors of the economy, we used where possible information from Companies House. Consequently the sectoral allocation is driven largely by how individual companies classify themselves in submitting their accounts.

construction activities” and “Architectural and engineering activities, technical testing and analysis” enjoy amongst the highest levels of spending.

Fig. 13. Top 10 sectors for tier 3 spending in the UK in 2016/17

Local Authorities	Total spend (£m)	Share of total
43 Specialised construction activities	£68.0	20.0%
25 Manufacture of fabricated metal products, except machinery and equipment	£37.5	11.0%
71 Architectural and engineering activities; technical testing and analysis	£32.0	9.4%
28 Manufacture of machinery and equipment n.e.c.	£23.7	7.0%
74 Other professional, scientific and technical activities	£19.3	5.7%
70 Activities of head offices; management consultancy activities	£16.6	4.9%
46 Wholesale trade, except of motor vehicles and motorcycles	£13.2	3.9%
62 Computer programming, consultancy and related activities	£13.2	3.9%
61 Telecommunications	£12.3	3.6%
78 Employment activities	£10.9	3.2%
Total	£340.0	100.0%

Source: Oxford Economics and Sellafield Limited

Sellafield Ltd’s economic footprint is especially concentrated in several of Copeland’s sectors. As Figure 14 shows, the share of jobs sustained by Sellafield Ltd’s activities reaches 100 percent in some sectors. For example, the “Computer programming, consultancy”, “Architectural and engineering” and “Specialised Construction activities” in Copeland are effectively wholly dependent on Sellafield Ltd. There are several reasons the modelling suggests that Sellafield Ltd sustains 100% or more of local sectors (see the footnote to Figure 14).

Firstly, the sectoral data for Copeland is only available for 2015 and data at this level can be volatile from year to year. More importantly, while we know where supply chain spending has taken place, we have had to estimate the location of the actual work. In other words, we know where invoices are sent, but this is not always where the actual work is carried out. In doing so we have taken advice from Sellafield Ltd and allocated some of the value of supply chain to Copeland despite invoices being sent elsewhere. Official statistics will not however capture the temporary location of jobs. Consequently, there could be some discrepancy between our spatial modelling of supply chain spending and the location of jobs in Government Statistics.

Fig. 14. Copeland sectoral impacts (sectors employing 100 or above)

Copeland	Share of jobs
Computer programming, consultancy	100%*
Architectural and engineering	100%*
Specialised construction activities	100%*
Office administrative, office support	100%*
Manufacture of basic metals	100%*
Public administration and defence	100%*
Other personal service activities	88.2%
Other professional, scientific	78.3%
Civil engineering	50.1%
Manufacture of machinery and equip	42.4%
Total	58.7%

Source: Oxford Economics

Note: * = Our sectoral impact estimates were over 100 percent. This can be due to several reasons. Published sectoral employment is available for 2015 and does not include any major changes in 2016. It is also based on survey information, and therefore can be volatile from year to year as significant companies are not included in the numbers or if companies change the postcode on their forms. In addition, the impact modelling uses standard sectoral supply chain spending patterns to estimate of sectoral impacts of Sellafield. Combined, these can produce impact estimates that are higher than the published size of the sector.

The UK economy is extremely reliant on small and medium sized business activity (SMEs). An SME is defined as a firm which employs less than 250 employees or generates turnover of less than £50 million. SMEs typically make a strong contribution within local economies. This is even more so in Cumbria and Warrington. Published business count figures by employee size and turnover bands show that SMEs are more prevalent in Cumbria and Warrington when compared to both the UK and regional averages. Indeed, only Carlisle and Warrington had above average representation of larger businesses based within their geographies.

Figure 15 shows the share of businesses by employee size in each economy, excluding micro businesses with less than 10 employees.

Fig. 15. Businesses by employee size, 2016

	Small (10 to 49)	Medium-sized (50 to 249)	Large (250+)	Total (SML)
Allerdale	86.7%	11.1%	2.2%	100.0%
Barrow-in-Furness	82.9%	14.6%	2.4%	100.0%
Carlisle	81.1%	14.2%	4.7%	100.0%
Copeland	86.5%	13.5%	0.0%	100.0%
Eden	88.1%	10.4%	1.5%	100.0%
South Lakeland	86.7%	12.0%	1.3%	100.0%
Cumbria	85.3%	12.4%	2.2%	100.0%
Warrington	78.7%	16.9%	4.4%	100.0%
Cumbria and Warrington	83.5%	13.6%	2.8%	100.0%
North West	82.1%	14.5%	3.4%	100.0%
UK	82.1%	14.4%	3.5%	100.0%

Source: ONS

Copeland, where Sellafield Ltd makes the largest contribution, has a below average share of large businesses. Interestingly published data shows that Copeland had 5 large companies up to 2014, but zero in both 2015 and 2016. Yet Tier 2 spending in Copeland is likely to be concentrated in enterprises with more 50 employees given all the top 100 Tier 2 companies receive over £900,000 in supply chain expenditure, small enterprises are more likely to benefit from subsequent rounds of supply chain spending. This is also true for Allerdale, where 4.4 percent of the economy is reliant on Sellafield Ltd activity.

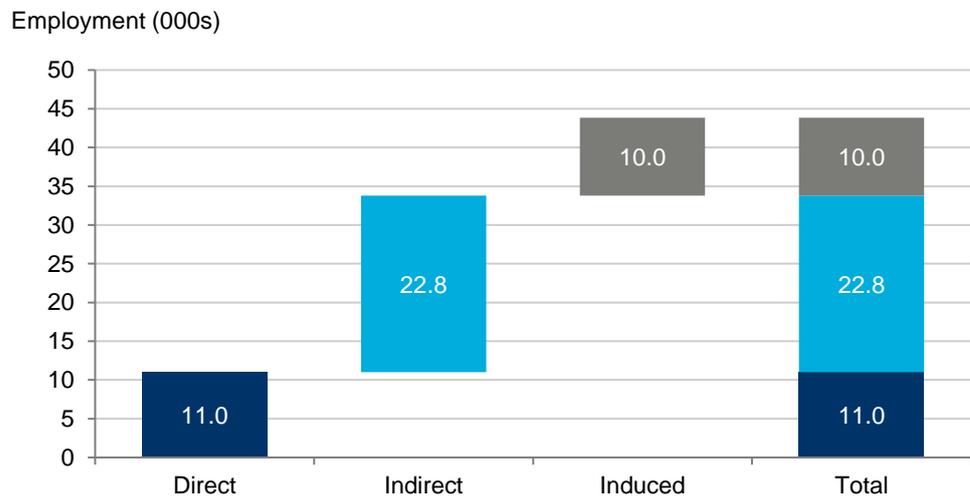
3. SELLAFIELD LTD'S JOBS CONTRIBUTION

3.1 TOTAL CONTRIBUTION

Sellafield Ltd directly employed on average 10,976 FTE employees in 2016/17. In addition to direct staff it also supported 740 FTE Agency Workers and 305 FTE Contractor Supply Workers.

Overall, Sellafield Ltd supported 43,800 FTE jobs in 2016/17. We estimate 22,800 were generated from the activity that Sellafield Ltd supported in its UK supply chain. Finally, as its staff and employees within its supply chain spend their wages, a further 10,000 jobs were generated in the wider economy.

Fig. 16. Sellafield Ltd's employment contribution, 2016/17



Source: Oxford Economics

In total this means that for every direct job in Sellafield Ltd, a further three are sustained in the rest of the economy. This means that when benchmarked against 80 two digit sectors of the economy, Sellafield has the eighth highest employment multiplier (see Figure 17). The job multiplier is notably higher than the GVA multiplier; this is due to the high levels of GVA per job in Sellafield Ltd. In other words the workforce of Sellafield Ltd produce above average levels of GVA and are thus able to generate high levels of supply chain and induced activity that require similar high levels of indirect and induced employment relative the workforce in Sellafield Ltd.

