

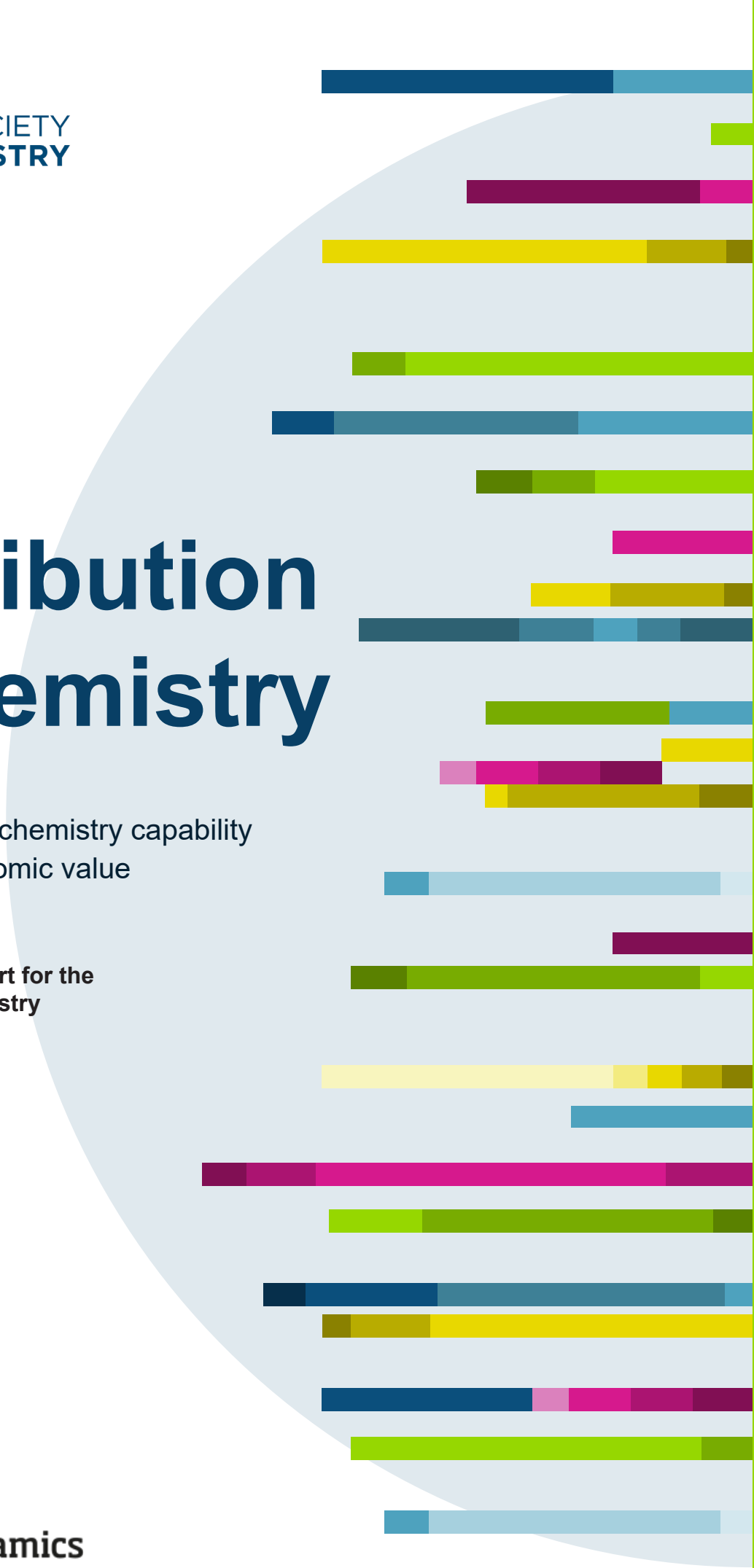
The Contribution of Chemistry

Understanding how chemistry capability
translates into economic value
across the UK

A Metro Dynamics report for the
Royal Society of Chemistry

June 2026

Metro — Dynamics





About the Royal Society of Chemistry

We work at the heart of the chemical sciences community to create a future that is more open, more green, and more equal. Together, we're helping chemistry to change the world.

We enable exciting progress that would be otherwise impossible. As an independent catalyst for change, we connect people and ideas through partnerships, conferences, events and networks that span the globe.

We publish scientists' discoveries and insights so they can be used to improve our health, environment and lifestyles. And we're transforming how we do that with a commitment to open access: everyone, everywhere, should have the same potential to read and share knowledge.

We care about protecting our natural environment, about tackling discrimination to build a truly inclusive world, and about making cutting-edge chemistry accessible wherever it's needed for the good of society.

It's all built upon and lifted up by our diverse global membership, with every one of those 60,000 members bringing a unique and valuable perspective. The chemical science community has the knowledge, skills and passion to make those a reality – together, we're changing the world.

Metro — Dynamics

About Metro Dynamics

Metro Dynamics was founded in 2015 to support devolution, adding lasting capacity to local places and helping deliver local priorities.

How to deliver good growth is a question we care deeply about as a business. As a critical enabler of economic growth, we support our clients in creating the right conditions for innovation to happen and curate the necessary activity and infrastructure for innovation to thrive.

We work with places to understand their strengths and priorities and translate these into ambitious and tangible strategies and projects.

We work with national and local leaders to turn national science and technology priorities into place-based delivery; aligning assets, skills and investment so that innovation can flourish in every region.

Our economic and innovation analysis, trusted by investors, universities, and government, combines technical rigour with practical insight to help build stronger, more inclusive innovation ecosystems that deliver real growth.

Foreword

from the Royal Society of Chemistry

Chemistry is fundamental to the world we live in. It underpins the products, technologies and services we rely on every day, supports innovation across industries, and helps address some of the most pressing challenges facing society, from tackling pollution (and achieving net zero) to improving health and strengthening economic resilience.

Yet the contribution of chemistry is not always fully visible. Chemistry does not sit neatly within a single sector; instead, it is a capability woven throughout the UK economy. This can mean that its role in driving growth, productivity and innovation can be overlooked in economic analysis and not fully captured in policy.

This report provides a clear and comprehensive picture of that contribution. It shows that the chemical sciences are a major and growing driver of economic value, contributing £60.5 billion in Gross Value Added in 2023 and supporting a highly skilled workforce across the UK. Just as importantly, it highlights how chemistry enables wider economic activity, underpinning supply chains, innovation systems and many of the UK's priority growth sectors, with productivity that outpaces the economy-wide average.

The findings reinforce that chemistry is not simply one part of the economy, but a strategic capability for the UK's future. It plays a critical role in sectors such as life sciences, defence and clean energy, supporting national ambitions for growth, resilience and technological leadership.

At the same time, this report highlights important challenges. Pathways from research to innovation, scale-up and commercialisation are not always strong enough, and the skills pipeline that underpins chemistry capability is under pressure. Strengthening these connections will be essential if the UK is to fully realise the value of its chemistry strengths.

There are also challenges for specific sectors that it is important to recognise. Chemicals manufacturing faces pressures from rising energy costs, shifting geopolitics and growing global competition for input materials such as critical minerals and molecular building blocks which all test supply chain resilience and domestic capability. These challenges shine a light on the strategic importance of chemistry to national resilience and government priority sectors.

A stable policy environment with coordinated support across skills, infrastructure and supply chains, could strengthen resilience while unlocking the potential of chemistry for the UK, devolved and local economies.

This is a moment of opportunity. Metro mayors and other local decision-makers play an important role in growth and innovation and need clear, place-specific evidence to support decision-making. This report provides that evidence base, helping policymakers, universities, businesses and the wider chemistry community to better understand where chemistry capability exists in the UK and how it can be strengthened.

At the Royal Society of Chemistry, we are committed to ensuring that chemistry is recognised and supported as a strategic capability for the UK economy. We encourage all those with an interest in the UK's future to engage with this evidence and work with us to unlock the full potential of chemistry for growth, innovation and opportunity.

*Dr Helen Pain MBE CSci CChem FRSC
Chief Executive, Royal Society of Chemistry*

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Executive Summary

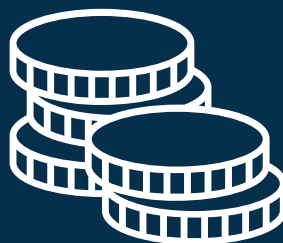
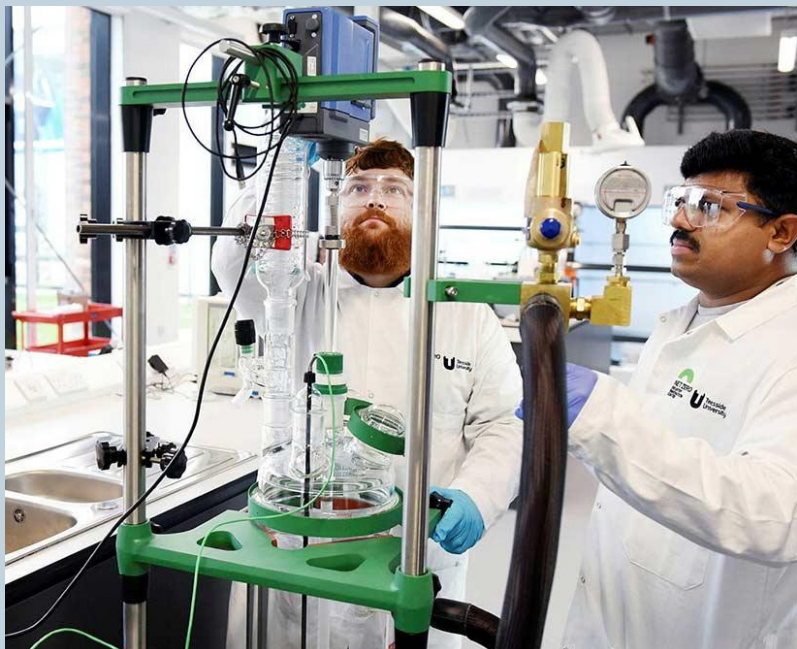
The context and opportunity

Chemistry is a capability woven throughout the UK economy. Rather than operating as a single sector, it underpins many of the UK's most important industries through a complex network of skills, research, innovation and production activity. Despite this, chemistry is often difficult to see in conventional economic analysis and policy frameworks because its contribution is spread across multiple sectors and value chains.

As decision-making in the UK's economic and innovation landscape becomes increasingly devolved, and responsibility for growth, skills, innovation and industrial development shifts further towards national, regional and local leaders, it is critical to address chemistry's low visibility. To make informed decisions, actors need a clearer understanding of where chemistry capability exists, the role it plays in their economies and how it contributes to wider ambitions around growth, resilience, net zero and competitiveness.

There are already examples across the UK of chemistry capability supporting successful local economies, from globally significant research clusters and innovation ecosystems to major manufacturing locations that anchor jobs, exports and strategic resilience. However, these strengths exist alongside significant economic and geopolitical challenges, creating a growing need for robust evidence on where chemistry capability sits and how it contributes to economic outcomes.