Fig. 17. Top 10 employment multiplier's, Sellafield vs two digit sectors

	Employment
Scientific research and development	9.5
Manufacture of chemicals and chemical products	7.2
Water collection, treatment and supply	6.0
Mining of coal and lignite	5.3
Manufacture of fabricated metal products, except machinery and equipment	4.8
Manufacture of other transport equipment	4.3
Manufacture of furniture	4.3
Sellafield	4.0
Remediation activities and other waste management services	3.8
Architectural and engineering activities; technical testing and analysis	3.5

Source: Oxford Economics

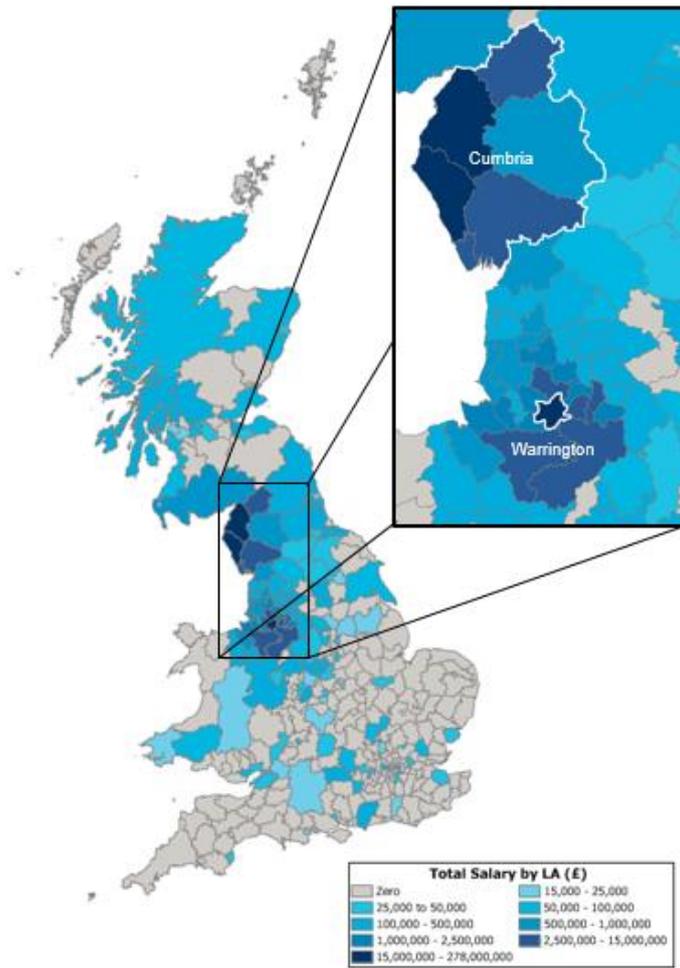
3.2 WAGES AT SELLAFIELD LTD

Given Sellafield Ltd has no gross operating surplus, its contribution to GDP equated to the value of compensation to employees—£738 million (in nominal prices) in 2016/17, equating to 36.8 percent of the total £2 billion total operating budget. Of this figure £472.4 million was basic salaries for the workforce (excluding bonuses, pensions, and social security payments). In other words, the average salary was over £43,000 in 2016/17. To put this in context, the mean annual pay for full-time employee jobs in the UK was £34,451⁷.

An analysis of basic salaries shows that Sellafield Ltd employees are spread across 142 local authorities in the UK (see Figure 18). As expected however salaries are concentrated in a small number of local economies. We find that Copeland benefits from £264 million in basic salaries (55.9 percent of Sellafield Ltd's 2016 / 17 wage bill). Allerdale is second with £121.9 million (25.8 percent) and Warrington third with £16 million (3.4 percent).

⁷ Taken from the Annual Survey of Hours and Earnings.

Fig. 18. Wages (excluding bonuses and pensions) by place of residence, 2016/17



Source: Sellafield Ltd

Fig. 19. Top 10 local authorities by wages (exc. bonuses and pensions), £m, 2016/17

Resides in:	Works in:			Total
	Seascale	Warrington	Whitehaven	
Copeland	£249.8	£0.7	£13.8	£264.27
Allerdale	£114.8	£0.7	£6.4	£121.90
Warrington	£0.7	£15.2	£0.1	£16.04
Barrow-in-Furness	£11.1	£0.1	£1.2	£12.35
Wigan	£0.3	£7.1	£0.1	£7.52
South Lakeland	£4.9	£0.3	£0.5	£5.70
Carlisle	£3.8	£0.1	£0.4	£4.25
Cheshire West and Chester	£0.5	£3.6	£0.0	£4.10
Trafford	£0.2	£3.8	£0.1	£3.98
Cheshire East	£0.3	£2.2	£0.0	£2.55
Total	£394.7	£54.9	£22.8	£472.4

Source: Sellafield Ltd

3.3 LOCAL CONTRIBUTION

As with GVA we can explore this impact at a local authority level. Of the total 43,800 jobs supported by Sellafield Ltd's activities in the UK, 27,950 jobs (63.8 percent) are in Cumbria and Warrington.

Further, Sellafield Ltd is extremely important to employment in Copeland sustaining an estimated 58.7 percent of local jobs in that district alone. Allerdale has the next largest reliance on Sellafield Ltd with 4.4 percent of total economy jobs dependent on Sellafield Ltd activity.

Fig. 20. Sellafield Ltd's local employment footprint, 2016/17

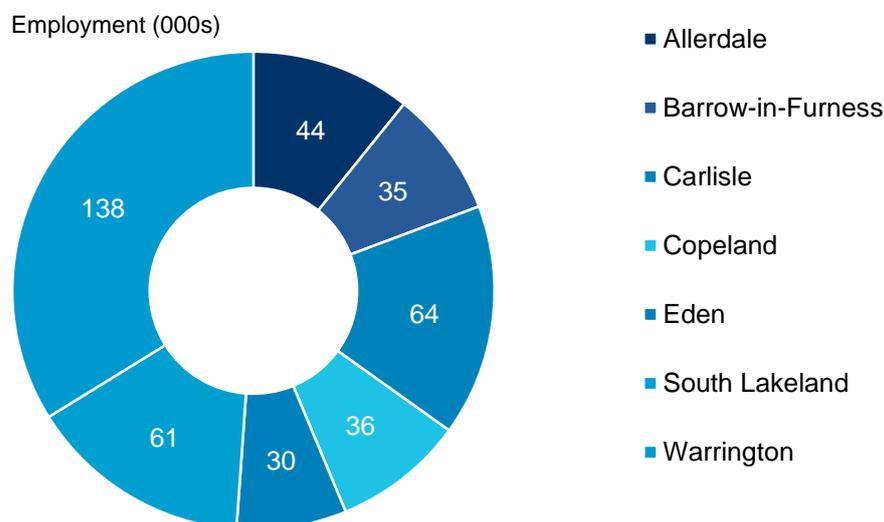
	Total jobs	Share of economy jobs
Allerdale	1,950	4.4%
Barrow in Furness	440	1.3%
Carlisle	510	0.8%
Copeland	21,090	58.7%
Eden	20	0.1%
South Lakeland	110	0.2%
Warrington	3,840	2.8%
Cumbria and Warrington	27,950	6.9%

Source: Oxford Economics

To provide some context, in 2016, Cumbria and Warrington had 408,000 jobs, 11.3 percent of the North West's employment. Warrington is the largest of the seven local authorities, accounting for a third all jobs. In 2016, it was estimated to have had 138,000 jobs compared to the next largest local authority, Carlisle, with 64,000. Copeland was the third smallest with 36,000 jobs, slightly larger than Barrow-in-Furness (35,000 jobs) and Eden (30,000). South Lakeland was of similar size to Carlisle with 61,000 jobs while Allerdale had a modest 44,000

jobs. This difference in size helps explain why such a large share of jobs in Copeland are supported by Sellafield Ltd, and why the share is much smaller in Warrington.

Fig. 21. Employment by local authority, 2016



Source: Oxford Economics

The presence of Sellafield Ltd and its future transformation (which we discuss in more detail later) are likely to be increasingly important to Cumbria and Warrington. Employment growth in the combined area of Cumbria and Warrington fluctuated between 2006 and 2016, but averaged 0.5 percent annually, an increase of 20,200 over the period. This rate of growth was in line with the North West region as a whole, but slower than the UK average (0.8 percent).

Fig. 22. Total employment and growth, by local authority, Cumbria and Warrington, 2006-2016

	Jobs (000s)	Growth 2006-2016
Allerdale	44	0.4%
Barrow-in-Furness	35	1.0%
Carlisle	64	0.4%
Copeland	36	0.3%
Eden	30	0.1%
South Lakeland	61	0.2%
Cumbria	270	0.4%
Warrington	138	0.8%
Cumbria and Warrington	408	0.5%
North West	3,609	0.5%
UK	34,424	0.8%

Source: Oxford Economics

Job growth in Warrington and Copeland, where Sellafield Ltd is directly active, varied significantly from one another over the past decade. We estimate that,

from 2006 to 2016, the number of jobs in Warrington increased by 0.8 percent a year—on par with the national rate of growth. This translated into an average gain of just over 1,000 jobs annually and, thus, the number of jobs reached its highest level in 2016. Employment growth in Copeland was much weaker, averaging only 0.3 percent a year in the decade to 2016. Growth in Allerdale was also below average at 0.4 percent a year over the period 2006 to 2016.

Therefore, the local economy which benefits most from Sellafield Ltd direct jobs (Copeland), recorded amongst the slowest rates of growth in Cumbria, while Allerdale also experienced sluggish growth.

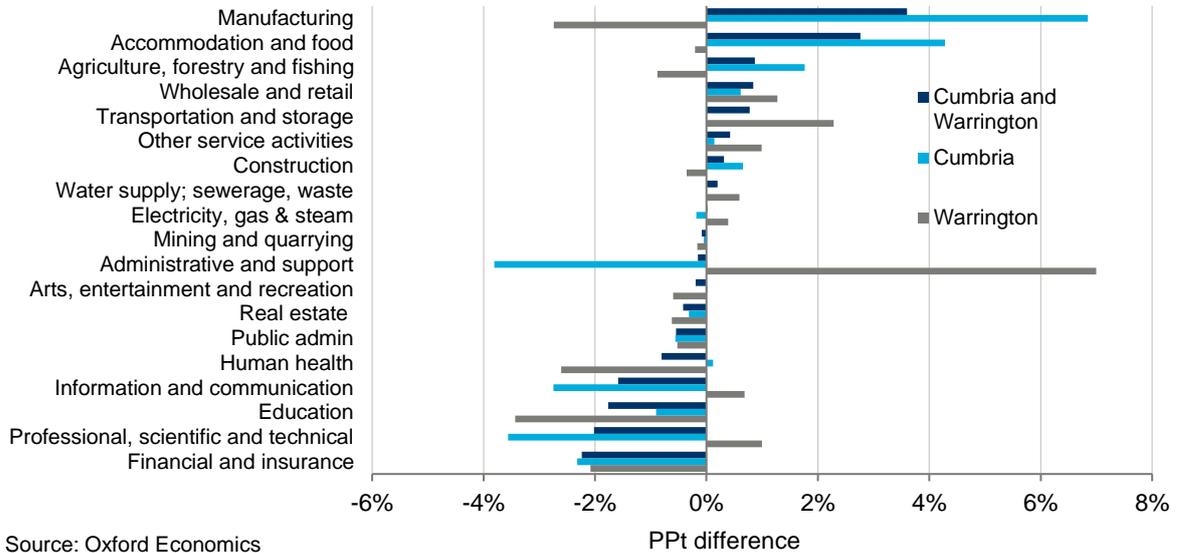
3.4 SECTORAL EMPLOYMENT

Job growth is intrinsically linked to the structure of the local economy. The combined Cumbria and Warrington economy varies significantly from the UK and has a high reliance on contracting and low value added sectors to provide jobs (see Fig. 23). This is particularly the case for Copeland, where Sellafield Ltd's contribution is concentrated. Therefore, Sellafield Ltd's presence and plans to transform the organisation is likely to become increasingly important to Copeland, though as we will see, the structure of Warrington means it is likely to be less reliant on Sellafield Ltd's employment and economic contribution.

Manufacturing provided 11.2 percent of all jobs in the combined area in 2016. At a regional and national level the sector has been shedding jobs over the past decade (2006 to 2016). Cumbria and Warrington is also heavily reliant on "Accommodation and food" (which experienced modest growth of 140 jobs over the past decade) and "Wholesale and retail" (which contracted by 370 jobs), both of which are reliant on the wider economic performance of the economy and growth in consumer spending. Furthermore, "Agriculture, forestry and fishing" is unlikely to experience much growth and is vulnerable to health scares. Over the past decade it has grown by only 100 jobs in Cumbria and Warrington.

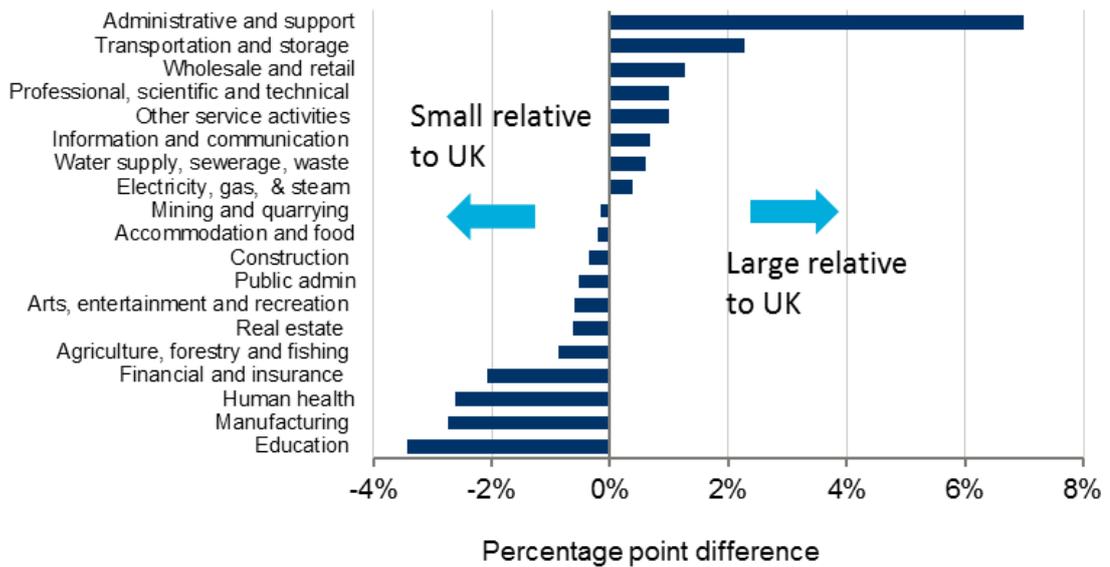
On the other hand, sectors associated with strong growth potential at the national level, such as professional services, and information and communication are relatively under-represented in the combined area. Therefore, despite the fact we expect them to grow, their ability to drive growth locally is limited by their size.

Fig. 23. The structure of Sectoral employment structure, Cumbria and Warrington, Cumbria and Warrington, 2016



A deeper analysis of the sectoral structure reveals that there are marked differences within Cumbria and Warrington. Warrington’s sectoral structure is more conducive to jobs growth. For example, we expect the “Professional services”, “Information and communication” and “Administrative and support” sectors to drive job creation in the UK and we find that Warrington has an above average share of jobs in each. In addition, its manufacturing sector is smaller than the UK average. Indeed, it is nearly three times smaller than in Cumbria where the sector accounts for 14.4 percent of jobs.

Fig. 24. Sectoral employment structure, Warrington, 2016

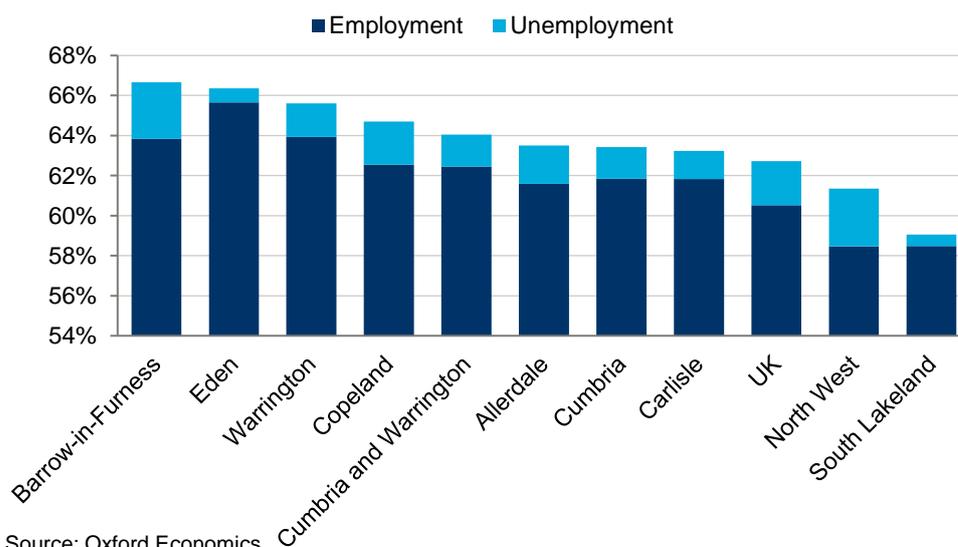


Therefore, Sellafield Ltd is likely to have had a large influence on recent growth. Moreover, it is likely to have a large influence on the future performance of the labour markets in Cumbria, but less so in Warrington, given our expectations for future sectoral growth (discussed later).

In addition, because local economies are dynamic, the health of the jobs market will affect other variables such as unemployment, demographics, wages and house prices.

An analysis of employment and unemployment rates would suggest there is little spare capacity in these local economies which could have starved growth and will have implications for future expansion. For example, employment rates within the Cumbria and Warrington combined area, (residents in work divided by the population aged 16+) stood at 62.5 percent in 2016, above that for the North West (58.5 percent) and the UK (60.5 percent). Indeed, every local area in the county of Cumbria, aside from South Lakeland, recorded above average employment rates. In addition, over the decade to 2016, Cumbria and Warrington has seen both the employment and unemployment rates reach record levels.

Fig. 25. Employment and unemployment rates, 2016



Source: Oxford Economics

Despite strong employment and unemployment rates demographic trends in the local area pose a potential challenge as slow growth and contraction in working age population will starve the economy of labour.

Population growth in the combined area of Cumbria and Warrington, from 2006 to 2016, averaged just 0.2 percent—half the pace of the North West (0.4 percent) and a quarter of the pace recorded by the UK (0.8 percent). The slow pace of growth is due to the population in Cumbria stagnating, with small gains in Carlisle and Allerdale being offset by stronger falls in Barrow-in-Furness and South Lakeland.

Fig. 26. Population and working age population level 2016, and growth rates 2006-2016, Cumbria and Warrington

	Population (000s)	% change p.a. 2006-2016	16-64 year olds (000s)	% change p.a. 2006-2016
Allerdale	97	0.2%	58	-0.3%
Barrow-in-Furness	67	-0.4%	41	-0.8%
Carlisle	108	0.2%	67	-0.4%
Copeland	69	-0.1%	42	-0.6%
Eden	53	0.1%	31	-0.5%
South Lakeland	104	-0.1%	59	-0.8%
Warrington	209	0.7%	132	0.4%
Cumbria	498	0.0%	299	-0.6%
Cumbria & Warrington	707	0.2%	431	-0.3%
North West	7,207	0.4%	4,520	0.1%
UK	65,664	0.8%	41,445	0.5%

Source: Oxford Economics

Furthermore, the combined area has a below average share of its population aged 16-64, at 60.9 percent. This compares to 63.1 percent at the UK level, and 62.7 percent for the North West.