This report provides that evidence base, bringing together analysis of economic activity, workforce and graduate pipelines, research capability, spinouts and place-based ecosystems to understand how, where and why chemistry contributes to the UK economy.



£60.5bn

Total GVA contributed to the UK economy from the chemical sciences in 2023.

Headline Insights

- 1** The chemical sciences are a foundational capability across the UK economy, creating substantial economic value directly and through wider spillovers. In 2023, total activity contributed £60.5 billion in Gross Value Added (GVA) to the UK economy, a similar amount to the tourism sector. Between 2019 and 2023, chemistry's overall GVA contribution grew by 18%, despite significant challenges in the UK economy.
- 2** Overall, 327,500 people were employed in chemistry occupations. The GVA per job for chemistry-using workers (excluding secondary and higher education staff) averages at £98,300.
- 3** As a highly productive sector relative to the wider economy, the chemical sciences value creation is strongest where chemistry capability is applied in production-intensive sectors, particularly manufacturing, whilst research-intensive activity can appear “lower in productivity” in conventional GVA metrics, despite its upstream importance.
- 4** Chemistry is vital in supporting UK government ambitions and future economic growth, with nearly half of chemistry-using workers (excluding secondary and higher education staff) working in UK Government priority Industrial Strategy sectors (46% vs 26% economy-wide). There are particularly high concentrations in Life Sciences and Defence, highlighting chemistry as a strategic enabler of national missions such as net zero, health, resilience and growth.

These headlines reinforce the need for place-specific evidence to help devolved and local leaders recognise where chemistry capability sits, what form it takes, and how it can be strengthened to support economic growth ambitions. They also highlight a wider challenge: ensuring that chemistry capability is visible within economic decision-making and that stronger pathways exist between research, skills, innovation, commercialisation and production.

Chemistry Ecosystem Typologies

The analytical findings highlight the importance of understanding chemistry not simply as a collection of sectors or occupations, but as a place-based ecosystem. Different places play different roles within the wider chemistry value chain, from discovery and talent generation through to commercialisation, manufacturing and deployment.

To better understand these different roles, this report introduces a typology that combines industrial indicators (scale, productivity and employment concentration) with university indicators (student numbers, postgraduate researcher intensity and spinout activity). This moves on from isolated indicators to a clear, place-based framework which outlines how and where chemistry capability is created and applied.

This approach reveals four broad types of chemistry ecosystem across the UK:

- **Integrated ecosystems**, where strong industrial and university capability reinforce one another.
- **University-anchored ecosystems**, where research, talent and innovation activity are particularly strong.
- **Industry-anchored ecosystems**, where chemistry contributes significantly to production, productivity and economic output.
- **Localised ecosystems**, where chemistry activity exists at a smaller or more specialised scale.

The typologies demonstrate that different places contribute to the chemistry economy in different ways and that no single model of success exists. They also highlight that headline productivity measures can understate the importance of research-intensive places, where value may ultimately be realised elsewhere through commercialisation and production.

Conclusions

Taken together, it is these findings that point towards the challenge set out in the headlines: ensuring that chemistry capability is visible within economic decision-making and that stronger pathways exist between research, skills, innovation, commercialisation and production.

The chemical sciences story is strongest where research, talent, innovation and production are connected within a regional ecosystem. In research-intensive places, this means strengthening translation and value capture. In production-intensive places, it means supporting competitiveness, resilience and future growth.

Across all ecosystem types, stronger collaboration between industry, universities, policymakers and the wider chemistry community is required to ensure chemistry's contribution is recognised and fully realised.





02 Introduction

Chemistry is a capability, interwoven throughout the UK economy.

Chemistry underpins the UK economy's key sectors through a complex and nuanced network of skills, outputs and assets. In 2023, overall activity within the chemical sciences contributed a total of £60.5 billion to the UK economy in Gross Value Added.

Chemistry intrinsically supports key objectives of the four governments in the UK, whether that is building a green future and supporting net zero targets through key innovations, securing better health, ageing and wellbeing by supporting the application of research and personnel to key sectors like healthcare, or driving sustainable economic growth by fostering innovation, strengthening industry and enhancing UK competitiveness. This widespread influence is reflected in employment figures, with 327,500 people employed in the chemical sciences in 2023, and a further 1.82 million jobs supported in 'non-chemistry industries'.

At a UK level, key decisions on investment are driven by HMG's Industrial Strategy, the Science and Technology (S&T) framework and UK Research and Innovation (UKRI). Activity and rhetoric have largely focused on the identified eight Industrial Strategy (IS-8) sectors. These are sectors that have been identified by government as having the greatest growth potential over the next decade and a critical role to play in supporting economic security and resilience, net zero and regional growth. IS-8 sectors include Life Sciences, Defence and Clean Energy Industries, all sectors which this work demonstrates the chemical sciences are pivotal to. For example, compared to the national average, the chemistry-using workforce are 17 times more likely to be employed in the Life Sciences sector, and nearly six times in the Defence sector.

UKRI also continues to play a key role in supporting the development of research and innovations that underpin these sectors. Looking ahead from this moment in time, UKRI's emerging strategy emphasises; a more targeted approach to investment; balancing curiosity-driven research; mission-led programmes addressing strategic government and societal priorities; support for innovative companies and the enabling infrastructure; and talent pipelines and regional innovation ecosystems that underpin the UK's research, commercialisation and industrial capability.

We are likely to see further devolution and reorganisation of powers in the coming years, whether in unitary and combined authorities in England or calls for increased devolution across the nations. The devolved governments in Scotland, Wales and Northern Ireland have each set their own direction on innovation and economic development, and chemistry needs to be well positioned to take advantage of the opportunities this creates. Increasingly we are seeing further devolution within England and that emerging Local Growth Plans are intended to 'play out' national strategy and connect into other devolved funds, with some of this already being delivered through the Local Innovation Partnership Fund.

To ensure that leaders across the UK understand and recognise the role and importance of chemistry in their place, a strong grip is needed on the local chemistry story, and the differentiated support required to grow chemistry and underpin other sectors.

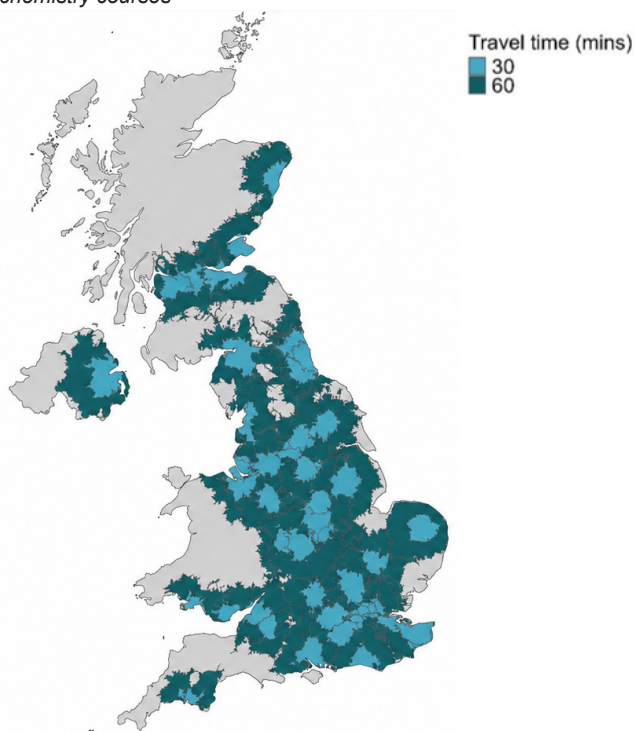
Whilst there is a recognition that chemistry plays a key role in supply chains and in some specific strategic locations, neither national nor local strategies set out how, in practice, chemistry will be supported. For some, including the S&T Framework, chemistry is implied rather than explicitly discussed. This highlights the distributed and underpinning nature of chemistry, which is not always visible, and as a result is not acted upon in a purposeful or meaningful way. There are therefore barriers to understanding that need to be overcome to demonstrate to leaders across government the importance of chemistry and the chemical sciences in supporting and enabling priority sectors to grow.

In addition, some specifically challenging economic headwinds are facing the chemical sciences, impacting its and the wider economy's short and long-term success:

1. Universities and the skills pipeline:

Universities play a vital role in supporting the pipeline of chemistry skills and research. Recently, however, universities have experienced a number of challenges, including falling international student numbers, the cost of living crisis and the Covid-19 pandemic. For many universities this has proved financially unsustainable, leading to significant change. Whilst not unique to chemistry, many universities have paused or closed chemistry courses, and in some cases, chemistry departments have closed, including Bangor University in Wales and University of Hull in Yorkshire and the Humber. This has led to a number of chemistry cold spots across the UK, with some universities now a 60-minute or more drive away (shown by light blue and dark green for up to 30 minutes and 60 minutes respectively, or grey for over 60 minutes)¹. With more than half of UK undergraduates choosing to study less than 55 miles from home², cold spots will limit student choice and access.

Figure 1. Travel time distances from universities offering undergraduate chemistry courses



2. International trade and geopolitics:

The chemical sciences underpin multiple sectors critical to the UK economy, including Clean Energy, Life Sciences and Advanced Manufacturing. Changing geopolitics, rising energy prices and growing global competition for input materials such as critical minerals and molecular building blocks place pressure on supply chains on which many diverse sectors depend (for example, disruptions to feedstocks and foundational materials can have cascading impacts across interconnected value chains). In an increasingly unpredictable global environment, this could create risks to industrial and economic resilience, particularly where supply chains lack coordination or visibility.

¹ The map uses HESA data, showing the travel times by car to an active chemistry undergraduate course in the UK based. 30- and 60-minute driving ranges are indicated in blue and green respectively. Grey indicates where the driving range is over one hour. The map is up to date as of April 2026. Find out more at '[Shaping the future of chemistry in higher education](#)'

² <https://www.suttontrust.com/our-research/home-and-away-student-mobility/>

The opportunity

This is a timely moment to reiterate that the chemical sciences is one of the key foundations to the success of the UK economy. There is a clear opportunity to reposition the chemical sciences as a vital enabler of the UK's priority sectors and place-based growth agenda, at a moment when the landscape of sectoral and political decision-making is shifting. Local growth plans and emerging devolution arrangements are moving more responsibility for prioritisation and delivery to combined and unitary authorities. UKRI are driving new models of locally led R&I investment and partnership, strengthening the case for timely, place-specific evidence on where chemistry capability can best be translated into growth and resilience. **This therefore requires a clear, accessible evidence base that helps leaders understand where chemistry activity is located in their area and whether it is driven by industry, research, or a mix of both.**

There are already success stories to build and learn from, from localised capabilities to large-scale production that anchors jobs, exports and strategic resilience. For example, the University of Liverpool and Unilever have collaborated through a major strategic partnership on the Materials Innovation Factory (MIF), valued at £81 million. Alongside such flagship investments, there is a significant body of activity that remains under the radar, which collectively makes a substantial contribution to productivity, resilience and innovation, yet is often not visible to decision-makers. Bringing this activity into view is essential to understanding the true scale of the UK's chemical sciences base and unlocking its full economic potential.