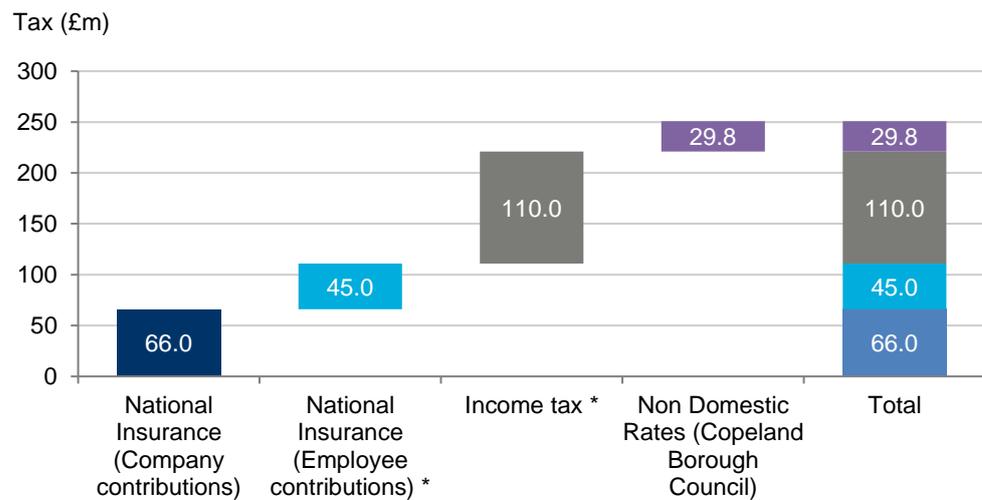
In addition, each local authority within Cumbria has recorded a fall in its working age population over the last decade. This downward trend is most pronounced in South Lakeland and Barrow-in-Furness which have recorded declines of 0.8 percent a year between 2006 and 2016.

Warrington has experienced an increase in its working age population in comparison, with growth averaging 0.4 percent a year, driven by strong net immigration.

4. SELLAFIELD LTD'S TAX CONTRIBUTION

In 2016/17, Sellafield Ltd and its employees made a total tax contribution of £221m. The largest contribution was National Insurance contributions which totalled over £111m. Second was income tax which was estimated at £110m. Finally, Sellafield Ltd's Non-Domestic Rates liability for 2016/17 was £29.8m.

Fig. 27. Tax contributions



Source: Oxford Economics
Note * = estimated

5. SELLAFIELD LTD'S INVESTMENT IN R&D

In 2016/17 Sellafield Ltd spent £88 million on research and development (R&D). This level of R&D undoubtedly delivers direct benefits to the company itself— R&D spending by a company is positively correlated with underlying productivity performance—but beyond that the process of developing new and innovative technologies (and their applications) also gives rise to wider, societal benefits. This occurs as the advances and developments emerging from innovation are disseminated throughout other businesses, academia, government, and wider society. Many of the benefits of R&D are shared by other firms, particularly ones located locally, either through spill-overs, or simply because they are linked together within a value chain.⁸

The channels through which this takes place are varied. For example, the technical aspects of a novel system might be shared across a firm's supply chain, with the innovator requiring new and improved inputs to their product. Such technological advances and innovations by one firm are typically used by others in the value chain to improve their own competitiveness, raising their productivity and reducing their costs. In addition, employee turnover can spread novel ideas into other companies or new start-ups. Overall, these represent some of the ways that R&D investment can produce social benefits, also termed 'spillovers'.

These spill-over benefits can be quantified using econometric analysis. For Sellafield Ltd we have estimated these using an approach that is consistent with our previous work for BIS and DECC on the capacity of the UK nuclear supply chain to support future investment in the sector. In doing so, we depreciate our stock of R&D spend each year by 15 percent, and apply a GDP spill over assumption of 25 percent.

Figure 28 shows that R&D spend by Sellafield Ltd from 2006/07 to 2016/17 could have provided annual spill-over GDP benefits of £107.5 million in 2016/17.

The benefits that Sellafield Ltd's innovation activity has on productivity growth is particularly important, since productivity improvements are the fundamental driver of long-term prosperity.

⁸ Econometric analysis of R&D spill-overs by sector, Oxford Economic Forecasting (2006). Value chain benefits occur when a supplier produces a better product allowing customers to make efficiency gains and hence raise their value added. These are paid for through the market. Spill-overs occur when companies become aware of and so emulate one another's innovations. These are not paid for. Proximity typically makes them easier to achieve. See 'Knowledge spillovers and sources of knowledge in the manufacturing sector' Future of manufacturing project evidence paper 18 Government office for Science 2013.

Fig. 28. R&D spend and spill-over

	Annual R&D spend (£m)	R&D stock at end of previous year (£m)	Annual 'spillover' GDP benefit (£m)
2006/07	54.3		
2007/08	59.8	54.3	13.6
2008/09	69.4	106.0	26.5
2009/10	77.6	159.5	39.9
2010/11	68.4	213.1	53.3
2011/12	78.3	249.6	62.4
2012/13	81.5	290.4	72.6
2013/14	84.9	328.4	82.1
2014/15	87.8	364.0	91.0
2015/16	92.2	397.2	99.3
2016/17	88.0	429.8	107.5

Source: Oxford Economics and Sellafield Ltd

6. THE OUTLOOK

6.1 TRANSFORMING SELLAFIELD LTD

Sellafield Ltd has made a commitment to the Nuclear Decommissioning Authority to reduce mission spend by at least £1.4 billion by 2029. This will be achieved through cost efficiency and productivity gain. Despite the deadline of this commitment Sellafield Ltd aims to achieve the reduction in spend by 2020 as reprocessing operations end. Indeed, Sellafield Ltd is targeting a further £1.4 billion in savings by 2029.

Through the transformation agenda⁹, Sellafield Ltd anticipates a reduction in the workforce its “Transforming Sellafield” report notes “in the order of 3,000 roles. Our expectation is that, taking attrition into account, we will need to manage the impact of 1,500-2,000 surplus roles over the next 4-5 years”. This will obviously have a negative impact on the local economies of Cumbria and Warrington. Though as part of the transformation agenda Sellafield Ltd has confirmed its ambition to revitalise local economies by working “with its supply chain, local authorities and agencies to inject growth into UK and regional economies”.

Indeed, in its “Transforming Sellafield” report¹⁰ it states “It is possible that we can develop a commercial offering that could create employment options beyond Sellafield, in turn helping to manage the longer-term impact of a smaller Sellafield Ltd on our employees and communities.”

The analysis thus far has shown how important Sellafield Ltd is for Cumbria and Warrington. Any change in how Sellafield Ltd operates will have real implications at a local level, none more so than for Copeland. Given the desire to be actively involved in revitalising the local economy, this section of the report presents Oxford Economics baseline outlook for Cumbria and Warrington.

6.2 LABOUR MARKET OUTLOOK

Overall our baseline forecasts show employment growth slowing across Cumbria and Warrington (our baseline forecasts do include any policy interventions from the LEP or Councils, nor does it include planned investments). Job creation, between 2016 and 2030, is likely to ease to 0.2 percent a year—slower than both the regional (0.3 percent) and national average (0.4 percent). This rate of growth is also less than half the pace experienced in the decade to 2016. Despite this weaker growth, a further 10,000 jobs are likely to be generated within the combined area by 2030.

The sectoral structural of Warrington puts it in a strong position, relative to Cumbria. Indeed, we forecast job growth to average 0.7 percent a year in Warrington over the forecast period creating 14,000 net new jobs, compared to a decline of 0.1 percent a year in Cumbria, which translates to a loss of 4,000

⁹ <http://www.sellafieldsites.com/press/the-transformation-plan/>

¹⁰ <http://www.sellafieldsites.com/press/the-transformation-plan/>

net jobs (much of this reduction stemming from Copeland and Barrow-in-Furness).

Copeland is forecast to have the most challenging employment outlook of the Cumbrian local economies. This is due to its reliance on Manufacturing which accounted for 31.7 percent of all jobs in 2016. From 2006 to 2016 the sector grew by 1,000 jobs in Copeland. Unfortunately, we expect a loss of 1,300 manufacturing jobs over the forecast period. Overall, we forecast a loss of 1,900 jobs in Copeland from 2016 to 2030.

Jobs losses at Sellafield Ltd would obviously worsen the employment outlook for the local economies of Cumbria (particularly Copeland). The exact impact would of course depend on the number of jobs lost at the Seascale and Whitehaven sites, any supply chain impacts and the resulting loss of consumer spending. The loss of roles in Warrington, while dampening growth, would have less of an impact given the scale of anticipated employment creation and the lower contribution Sellafield Ltd makes to the economy.