This report therefore provides a framework and supporting evidence base in which to identify, quantify and articulate where chemistry activity is taking place, and in what form. This focuses on: How is chemistry-driven value being created today? What are the chemistry skills and research (spinouts) pipelines? Where does this activity happen, and how does it support UK policymaking?

Over the following sections this report sets out:

- **Economic Impact: Value, Productivity and Contribution:** Quantifying chemistry's economic footprint across the UK and illustrating what drives economic value.
- **People: Talent, Skills and Careers:** Mapping out the chemistry-using workforce and the career pathways of graduates.
- **Policy: Industrial Strategy and National Priorities:** Outlining how chemistry underpins the UK's priority sectors and national ambitions.
- **Place: The Regional Chemistry Landscape:** Illustrating how and where chemistry is distributed and concentrated across the UK, whether that be skills, innovation or economic value.
- **Chemistry Ecosystems: Integrating the Story:** Creating typologies that provide a clear, place-based framework showing where and how chemistry capability is created and applied.

Importantly, this report does not attempt to provide a picture of quality, nor diagnose where interventions may be required. The indicators presented here are deliberately descriptive. They show where chemistry activity is located, what form it takes, and how it relates to broader patterns of economic value, skills and research. They do not, on their own, distinguish the performance of institutions or organisations, explain causal drivers, or capture the full social and environmental outcomes that chemistry enables.

Instead, the framework and supporting evidence base provide a shared foundation for more targeted questions, helping local and national stakeholders to identify areas of strength, potential gaps in the pipeline from skills to commercialisation, and places where deeper qualitative insight, engagement and additional metrics are needed to assess performance and consider the case for intervention.

The report concludes with a call to action setting out how government, industry, universities and the chemistry community can better support visibility, alignment and value capture across the UK.

Approach

As chemistry is not a single sector or industry, but rather a cross-cutting capability that supports activity across many other parts of the economy, its contribution can be difficult to understand using traditional economic analysis alone.

This study therefore takes a broad approach to understanding the contribution of chemistry to the UK economy. Rather than looking only at chemical manufacturing or individual firms, it considers the wider system of skills, research, industry and innovation activity that chemistry enables.

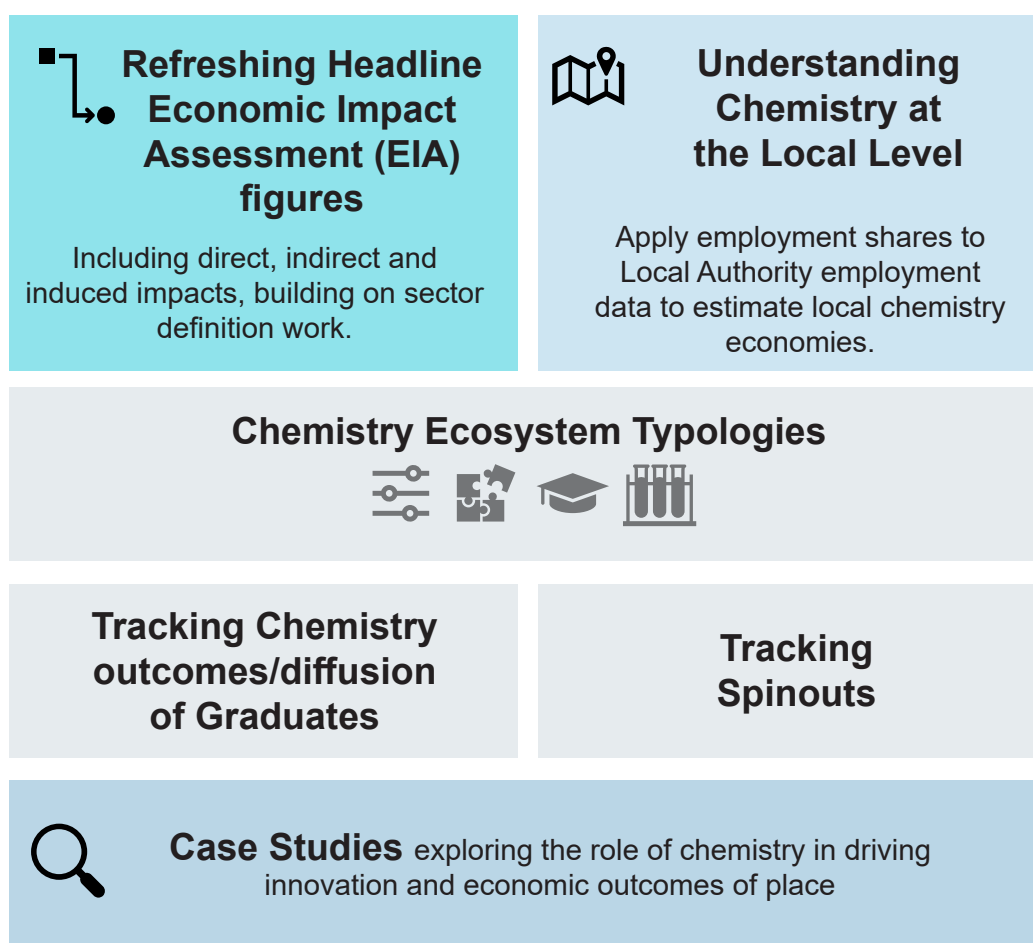
The analysis covers:

- Economic analysis of employment, productivity and Gross Value Added (GVA).
- Workforce and graduate pipeline analysis.
- Research, university and spinout activity.
- Place-based analysis exploring how chemistry activity differs across the UK.

The study brings these different strands together through a typology approach, helping identify different types of chemistry ecosystems across the UK. This provides a framework for understanding how chemistry contributes to economic activity in different places, whether through industrial production, research excellence, innovation activity, workforce capability, or combinations of these.

Further technical detail on the method is provided in Appendix A.

Figure 2. Our Approach



Definitions – the chemistry-using workforce

The study adopts the definition of the **chemistry-using workforce**, developed for the Royal Society of Chemistry's Future Workforce and Educational Pathways Report³. This combines two main groups of workers:

1 People working directly in chemistry or chemistry capability embedded across wider sectors and industries. The definition utilises the UK's Standard Industrial Classification (SIC) and Standard Occupational Classification (SOC) to create a SIC/SOC framework in which to identify the majority of the chemistry-using workforce (Figure 3). Chemistry industries are defined by multiple SICs within manufacturing, utilities, trade of chemical goods and technical and research services. Alongside different occupation groups, this gives us three broad groupings:

- **Core chemistry occupations in chemistry industries:** Four 'core' occupations are identified in which all activity is classed as chemistry-using, such as biochemists and biomedical scientists in scientific research and development.
- **Core chemistry occupations (the four 'core') in non-chemistry industries:** Such as laboratory technicians in healthcare.
- **Other chemistry occupations in chemistry industries:** An additional 13 'other' occupations are classified as chemistry-using when employed in a chemistry industry, such as engineering professionals in pharmaceuticals or chemicals manufacturing.

2 Chemistry teachers in secondary education and chemistry staff in universities. As the SIC/SOC framework does not distinguish between subject specialisms, national education workforce and HESA datasets have been used to identify chemistry teachers and higher education staff.

Chemistry-related education staff also work in the further education sector, but due to data availability, it was not possible to isolate them in the data.

Figure 3. SIC and SOC definitions for the chemical sciences



³ Future Workforce and Educational Pathways Report. Carried out by Lightcast for the Royal Society of Chemistry, published 2023



Economic Impact

Value, Productivity and Contribution

Gross Value Added

Gross Value Added (GVA): Gross Value Added measures the value of goods and services produced in an area, industry, or sector. This allows us to measure the economic contribution of chemistry to the UK economy, as well as to compare against other sectors.

GVA is a practical starting point for understanding where chemistry activity sits within the economy. It is a widely used metric by central and local government, therefore calculating this enables us to illustrate and compare the economic performance and importance of chemistry to the UK economy. There are, however, recognised limitations of GVA, with upstream research value often not captured.

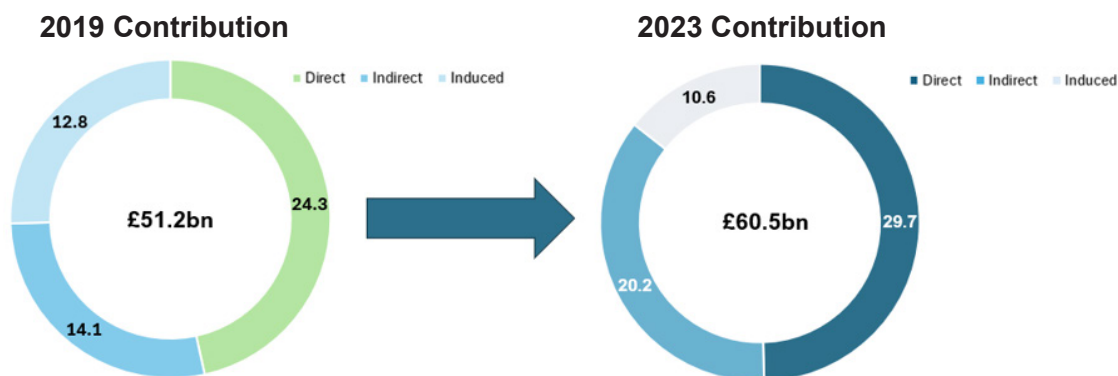
There are three GVA indicators presented in this analysis:

- 1. Direct GVA:** This is the economic value created directly from activity of the chemistry-using workforce, including the production of goods and services within chemistry.
- 2. Indirect GVA:** This includes the wider supply chain impacts (business to business) from direct chemistry activity (those defined in core jobs).
- 3. Induced GVA:** This captures the multiplier effect from increased household spending from those employed, directly or indirectly, within chemistry.

Overall, the chemical sciences contributed a **total of £60.5 billion in Gross Value Added to the UK economy in 2023**. This is the sum of £4.8 billion generated through the activity of secondary education teachers and higher education staff, and £55.6 billion from the rest of the chemistry-using workforce.

When comparing to the previous analysis carried out for the Royal Society of Chemistry in their 2020 Chemistry's Contribution report⁴, we find that chemistry's contribution to the economy has also grown in recent years. **Between 2019 and 2023, its overall GVA contribution grew by 18%**, despite significant challenges in the UK economy.

Figure 4. Total Gross Value Added by the chemical sciences in 2023 prices



Induced impacts, which capture the effects on household spending, have fallen. Changes are partly due to methodological differences between input/output approaches from the previous report, but it may also reflect the wider cost of living pressures experienced over this period, which has reduced real disposable household income and therefore spending.

⁴ Chemistry's Contribution: Workforce trends and economic impact, carried out by Cambridge Economics for the Royal Society of Chemistry, published September 2020

How is this split across the devolved nations?

As no national multipliers for England are published, a high-level approach has been taken forward to estimate how the indirect and induced UK figures are split across each of the devolved nations. These figures are indicative and should be treated as illustrative only. The approach uses publicly available national Scottish, Welsh and Northern Irish multipliers⁵, which are then subtracted from the total UK estimates presented above to produce England GVA figures. Given cross-border flows are omitted from national multipliers, it is likely that for Scotland, Wales and Northern Ireland, indirect and induced GVA is underestimated, whilst for England these are overestimated due to UK-wide supply chain impacts being accounted for in the England estimates.

Figure 5. Total Gross Value Added by the chemical sciences in 2023, by devolved nation

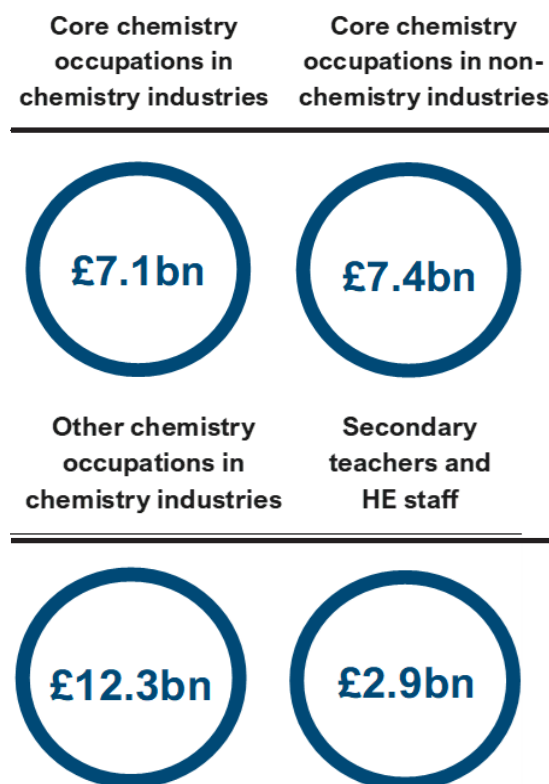


Direct Gross Value Added

The total direct Gross Value Added (GVA) impact of chemistry on the UK economy was £29.7 billion in 2023.

Figure 6 below shows how the £29.7 billion is split across the chemical sciences, with £2.9 billion contributed by secondary teachers (£2.5 billion) and higher education staff (£0.4 billion) and a further £26.8 billion contributed by the rest of the chemistry-using workforce identified in the SIC/SOC framework.

Figure 6. Direct GVA in the chemical sciences, 2023



⁵ Given Wales latest published multipliers are for 2019, we have used 2019 multipliers for each devolved nation to ensure a common base. This therefore ignores the potential economic consequences of Covid-19 on nation level supply-chains and household spending, meaning in practice the balance of indirect and induced impacts could differ across each devolved nation.

Indirect and Induced Economic Impacts

In addition to the £29.7 billion direct GVA generated by the chemistry-using workforce in 2023, **a further £20.2 billion of indirect (supply chain) and £10.6 billion of induced (household spending) GVA was created from chemistry activity.** Of this, chemistry teachers in secondary education and higher education staff contributed £0.8 billion and £1.1 billion⁶ in indirect and induced respectively, whilst the rest of the chemistry-using workforce contributed £19.4 billion in indirect GVA and £9.5 billion in induced GVA. The table below shows how this is split by the devolved nations.^{4,7}

Table 1. Indirect and induced impacts by devolved nation, £ billion (rounded to nearest 0.1)

Devolved nation	Indirect GVA	Induced GVA
England	18.6	9.2
Northern Ireland	0.3	0.5
Scotland	1.0	0.8
Wales	0.4	0.2
United Kingdom	20.2	10.6

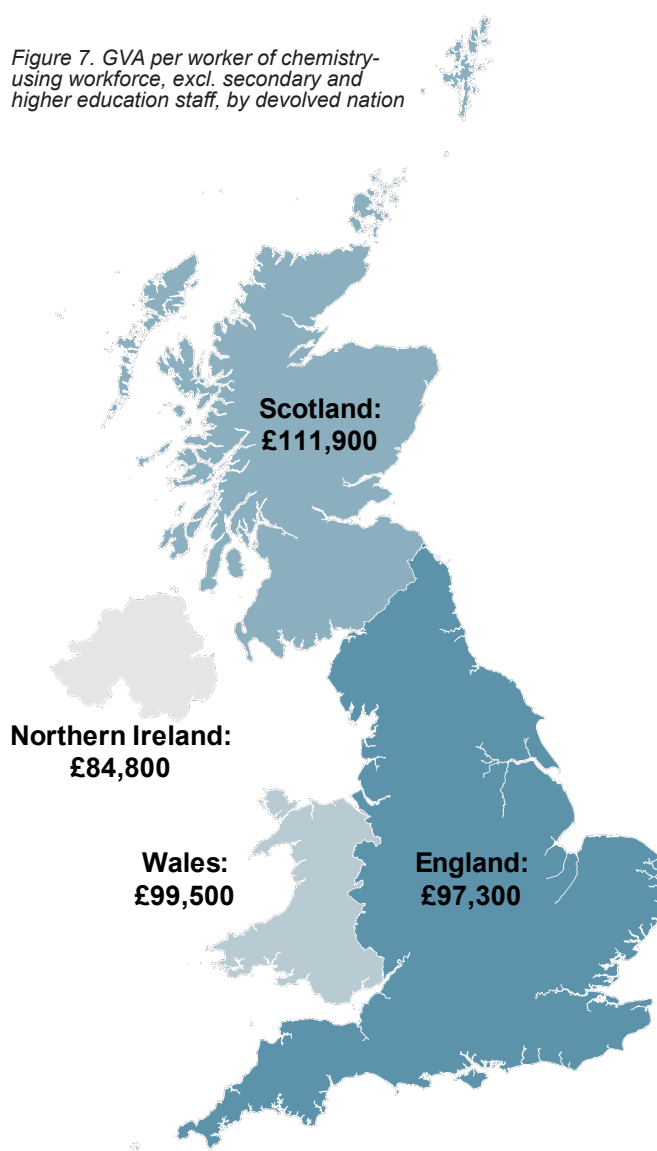
Productivity

Chemical sciences are highly productive, with a significantly higher GVA per worker than the overall economy.

Overall, 327,500 people are employed in the chemical sciences across the UK.⁸ We can assess how productive the chemical sciences sector is, using the metric of Gross Value Added per worker.⁹ Given secondary education teachers and higher education staff are identified separately from the SIC/SOC framework, the **following GVA per worker figures are for the chemistry-using workforce excluding secondary and higher education staff.**

Overall, the GVA per worker for the chemical sciences (excluding secondary and higher education staff) is £98,300, 34% higher than the UK average across all sectors at £73,300.

Figure 7 to the right, shows how this is broken down for each UK nation, with Scotland having the highest GVA per worker at £111,900 and Northern Ireland having the lowest at £84,800. GVA per worker can also be viewed across occupations and industries, with the full breakdown show on the next page.



⁶ For teachers and higher education staff, induced impacts are higher than indirect. This highlights that these professions have less/shorter supply chains, with the bigger effect coming from induced household spending.

⁷ As no national multipliers for England are published, a high-level approach has been taken forward to estimate how the indirect and induced UK figures are split across each of the devolved nations. These figures are indicative and should be treated as illustrative only. The approach uses publicly available national Scottish, Welsh and Northern Irish multipliers, which are then subtracted from the total UK estimates presented above to produce England GVA figures. Given cross-border flows are omitted from national multipliers, it is likely that for Scotland, Wales and Northern Ireland, indirect and induced GVA are underestimated, whilst for England these are overestimated due to UK-wide supply chain impacts being accounted for in the England estimates.

⁸ including workers in identified chemistry occupations (chemistry-using workers) as well as teaching staff in secondary schools and higher education.

⁹ Typically, productivity is measured by GVA per hour worked, but due to data availability by specific industries and at the local level, we have used the GVA per worker metric.

Figure 8 to the right, shows that the highest GVA per worker is generated by chemistry-using roles working within chemistry industries. Core chemistry jobs in chemistry industries generate around £119,900 per worker, compared to £96,300 for non-chemistry jobs in those same industries.

By contrast, core chemistry jobs outside chemistry industries generate lower GVA per worker (£64,400). This suggests that chemistry skills create the greatest economic value when they are embedded within chemistry-intensive industries, where specialist knowledge, processes and innovation are concentrated.

Other chemistry-related occupations also generate higher GVA per worker when they are based in chemistry industries rather than elsewhere in the economy.

Figure 8. Gross Value Added per worker¹⁰ across different chemistry groupings

Chemical sciences	
£119,900	Core chemistry jobs in chemistry industries
£124,700	Other chemistry jobs in chemistry industries
£64,400	Core chemistry jobs in non-chem industries
Other sectors	
£96,300	Non-chemistry jobs in chemistry industries
£101,100	Other chemistry jobs in non-chem industries

What is driving economic value?

Chemical sciences are highly valuable to the UK economy, making a significant economic contribution. GVA per worker is higher overall in the chemical sciences than the national sector average. Excluding secondary school teachers and higher education staff, the chemistry-using workforce produces an average GVA per worker of £98,300 compared to a national sector average of £73,300. Productivity is highest when chemistry roles are in chemistry industries rather than in other sectors.