Fig. 29. Jobs level and average annual growth rates, 2016-2030, Cumbria and Warrington, and regional and national benchmarks

	Jobs (000s)	Growth 2016-2030
Allerdale	44	0.0%
Barrow-in-Furness	33	-0.3%
Carlisle	64	0.1%
Copeland	33	-0.6%
Eden	29	-0.2%
South Lakeland	62	0.1%
Cumbria	266	-0.1%
Warrington	152	0.7%
Cumbria and Warrington	418	0.2%
North West	3,785	0.3%
UK	36,495	0.4%

Source: Oxford Economics

Figure 30 presents our sectoral employment forecasts from 2016 to 2030. While Cumbria is expected to enjoy employment creation of nearly 4,000 jobs in the “Construction”, “Professional, scientific and technical” and “Administrative and support” sectors, it will not be enough to replace the 6,100 net job losses expected in manufacturing. It is worth noting that the loss of manufacturing jobs do not include any planned reduction in Sellafield Ltd roles.

Fig. 30. Job growth by sector, Cumbria and Warrington, 2016-2030.

Change in total employment	Cumbria & Warrington		Cumbria		Warrington	
	Level (000s)	% p.a.	Level (000s)	% p.a.	Level (000s)	% p.a.
Agriculture, forestry and fishing	-1.2	-1.1%	-1.1	-1.1%	-0.1	-1.0%
Mining and quarrying	-0.1	-3.6%	-0.1	-3.6%	0.0	-3.6%
Manufacturing	-7.3	-1.2%	-6.1	-1.2%	-1.2	-1.4%
Electricity, gas & steam	-0.3	-1.5%	-0.1	-1.5%	-0.2	-1.5%
Water supply; sewerage, waste	-0.4	-0.8%	-0.2	-0.8%	-0.2	-0.8%
Construction	3.5	0.8%	1.5	0.5%	1.9	1.5%
Wholesale and retail	2.8	0.3%	0.8	0.1%	2.0	0.6%
Transportation and storage	0.0	0.0%	-0.4	-0.2%	0.5	0.3%
Accommodation and food	1.1	0.2%	0.3	0.1%	0.8	0.6%
Information and communication	1.1	0.7%	0.4	0.8%	0.7	0.7%
Financial and insurance	-0.2	-0.4%	-0.1	-0.5%	0.0	-0.2%
Real estate	0.6	0.7%	0.3	0.5%	0.3	1.3%
Professional, scientific and technical	4.0	1.0%	1.2	0.6%	2.8	1.4%
Administrative and support	6.3	1.2%	1.2	0.6%	5.1	1.5%
Public admin	-2.0	-1.0%	-1.5	-1.1%	-0.5	-0.7%
Education	-1.1	-0.3%	-1.0	-0.4%	-0.1	-0.1%
Human health	0.8	0.1%	0.0	0.0%	0.8	0.4%
Arts, entertainment and recreation	1.1	0.7%	0.6	0.5%	0.5	1.1%
Other service activities	1.5	0.7%	0.6	0.5%	0.8	1.0%
Total	10.2	0.2%	-3.8	-0.1%	14.0	0.7%

Source: Oxford Economics

Our baseline expectation for a contraction in jobs in Copeland will present a skills challenge in the area. Developed economies are becoming increasingly 'skills hungry'. Therefore, it is becoming more difficult for those with limited skill levels to enter the labour market. As local economies continue the shift towards innovative and knowledge-based sectors, it is important that the workforce continues to maintain and upgrade their skill levels. If this process is not managed correctly, then local people could find themselves increasingly shut out from the labour market.

In addition, Sellafield Ltd's expectation of a reduction in 3,000 roles would result in additional competition in the labour market. While this would offer local firms with a wider pool of available labour, it would make it increasingly harder for the less skilled to find employment, particularly given we expect employment contraction across Cumbria. This could push up the number of long-term unemployed and make it increasingly difficult to address deprivation and social disadvantage.

Unfortunately, both Copeland and Barrow-in-Furness have below average shares of their working age population educated to degree level or above. The share of 16 to 64 year olds educated to this level equalled 23 and 20 percent in Copeland and Barrow-in-Furness respectively in 2015, significantly lower than both the UK and North West averages. Furthermore, ONS data shows that 12

percent of those aged between 16 and 64 in Copeland had no qualifications at all, significantly above the UK average of nine percent.

Fig. 31. Qualification attainment, 2015

	% with NVQ4+	% with NVQ3 only	% with Trade Apprenticeships	% with NVQ2 only	% with NVQ1 only	% with other qualifications (NVQ)	% with no qualifications (NVQ)
Allerdale	33.1	20.2	5.1	18.3	11.0	6.1	6.3
Barrow -in-Furness	20.4	20.5	12.4	21.6	14.1	4.5	6.5
Carlisle	31.3	17.3	5.5	14.9	16.6	7.4	7.2
Copeland	23.3	18.8	6.1	17.5	16.9	5.5	11.9
Eden	34.6	25.1	6.6	13.3	10.0	5.9	4.6
South Lakeland	40.0	16.8	5.4	18.6	11.3	2.6	5.3
Warrington	42.1	15.2	3.6	17.9	9.1	6.7	5.5
North West	32.6	17.8	3.5	18.1	11.6	6.6	9.8
UK	36.9	17.0	3.3	16.2	11.3	6.5	8.8

Source: ONS

Both, Copeland and Barrow-in-Furness have large manufacturing sectors which are generally expected to shed jobs over the forecast period. With limited capacity in typically service-based growth sectors and low levels of skills, they could struggle to rebalance their economy and find adequate employment opportunities going forward.

Allerdale, where a significant share of Sellafield Ltd's workforce live (25.8 percent), has a better skills profile than the UK except for NVQ level 4 qualifications where it falls short. It does however have a large share of its working age population with these highest qualifications than the North-West average.

6.3 GVA OUTLOOK

Unlike employment growth which is slowing, our baseline outlook (which does not include the transformation of Sellafield Ltd or any investments by the LEP etc) shows stronger GVA growth in the combined area. We forecast that between 2016 and 2030 growth will average 1.5 percent a year – 0.3 percentage points higher than in the decade to 2016. Despite this improvement, growth will continue to lag the UK average and will also be weaker than the North West (1.7 percent).

Growth in the combined area will be driven largely by gains in productivity, a key factor determining future economic prosperity. We expect productivity growth in both Cumbria and Warrington to grow by 1.3 percent per annum—in line with the regional average and only slightly slower than the UK average (1.4 percent). As such Warrington's strong GVA growth forecast is driven more so by increases in productivity, but job growth will play a factor.

Growth in the combined area will be more marked in certain local areas. Again, Warrington is expected to perform well over the forecast period while Cumbria is likely to weaken. We expect that, between 2016 and 2030, GVA growth will average 2 percent annually in Warrington – up from 0.6 percent in the decade to 2016. This rate of growth compares to 1.2 percent for Cumbria, marking a slowdown of 0.3 percentage points recorded in the decade to 2016. Although

growth in Cumbria will be slower than the previous decade in most local areas, we expect Copeland to be particularly weak, with a rate of growth of just 1 percent a year over the period (down from 3.3 percent in the decade to 2016).

Fig. 32. GVA levels and growth rates, £m 2013 prices, Cumbria & Warrington, 2016-2030

	2030	Growth, 2016-2030		
		GVA	Jobs	Productivity
Allerdale	1,750	1.3%	0.0%	1.3%
Barrow-in-Furness	1,579	1.2%	-0.3%	1.5%
Carlisle	2,900	1.3%	0.1%	1.3%
Copeland	2,298	1.0%	-0.6%	1.6%
Eden	1,158	1.0%	-0.2%	1.2%
South Lakeland	2,639	1.4%	0.1%	1.3%
Cumbria	12,324	1.2%	-0.1%	1.3%
Warrington	8,163	2.0%	0.7%	1.3%
Cumbria and Warrington	20,487	1.5%	0.2%	1.3%
North West	189,352	1.7%	0.3%	1.3%
UK	2,042,986	1.8%	0.4%	1.4%

Source: Oxford Economics

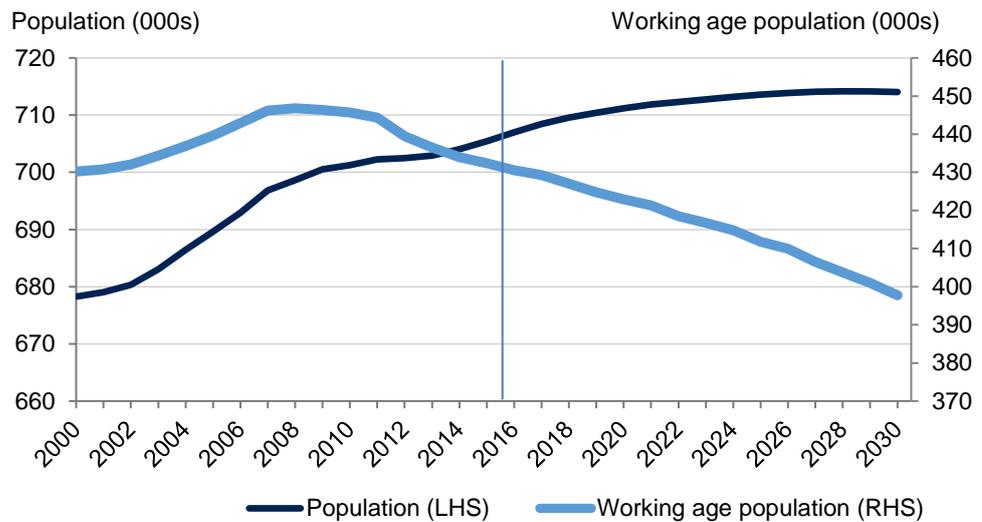
In Copeland GVA is expected to grow modestly over the forecast period, with gains in productivity being, in part, offset by job losses. Indeed, Copeland is expected to record the strongest growth in productivity, but is also forecast to see the greatest job losses. This is consistent with the general trend of more capital intensive and value added approaches to manufacturing which require less labour to produce the same volume of output. Manufacturing is after all the dominant sector in Copeland.