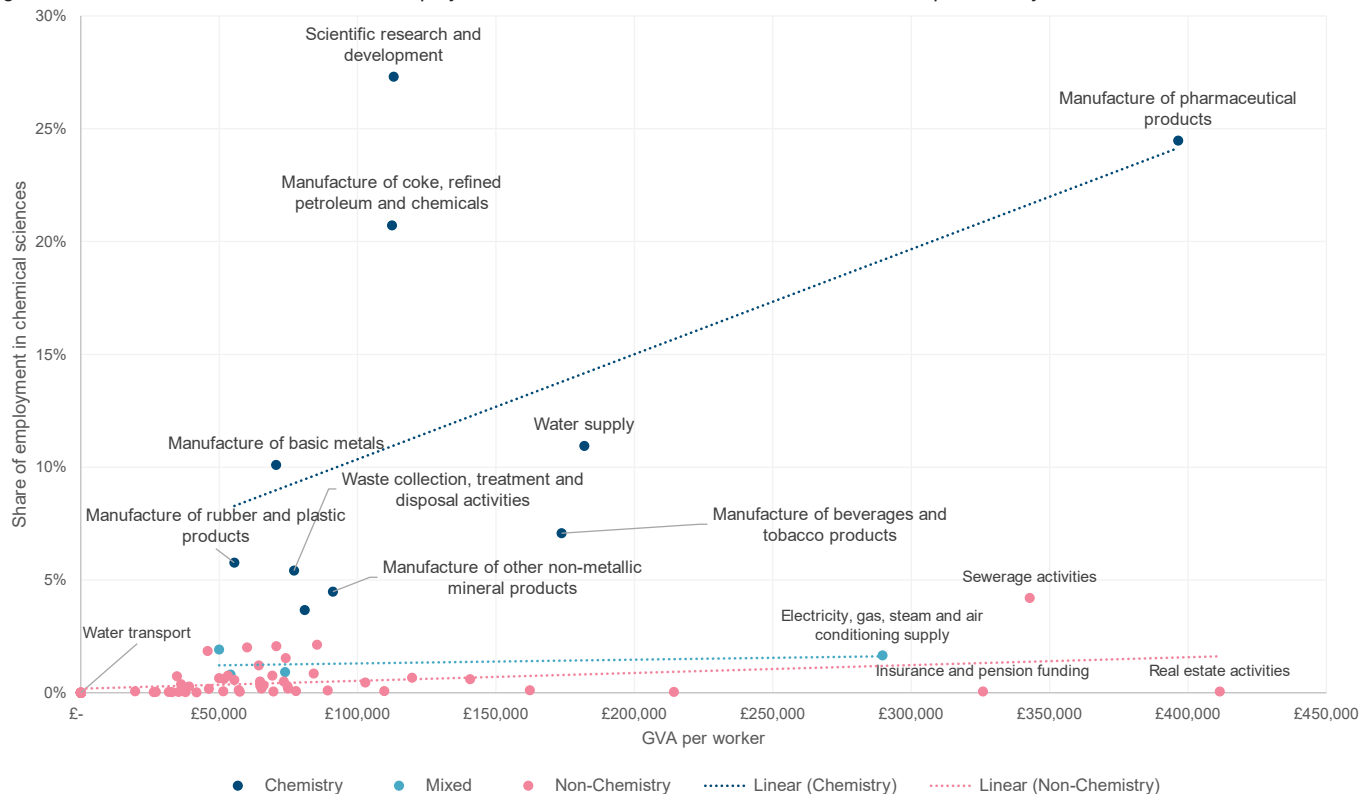
More chemistry capability tends to mean more economic value produced, with some of the most productive sectors highly reliant on the chemistry-using workforce. Across key sectors, higher employment shares in the chemical sciences have a strong positive correlation with higher GVA per worker. Figure 9 on the next page, shows each sub-sector's employment concentration in the chemical sciences and its GVA per job.

Each sector is colour-coded according to whether it is a chemistry industry, a non-chemistry industry, or a mix of both (due to sector definitions). Whilst this does not demonstrate causality, there is a clear positive correlation between employment in the chemical sciences and productivity, with this especially pronounced for sectors within chemistry-using industries.

Some notable sectors include scientific research and development, which has the highest share of workers in the chemical sciences, and a relatively strong GVA per job of £110,000 in the UK. This, however, is lower than other notable manufacturing sectors, particularly pharmaceutical manufacturing, which has 25% of its workforce in chemical sciences and has a very high GVA per worker.

¹⁰ of chemistry-using workforce, excl. secondary school teachers and higher education staff

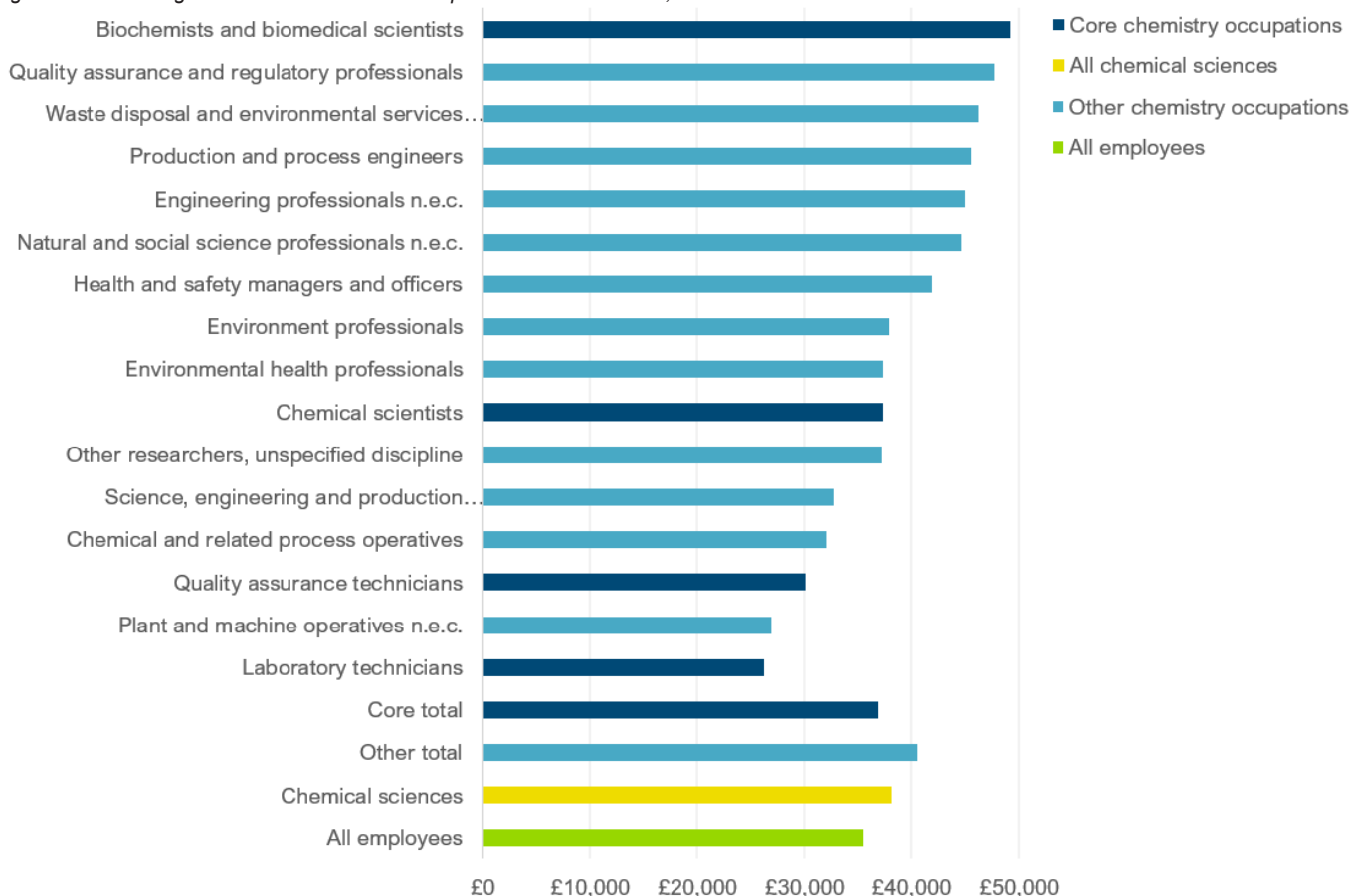
Figure 9. Correlation between the share of employment within the chemical sciences and the overall productivity of a sector



Skills alone do not determine economic productivity - it also matters what industries these skills are applied in. Many of the occupations within chemistry are considered high skilled, with wages reflecting how these occupations are valued in Figure 10. Typically, where there are higher concentrations of higher-value occupations like chemical scientists, there is a higher GVA per job. There are however exceptions to this rule, with economic outcomes depending on what industry the occupation sits in. For example, a scientist in a non-chemistry industry is likely to make a lower contribution to GVA than a scientist in a chemistry industry.



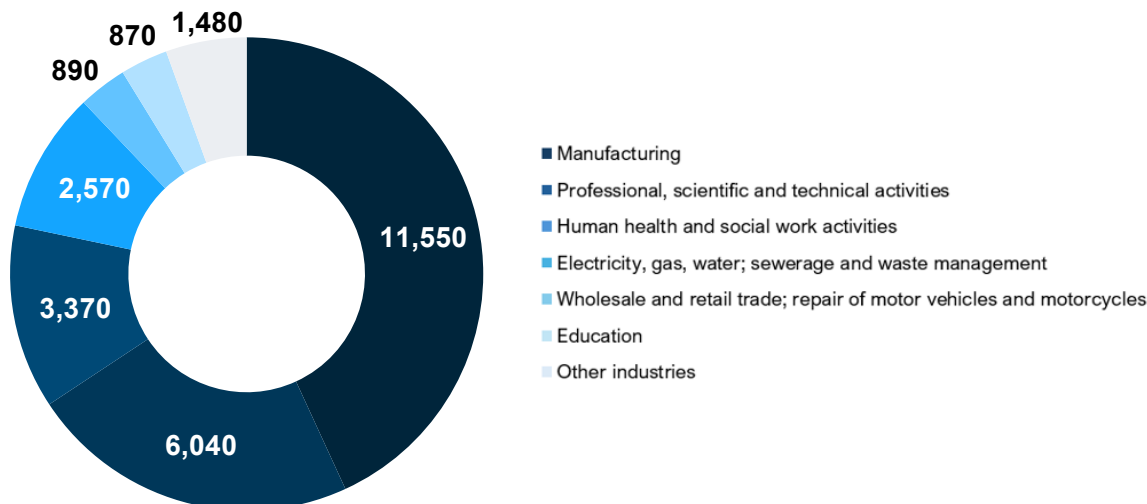
Figure 10. Mean wages of chemical science occupations vs. sector wide, 2023



Most value is generated in high-production intensive sectors, particularly where these overlap with high-skill jobs. As a measure of economic output, GVA is largely driven by production intensity. Areas with a high concentration of chemical sciences manufacturing, or where chemistry underpins service delivery, therefore tend to generate higher GVA and GVA per worker. However, GVA does not capture upstream research value and cross-sector enabling roles, which can undervalue certain activities which are part of the supply chain.

Figure 11 below, shows the industries with the highest direct GVA contribution in chemical sciences. Manufacturing accounts for the largest share of chemical sciences GVA at 43% followed by professional, scientific and technical services (23%), human health and social work (13%) and utilities (10%). In particular, the chemistry-using workforce account for a larger share of total GVA in manufacturing, professional services and utilities than across the wider economy.

Figure 11. Gross Value Added by broad chemical sciences sectors (£ million)





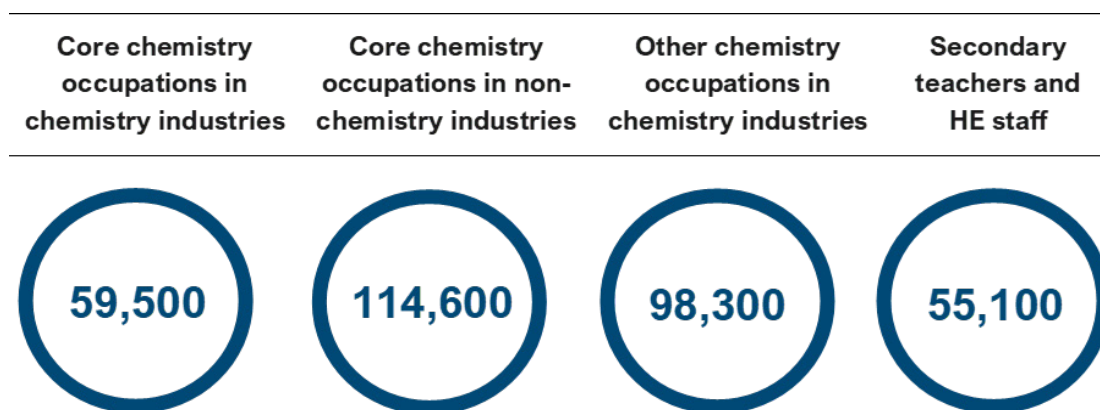
04 People

Talent, Skills and Careers

Overall, 327,500 people are employed in chemical sciences across the UK, including workers in identified chemistry occupations as well as teaching staff in secondary schools and higher education.

- 272,400 in chemical sciences in the UK, measured using the SIC/SOC definition framework: 22% of this total are core chemistry occupations in chemistry industries, 42% are core occupations in non-chemistry industries and the remaining 36% account for other chemistry occupations in chemistry industries.
- 49,500 chemistry teachers in secondary education and 5,600 higher education staff in chemistry departments, measured separately by using the teacher census from each devolved nation and the Higher Education Statistics Agency (HESA) staff record.

Figure 12. Breakdown of UK employment in chemical sciences and secondary teachers and higher education staff, 2023



The remaining analysis for people, policy and place excludes secondary teachers and higher education staff due to the differing methodology and data availability. Further explanation on data sources and caveats are provided in the technical annex.

The chemistry-using workforce identified in the SIC/SOC framework¹¹ are often high-skilled, with most working in one of the four core occupations. These are more prevalent in utilities, manufacturing, and professional, scientific and technical activities. Most occupations in the chemical sciences are classed as high-skilled, except for plant, machine, and chemical process operatives, who account for 21,200 of chemical sciences employment.

Of the high-skilled occupations, most are classed as professional occupations (154,000) or associate professionals (91,400) in the standard SOC system, with the 5,600 employed as waste disposal and environmental science managers classed as a managerial position.

¹¹ of chemistry-using workforce, excl. secondary and higher education staff.

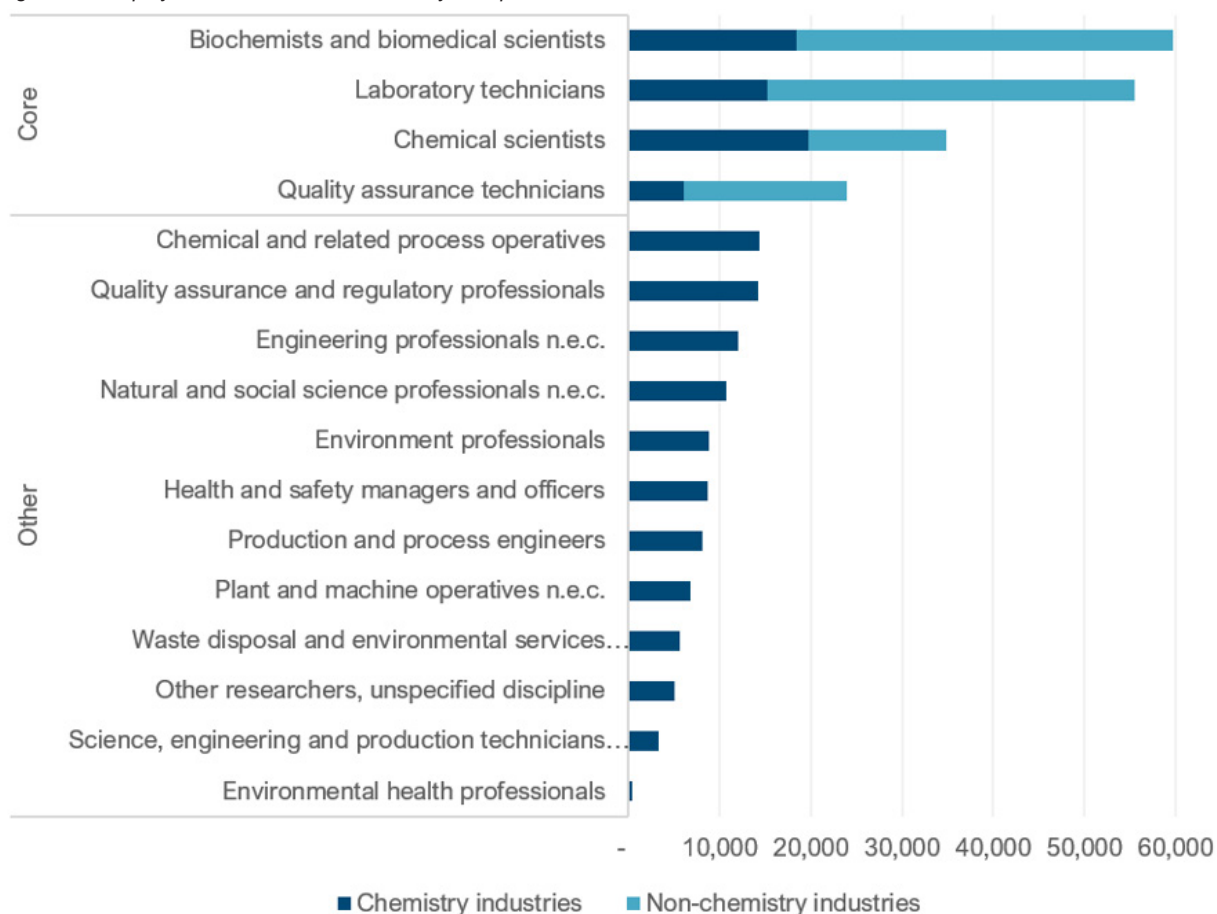
The top four most employed occupations are: biochemists and biomedical scientists, accounting for 59,700 workers, laboratory technicians (55,600), chemical scientists (34,900) and quality assurance technicians (23,900). However, just 6,100 quality assurance technicians are in chemistry industries, with the rest in other sectors. A high share of chemical sciences employment is in other chemistry occupations, with notably high employment in chemical and related process operatives (14,400), quality assurance and regulatory professionals (14,200), and engineering professionals (12,100).

Similar to the GVA breakdown of chemical sciences outlined in Figure 11, the most common industries that workers are in are manufacturing (32%), professional, scientific and technical activities (22%), and human health and social work activities (21%). However, the concentration of workers in chemical sciences is not even across broad industry groups.

Figure 13 highlights the share of chemical sciences employment in each broad industry. Overall, 0.8% of UK employment is in chemical sciences directly, **but the concentration of the chemistry-using workforce (excluding secondary school and higher education staff), in utilities, manufacturing and professional, scientific and technical activities is significantly higher than the UK average.**

In particular, the three sub-sectors which see the highest concentration of chemistry-using workforce are scientific research and development (27%), manufacture of pharmaceutical products (24%) and the manufacture of coke, refined petroleum and chemicals (21%). As highlighted earlier (Figure 9), these three sub-sectors are also highly productive, exceeding the majority of other sectors in GVA per job, and there is a strong positive correlation between the share of chemical sciences employment and GVA per job across chemistry industries.

Figure 13. Employment in chemical sciences by occupation



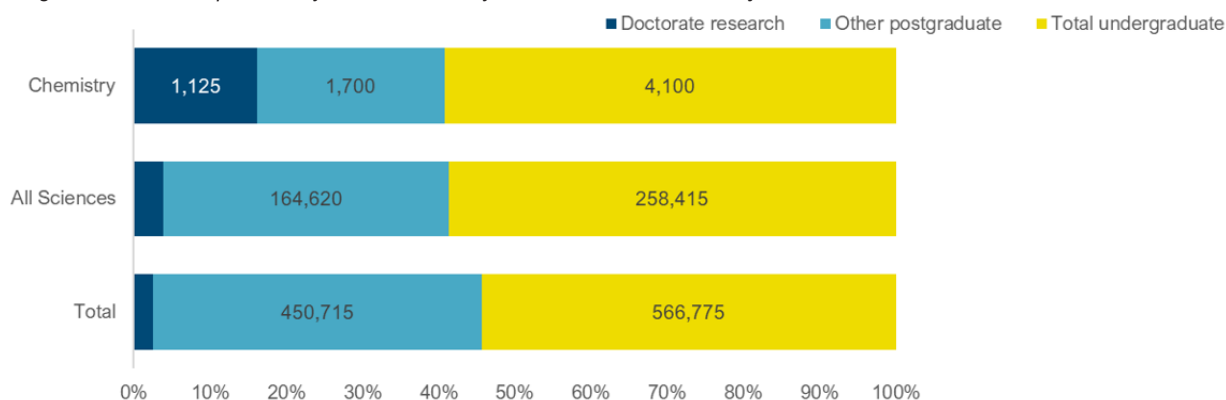
Chemistry graduate outcomes and pathways

Universities offering chemistry have a higher share of qualifiers achieving doctoral research degrees, and a higher share of graduates entering further study than other courses.

In 2024/25, there were 6,925 qualifiers¹² from universities in chemistry, including undergraduate, postgraduate and doctoral qualifications. Overall, qualifiers were from 70 universities offering chemistry courses, with Imperial College of Science, Technology and Medicine seeing the highest number of qualifiers at 405, followed by the University of Oxford (325), and University College London (310).

Compared with other science subjects¹³, chemistry has a higher share of graduates progressing to doctoral study. This difference is even more pronounced when compared with all subjects, with 16% of chemistry graduates achieving doctoral qualifications, versus 3% across all subjects.

Figure 14. Share of qualifiers by level in chemistry, all sciences and other subjects

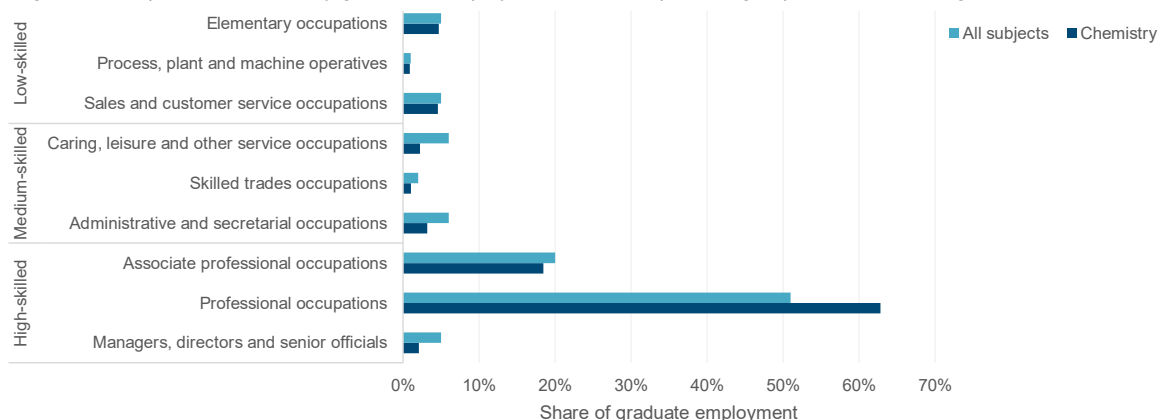


The graduate outcomes survey also finds that chemistry graduates are more likely to enter further study than other subjects, with 19% of graduates entering further study compared to the all subject average of 7%. Universities with an especially high number of doctoral research qualifiers are the University of Oxford (115) and the University of Manchester (75). For undergraduate degrees, Imperial College (215) and the University of York (195) have the most graduates.