At the time of writing we are beginning to model the impact of the transformation agenda at Sellafield Ltd. The “Transforming Sellafield” document sets out objectives to boost productivity within Sellafield Ltd and employment opportunities in the supply chain. The net affect of these objectives and the smaller workforce is unclear at this stage. However, given the economic contribution of Sellafield Ltd is currently concentrated in Copeland, the impact of the transformation programme is likely to be too.

6.4 POPULATION GROWTH

Going forward population growth in the combined area is expected to ease significantly. We forecast, that over the 2016 to 2030 period, growth in the combined area will average 0.1 percent a year, (down from 0.2 percent in the decade to 2016) notably slower than the pace expected in the North West (0.3 percent) and the UK (0.5 percent). In number terms this translates into an increase of 7,000 people over the period, with population likely to reach 714,000 by 2030.

Fig. 33. Population and working age population, Cumbria and Warrington

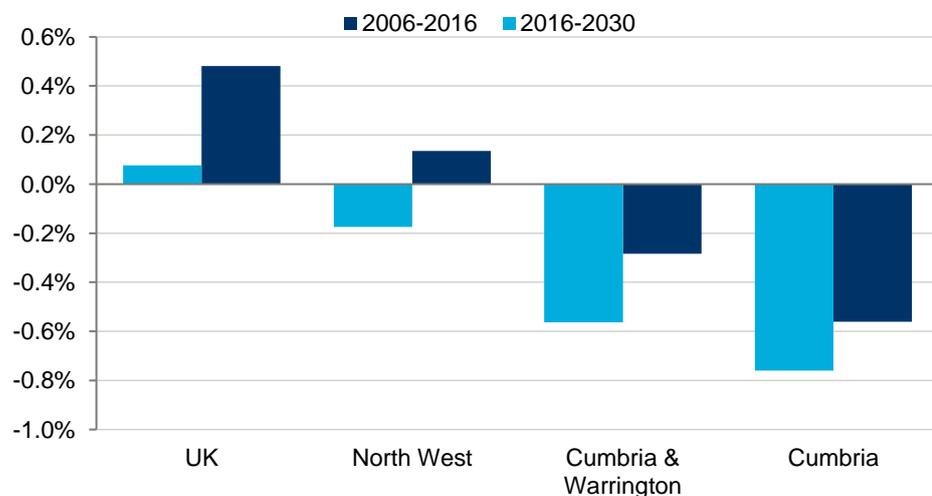


Source: Oxford Economics

The slowdown in overall population growth will be driven by sharper declines in the working age population. Indeed, we expect working age population in the combined area to fall by nearly 0.6 percent over the same period—a rate twice as fast as that recorded in the decade to 2016. This is driven by our outlook for net migration as both domestic and international migrants are typically of working age and active in the labour market.

We expect the rate of international migration into the UK to decline over the forecast period in line with stated UK government policy. Between 2016 and 2030, we expect net inward migration to fall from 2,700 to just 400 people a year within the combined area. Although some local economies will continue to see net inward migration, Copeland and Barrow-in-Furness are likely to experience net-outward migration.

Fig. 34. Average annual working age population growth, 2006-2016 vs 2016-2030, Cumbria and Warrington, Cumbria, North West and the UK



Source: Oxford Economics

Of course, the loss of jobs at Sellafield Ltd could encourage further out-migration as individuals seek job opportunities elsewhere. This would exacerbate population and working age population trends.

6.5 STRENGTHS, WEAKNESSES, OPPORTUNITIES AND THREATS

Many of the strengths in the Cumbria and Warrington economies are associated with Warrington. It has had strong population growth, outpacing the regional average. Its working age population has also grown strongly over the decade and is above the regional average and in-line with the UK. Warrington has also experienced faster jobs growth than the region and its resident employment rate is particularly high. Furthermore, jobs are likely to be created in private services such as administrative and support activities; professional, scientific and technical services; and wholesale and retail which puts Warrington in a strong position with relatively high shares of jobs concentrated in these sectors.

In Cumbria, we find that job growth has been fastest in Barrow-in-Furness, at almost twice the pace in Cumbria and Warrington and the North West, and faster than the UK. The resident employment rate in Cumbria is also higher than the region and UK while manufacturing and public administration have avoided large declines. In addition, GVA growth over the decade was significantly stronger than the region (though it was weaker than the UK) and Copeland has a strikingly high productivity level (35% above the region) driven by its concentration of manufacturing.

However, we also find several weaknesses in Cumbria, such as:

- Slow population growth, and falls in Barrow-in-Furness and South Lakeland;
- All local authorities in Cumbria have a smaller proportion of working age population than the regional and UK average, and all have experienced declines in the last ten years;
- Job growth since 2006, was significantly slower than the UK;
- A relatively small share of jobs in information and communications, education; professional, scientific and technical activities; and financial services;
- Generally low productivity levels across Cumbria (except for Copeland);
- Business growth has underperformed the North West since 2010; and
- Copeland and Barrow-in-Furness have below average shares of their working age population educated to degree level or above (23 and 20% respectively, significantly lower than both the UK and North West). In addition, 12% of those aged between 16 and 64 in Copeland had no qualifications at all, significantly above the UK average (9%).

There are also several threats:

- Both employment and unemployment rates are at record levels, indicating a tight labour market which could constrain future growth (unless fuelled by in-migration). Linked to this we forecast slower growth in population and falls in working age population which will not be helped by attempts to curb migration (following the decision to leave the EU);
- A potential reduction in trade and investment that could arise from the UK leaving the EU;
- Ongoing austerity in the public sector will mean “Public Administration”, Education and Health will not provide a rich source of job creation and could act as a drag on the economy; and
- Cumbria has a large manufacturing sector, which is generally expected to continue shedding jobs across the UK.

The loss of jobs at Sellafield Ltd is another threat to the local economies of Cumbria and Warrington. In the case of Cumbria it could exacerbate employment contraction, working age population decline and the challenge of finding employment for those with lower levels of skills.

Though Sellafield Ltd believe there is an opportunity to develop a more innovative and sustainable supply chain and in so doing create employment opportunities. This will of course take time and Sellafield Ltd are currently in the preparation phase of the transformation.

7. CONCLUSIONS

The analysis has shown that Sellafield Ltd plays a considerable role in the UK, especially Cumbria. It employs more than 11,000 people of which more than 86 percent are based in Seascale in Copeland.

We estimate it made a GVA contribution to GDP of £2.1 billion in 2016/17, with some 70 percent or £1.47 billion of GVA generated in Cumbria and Warrington. This accounts for 8.9 percent of GVA in the economy. However, much is concentrated in Copeland where it sustains 59.4 percent of Copeland's GVA.

GVA per job levels are some 40.9 percent higher than the UK average and 11.9 percent higher than UK manufacturing, which in part contributes to Copeland's strikingly high productivity level, which is almost 35 percent above the regional average.

From a job perspective, it sustains 43,800 FTE jobs in 2016/17, of which 27,950 jobs (63.8 percent) are in Cumbria and Warrington. As with GVA, Sellafield Ltd is extremely important to employment in Copeland sustaining an estimated 58.7 percent of local jobs. It also offers well paid employment. The average salary in Sellafield Ltd was over £43,000 in 2016/17 (compared to the mean annual pay for all full-time employee jobs in the UK at £34,451).

Sellafield Ltd also spent £88 million on R&D generating spill-over benefits to the UK economy. Furthermore, Sellafield Ltd and its employees made a total tax contribution of £221m in 2016/17.

Our forecasts show a challenging employment outlook for Cumbria and the local economies face several weaknesses and threats. Small and contracting working age populations along with poor skills levels in some areas will make it difficult to rebalance the economy and fast track growth in higher value added service sectors of the economy.

In addition to the challenging outlook, Sellafield Ltd is planning to transform the organisation and over the next 4 to 5 years expects a reduction in 3,000 roles which will have implications for the local economies of Cumbria and Warrington. Despite this, Sellafield Ltd hopes to play a role in revitalising local economies by working with local stakeholders and its supply chain.

ANNEX A: SECTORAL SPECIALISMS

This annex provides a more detailed analysis of the sectoral structure of Cumbria and Warrington in 2015. It provides additional insight into the presence of niche sectors within the local economy, which may be of relevance when considering Sellafield Ltd's procurement.