A high share of chemistry graduates go on to be employed in chemical sciences, and are more likely to enter high-skilled occupations than other subjects, with significant employment in manufacturing, education and professional services.

Overall, 83% of chemistry graduates go into high-skilled roles¹⁴, which is higher than the all-subject average of 76%. This is driven by a particularly high share in professional occupations, which scientists are classed as using the standard occupational classification framework, accounting for 63% of all chemistry occupations.

Figure 15. Proportion of chemistry graduates employed in each occupational group 15 months after graduation



¹² Qualifiers are the number of students receiving qualifications from a course, which is slightly different to the total number of graduates, referring to individuals. Data on qualifiers derives from HESA public tables, whereas detail on graduates comes from the graduate outcomes survey, which is only a sample of all graduates. More explanation on datasets used can be found in the technical report (Appendix A).

¹³ Sciences are those categorised in the Common Aggregation Hierarchy (CAH) of subject codes, numbered from 1-11, 13 and Geography (26) excluding human geography.

¹⁴ The Standard Occupational Classifications framework groups all occupations into a set of nine broad occupational categories, based on similarities in qualifications, training, skills and experience commonly associated with the competent performance of work tasks. Occupations in the first three groups are typically treated as a proxy for a higher skill level so are interpreted as such here, but in practice other roles outside of the three groups may still require substantial expertise. Roles also may vary in 'skill intensity'.

Chemistry graduates tend to remain within their field, with over 30% finding work in core chemistry roles. Other popular occupations include ‘other chemistry’ occupations, such as research or engineering roles.

A high share of graduates also move into teaching roles; whilst data limitations mean we are unable to identify if they teach chemistry specifically, it is highly likely they will be ‘chemistry-using’. The figure shows that whilst there is a high share of graduates in the chemistry-using workforce, significant numbers choose to move into professional services or technology roles.

Figure 16. Top 20 occupations, by the share of all chemistry graduates

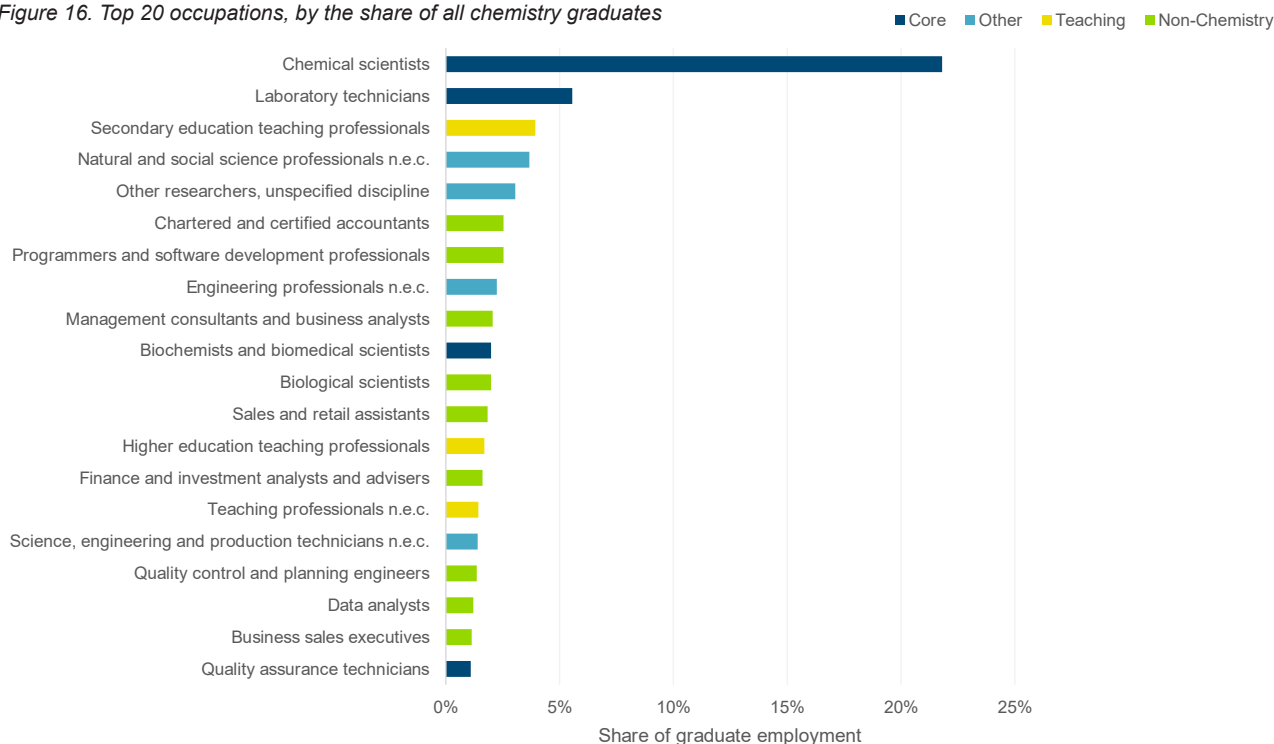
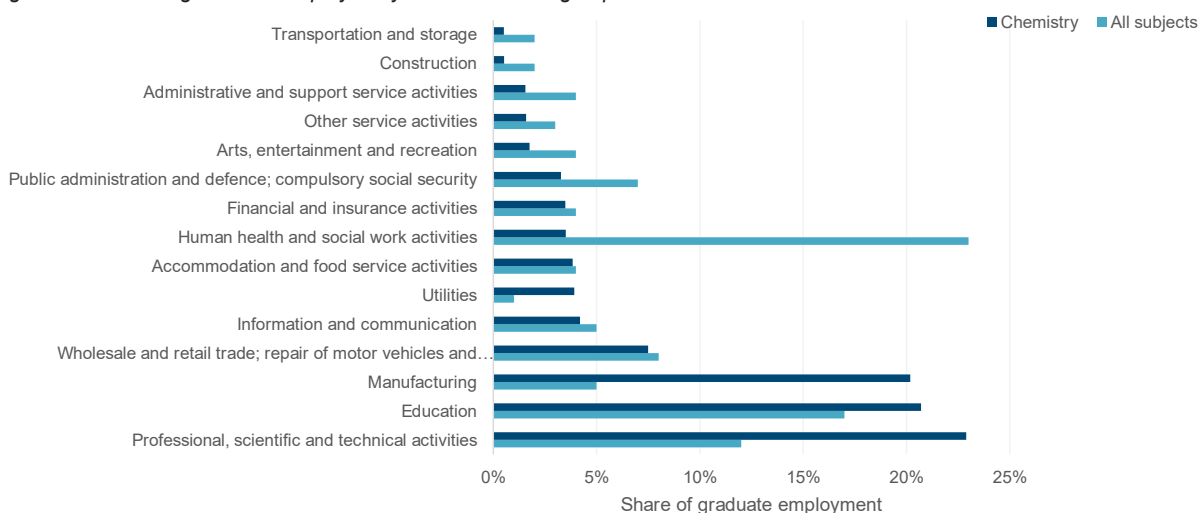


Figure 17. Share of graduates employed by broad industrial group¹⁶



Chemistry graduates are most likely to be employed in professional, scientific and technical activities, education, or manufacturing, accounting for 64% of chemistry graduates, nearly double the share of all graduate students of 34%.

Sectors that see a significantly higher proportion of chemistry graduates entering their industry often includes chemical industries as sub-sectors, such as manufacturing, utilities, and professional, scientific and technical activities. As highlighted in Figure 17 these sectors also employ a higher share of the chemistry-using workforce¹⁵ than other sectors.

¹⁵ Defined by the SIC/SOC framework, excluding secondary school teachers and higher education staff

¹⁶ Household activities and primary industries such as agriculture, forestry, fishing, mining and quarrying hidden



05 Policy

Industrial Strategy and National Priorities

The UK Government has identified eight priority sectors in the Industrial Strategy (the IS-8), earmarked to drive UK economic growth and innovation. As a cross-cutting capability, chemistry inherently plays an important role in the majority of these sectors, and is vital for Life Sciences, Advanced Manufacturing and Clean Energy.

By mapping out the Department for Business and Trade (DBT) Sector definitions for the IS-8, we can see how the chemical science sectors fit in. Importantly, Scientific and technical services¹⁷ is included as part of both Digital and Technologies and Professional Business Services sectors.

Table 2. Mapping the chemical sciences to the IS-8

SIC sector	Chemistry Industry	IS-8 sector		
20xx Manufacture of Chemicals	Manufacturing & Industrial Production	Advanced Manufacturing		
21xx Manufacture of pharmaceuticals	Manufacturing & Industrial Production	Life Sciences		
2446 Processing of Nuclear fuel	Manufacturing & Industrial Production	Clean Energy Industries		
2720 Manufacture of batteries and accumulators	Manufacturing & Industrial Production	Advanced Manufacturing	Clean Energy Industries	
38xx Waste collection, treatment and disposal activities, materials recovery	Utilities and Environmental Services	Clean Energy Industries		
7120 Technical testing and analysis	Technical and Research Services	Digital and Technologies	Professional Business Services	
7211 Research and experimental development on biotechnology	Technical and Research Services	Digital and Technologies	Life Sciences	Professional Business Services
7219 Other research and experimental development on natural sciences and engineering	Technical and Research Services	Digital and Technologies	Professional Business Services	
7220 Research and eperimental development on social sciences and humanities	Technical and Research Services	Professional Business Services		

Overall, nearly half of the chemistry-using workforce, excluding secondary school teachers and higher education staff, work in an IS-8 sector, with particular concentrations in Life Sciences, Defence and Advanced Manufacturing; 46% of the chemistry-using workforce work in IS-8 sectors, compared to an economy-wide average of 26%.