The following sectoral analysis makes use of location quotients (LQs). These functions allow us to measure an economy's extent of specialisation relative to a national or regional average. This provides an accurate way of identifying where an area's economic advantages lie. A value greater than one indicates that the local economy is more specialised in a sector than the North West. The following tables present the most specialised '2 and 4 digit' sectors, in terms of relative employment concentration compared to the region.¹¹

Figure 35 shows Cumbria and Warrington's top 10 sectors at the broader industry level in terms of relative employment concentration. The 'manufacture of basic metals' is significantly large (over six and half times larger than the North West average) reflecting the presence of Sellafield Ltd. Although manufacturing sectors were the most specialised, the table shows a broad range of specialist areas, including tourism related sectors and architectural and engineering activities.

Fig. 35. Employment specialisms (2-digit level), Cumbria and Warrington, 2015

Sector	LQ
Manufacture of basic metals	6.6
Manufacture of other transport equipment	2.5
Accommodation	2.3
Libraries, archives, museums and other cultural activities	2.3
Architectural and engineering activities; technical testing and analysis	1.7
Postal and courier activities	1.6
Repair of computers and personal and household goods	1.5
Manufacture of paper and paper products	1.4
Repair and installation of machinery and equipment	1.4
Publishing activities	1.4

Source: ONS

In Copeland, the 'manufacture of basic metals' sector's relative share of employment was 68 times larger than the regional average. Equally in Barrow-in-Furness, relative employment in 'water transport' and the 'manufacture of

¹¹ Due to confidentiality, this report cannot publish numbers of employees or shares in given sectors. However, we focus on sectors that have a minimum of 500 employees at the local council level and 1000 employees when considering Cumbria and Warrington overall. This helps to ensure the significance of the identified niche sectors.

other transport equipment’ were 54 and 28 times that of the North West average respectively.

Figure 36 provides a more granular analysis of area’s sector specialisms by concentrating on employment at the 4 digit SIC07 level. The ‘processing of nuclear fuel’ was found to be a key component within Cumbria and Warrington’s ‘manufacture of basic metals’ sector. It had the highest LQ of any 4-digit sector, with a proportional share of employment over eight times larger than that observed at the regional level. This sector was particularly prevalent within the local economy of Copeland with an LQ relative to the region of 89.

This part of the analysis also reveals that the ‘building of ships and floating structures’ plays an important role within the local economy’s ‘manufacture of other transport equipment’ sector. The Barrow-in Furness area demonstrated a strong presence in this niche sector with an LQ of 80.

Interestingly, although ‘waste collection, treatment and disposal activities’ did not rank very highly in the 2-digit analysis, its sub component—the ‘treatment and disposal of hazardous waste’—is a prominent niche sector within Cumbria and Warrington with an LQ of 7.5. This sector had its strongest presence in Warrington overall, where its LQ jumped to 21 relative to the regional average.

Fig. 36. Employment specialisms (4-digit level), Cumbria and Warrington, 2015

Sector	LQ
Processing of nuclear fuel	8.1
Treatment and disposal of hazardous waste	7.5
Building of ships and floating structures	7.1
Holiday and other short stay accommodation	4.9
Manufacture of electricity distribution and control apparatus	4.2
Regulation of and contribution to more efficient operation of businesses	3.5
Camping grounds, recreational vehicle parks and trailer parks	3.4
Manufacture of prepared meals and dishes	2.9
Combined facilities support activities	2.3
Hotels and similar accommodation	2.0

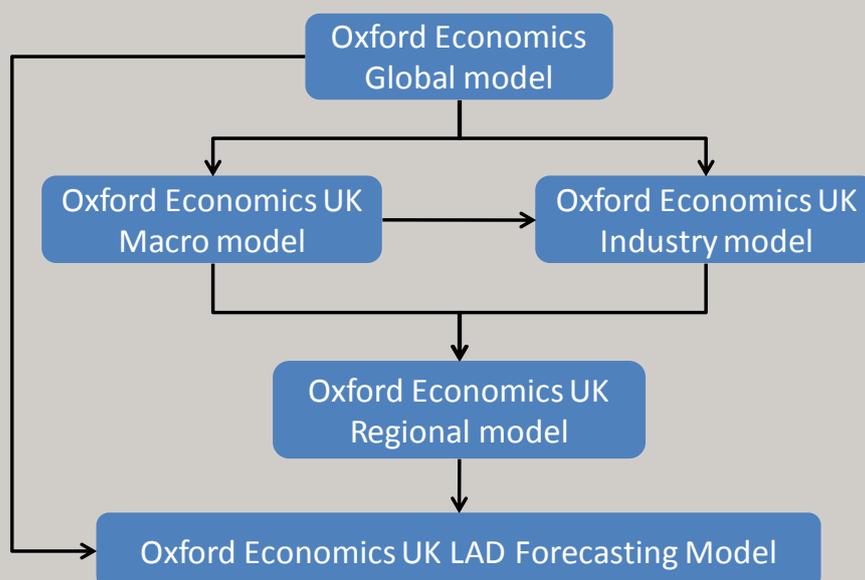
Source: ONS

ANNEX B: MODELLING APPROACH

Baseline forecasts

The baseline forecasts in this report were produced within Oxford Economics Local Authority District Forecasting Model. The model covers all local authorities within the UK and sits within the Oxford suite of forecasting models. Such a modelling framework ensures that global and national factors (such as developments in the Eurozone and UK Government fiscal policy) have an appropriate impact on the forecasts at a local authority level. This empirical framework (or set of 'controls') is critical in ensuring that the forecasts are much more than just an extrapolation of historical trends. Rather, the trends in our global, national and sectoral forecasts have an impact on the local area forecasts. In the current economic climate this means most, if not all, local areas will face challenges in the short-term, irrespective of how they have performed over the past 15 years.

Fig. 37. Hierarchical structure of Oxford Economics' suite of models

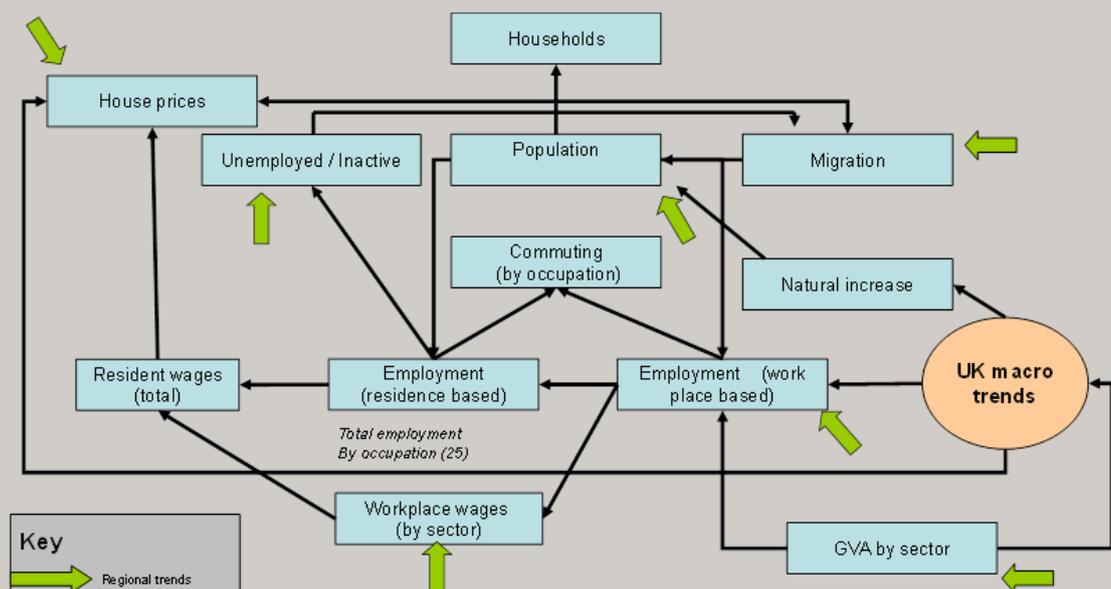


The baseline forecasts for Cumbria and Warrington are essentially shaped by three factors:

- International, national and regional outlooks - all the local area forecasts produced by Oxford Economics are fully consistent with broader regional, national and international models and forecasts. This ensures global events that impact on the performance of UK local economies are fully captured in the forecasts for a local area. So too are national level growth and policies, whether that be the impact of monetary policy on consumer spending or government spending on locally provided public services;
- Historical trends in an area, which implicitly factor in supply side factors affecting demand, combined with Oxford Economics' staff knowledge of local areas and the patterns of local economic development. This ensures for example, that we recognise and factor in to the forecasts any evidence of particularly high/low levels of competitiveness that local economies have in particular activities. It also means national policy programs that have a particular local impact and that are very likely to happen - such as the Government's Northern powerhouse agenda - are appropriately reflected in the forecasts; and
- Fundamental economic relationships which interlink the various elements of the outlook. Oxford Economics' models ensure full consistency between variables in a local area. For example, employment, commuting, migration and population are all affected by one another.

The forecasts are produced within a fully-integrated system, which makes assumptions about migration, commuting and activity rates when producing employment and population forecasts. The main internal relationships between variables are summarised below.

Fig. 38. Main Relationships



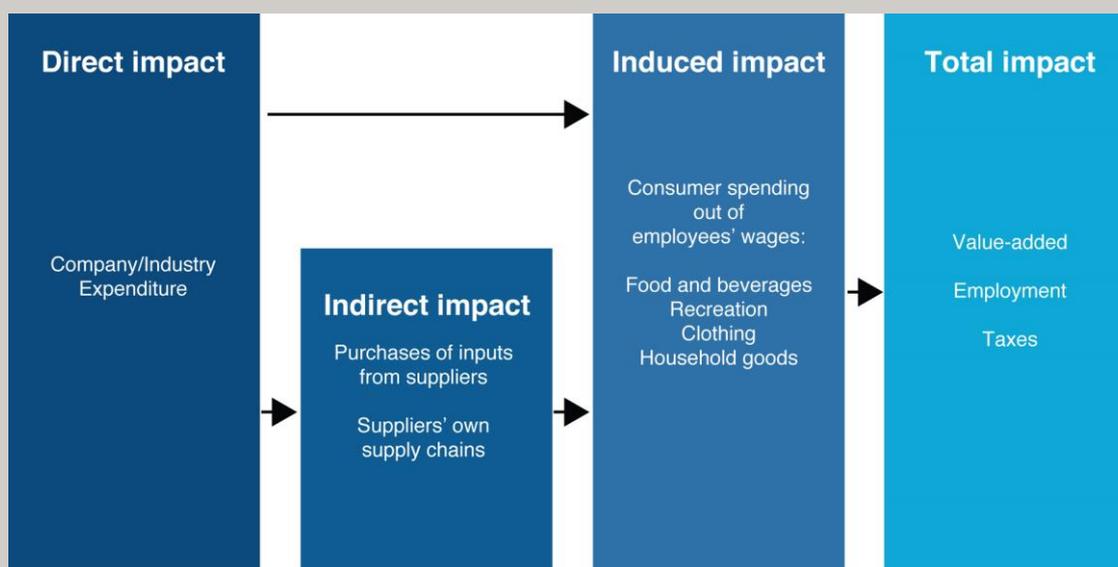
ECONOMIC IMPACT MODELLING

Economic impact modelling is a standard tool used to quantify the economic contribution of a company. Impact analysis traces the economic contribution through three separate channels:

- **Direct impact**—refers to activity conducted directly by Sellafield Ltd in the UK.

- **Indirect impact**—consists of activity that is supported because of the procurement of goods and services by Sellafield Ltd in the UK. It includes not just purchases by Sellafield Ltd, but subsequent rounds of spending throughout the supply chain.
- **Induced impact**—reflects activity supported by the spending of wage income by direct and indirect employees.

Fig. 39. Direct, indirect, induced and total economic impacts



Direct Impacts

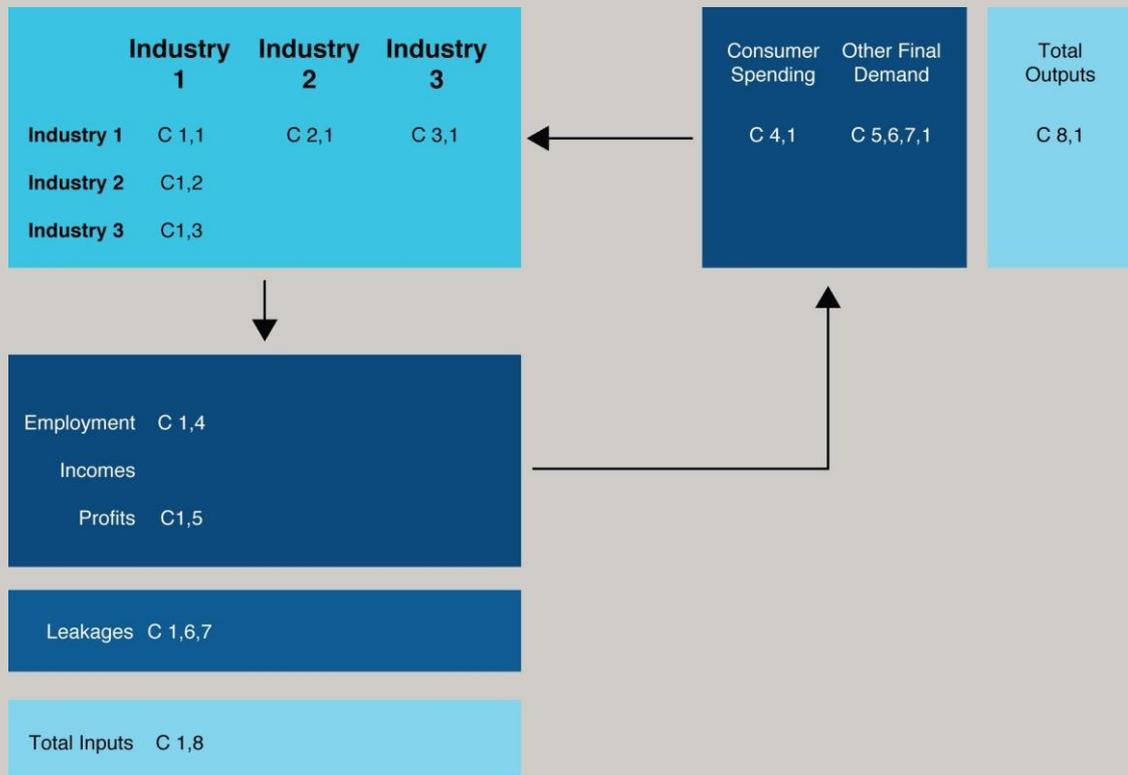
Data on the direct impacts were provided by Sellafield Ltd.

Indirect and Induced Impacts

Indirect and induced impacts were estimated using an input-output model. An input-output model gives a snapshot of an economy at any point in time. The model shows the major spending flows from “final demand” (i.e. consumer spending, government spending investment and exports to the rest of the world); intermediate spending patterns (i.e. what each sector buys from every other sector – the supply chain in other words); how much of that spending stays within the economy; and the distribution of income between employment and other forms such as corporate profits. Figure 40 provides an illustrative guide to a stylized input-output model.

In building our impact model we adjusted the UK input-output tables to account for the local characteristics of the local economies in Cumbria and Warrington. In doing so we used academic guidelines like those contained in academic papers such as Flegg, A. T. and Tohmo, T. (2013) “Regional input-output tables and the FLQ formula: A case study of Finland” (Regional Studies, 47 (5). pp. 703-721).

Fig. 40. A stylised Input-Output model



**Europe, Middle East,
and Africa:**

Global headquarters

Oxford Economics Ltd
Abbey House
121 St Aldates
Oxford, OX1 1HB
UK

Tel: +44 (0)1865 268900

London

Broadwall House
21 Broadwall
London, SE1 9PL
UK

Tel: +44 (0)20 7803 1418

Belfast

Lagan House Sackville Street
Lisburn
County Antrim, BT27 4AB
UK

Tel: + 44 (0)2892 635400

Paarl

12 Cecilia Street
Paarl 7646
South Africa

Tel: +27(0)21 863-6200

Frankfurt

Mainzer Landstraße 41
60329 Frankfurt am Main
Germany

Tel: +49 69 95 925 280

Paris

3 Square Desaix
75015 Paris
France

Tel: +33 (0)1 78 91 50 52

Milan

Via Cadorna 3
20080 Albairate (MI)
Italy

Tel: +39 02 9406 1054

Dubai

Jumeirah Lake Towers
Dubai,
UAE

Tel: +971 56 396 7998

Americas:

New York

5 Hanover Square, 19th Floor
New York, NY 10004
USA

Tel: +1 (646) 786 1879

Philadelphia

303 West Lancaster Avenue
Suite 2e
Wayne, PA 19087
USA

Tel: +1 (610) 995 9600

Mexico City

Emerson 150, Despacho 802
Col. Polanco, Miguel Hidalgo
México D.F., C.P. 11560

Tel: +52 (55) 52503252

Boston

51 Sawyer Road
Building 2 - Suite 220
Waltham, MA 02453
USA

Tel: +1 (617) 206 6112

Chicago

980 N. Michigan Avenue,
Suite 1412 Chicago
Illinois, IL 60611
USA

Tel: +1 (773) 372-5762

Los Angeles

2500 Broadway, Building F,
Suite F-125
Santa Monica, 90404

Tel: +1 (424) 238-4331

Florida

8201 Peters Road,
Suite 1000
Plantation,
Miami 33324
USA

Tel: +1 (954) 916 5373

Toronto

2425 Matheson Blvd East
8th Floor Mississauga, Ontario
L4W 5K4
Canada

Tel: +1 (905) 361 6573

Asia Pacific:

Singapore

6 Battery Road
#38-05
Singapore 049909

Tel: +65 6850 0110

Hong Kong

30/F, Suite 3112
Entertainment Building
30 Queen's Road Central

Tel: +852 3103 1096

Tokyo

4F Tekko Building
1-8-2 Marunouchi
Tokyo
100-0005

Tel: +81 3 6870 7175

Sydney

Level 56, MLC Centre
19-21 Martin Place
Sydney, NSW

Tel: +61 2 9220 1707

Email:

mailbox@oxfordeconomics.com

Website:

www.oxfordeconomics.com