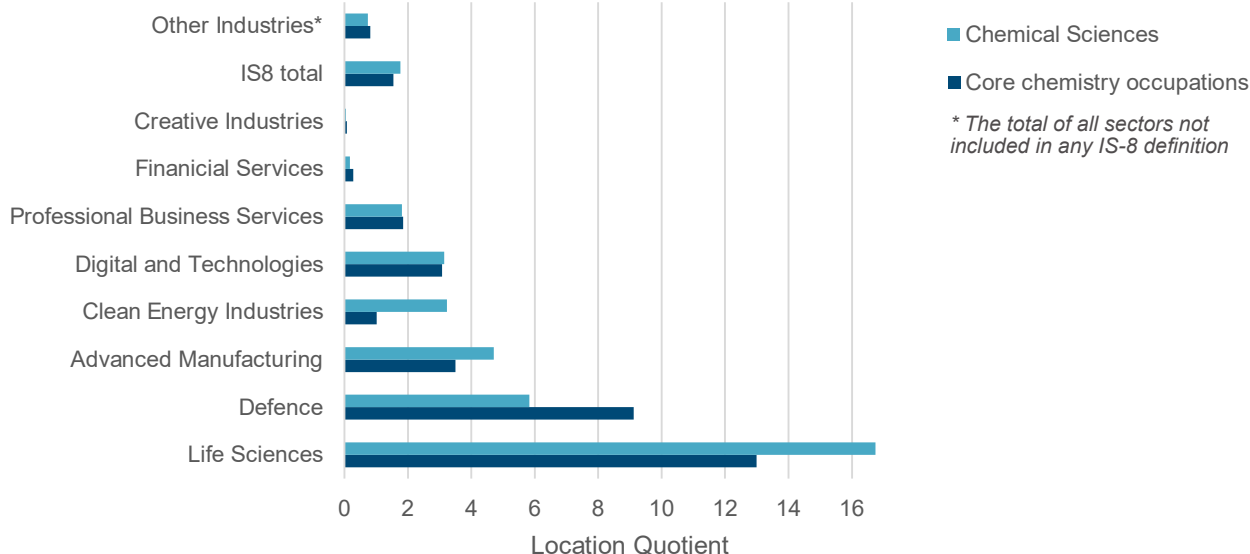
Figure 18 below employs Location Quotients¹⁸ to show the relative concentration of chemistry employment (core chemistry occupations and all chemical sciences) in each of the IS-8 sectors. This illustrates that most IS-8 sectors are more likely to employ chemistry workers than the national sector average, with these 17 times more likely to be employed in Life Sciences, and nearly six times for Defence.

Nearly half of chemistry graduates enter employment in IS-8 sectors each year. In absolute terms, and in line with the wider economy, the largest number are employed in Professional and Business Services. This reflects both the sector's size and the inclusion of core chemistry activities such as scientific research and development.

¹⁷ This is the name of SIC 72, encompassing both SICs 7219 and 7220 in the table above

¹⁸ Location Quotients (LQ) are an analytical statistic that measures an industry's concentration or specialisation in a specific region or sector in comparison to the national average. An LQ score of 1 means that the share of employment in chemical sciences in a location is equivalent to the national average, whilst a score of 2 means the share of total employment that is in chemical sciences is twice the national share. This is sometimes referred to as relative concentration in the report.

Figure 18. Location Quotients: Relative concentration of chemistry-using workforce in each IS-8 sector



However, when employment is standardised by sector size (as shown by Figure 19 below), Life Sciences and Defence have the highest concentration of chemistry graduates relative to their overall workforce, providing a clearer picture of sector specialisation.

Figure 19. Chemistry graduates per 10,000 employees in 2023

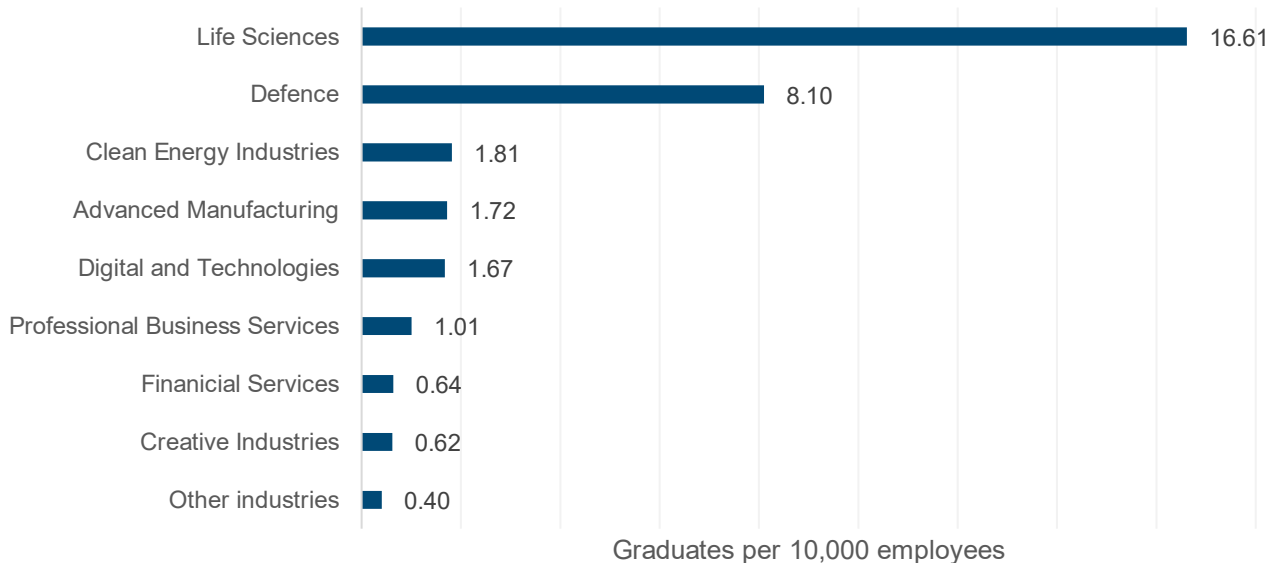
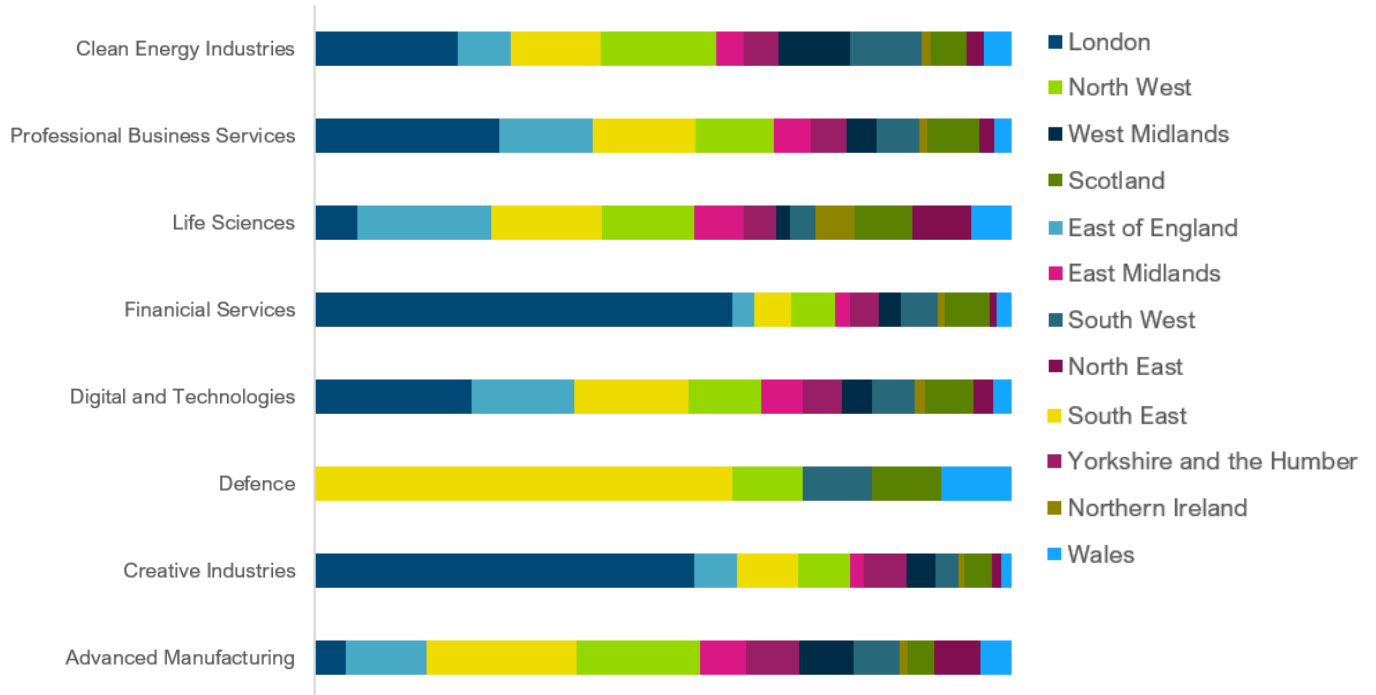


Figure 20 shows that, regionally, chemistry graduates working in IS-8 sectors are most likely to work in London, especially in Financial Services and the Creative Industries, where more than half of chemistry graduates work in London. Notably, these are also the two IS-8 sectors with the lowest concentration of chemistry graduates or chemistry-using workforce, as shown in Figures 18 and 19. However, there are some IS-8 sectors with more distinct regional concentrations, for example the South East and North West in Advanced Manufacturing, and the East of England in Life Sciences.

Figure 20. Share of chemistry graduate employment locations by IS-8 sector





06 Place

The Regional Chemistry Landscape

There are several key institutions driving the chemistry graduate workforce. Whilst Imperial College leads the way in absolute terms, the University of St Andrews has a slightly higher concentration of chemistry qualifiers.

In 2024/25, the university with the most chemistry qualifiers was Imperial College of Science, Technology and Medicine, with 405, followed by The University of Oxford and University College London, each producing 325 and 310, respectively. The remaining universities in the top 10, with the number of qualifiers ranging from 185 to 285, are The University of Manchester, The University of York, The University of Bristol, The University of East London, The University of Cambridge, The University of Warwick and Kingston University. Figure 21 shows the locations which had the most qualifiers in 2024/25.

Overall, chemistry accounts for a small proportion of qualifiers in the UK, averaging 0.7% in 2024/25. However, some universities tend to have a higher concentration of all qualifiers being in chemistry. Notably, the University of St. Andrews in Fife has the highest share of chemistry qualifiers at 4.4%, followed by Imperial College at 4.1%. These are significantly higher percentages than those of the following five universities: The University of Oxford (3.3%), The University of York (2.9%), Kingston University (2.6%), The University of Lincoln (2.2%), and the University of Cambridge (2.0%). A full picture of the areas producing the highest concentration of chemistry qualifiers is shown in the local authority map in Figure 22.

There are uneven patterns of graduate retention and specialisation across the UK, reflecting differences in both the scale of regional labour markets and the concentration of chemical sciences activity.

Figure 21. Number of chemistry qualifiers in each local authority district

Total number of chemistry qualifiers

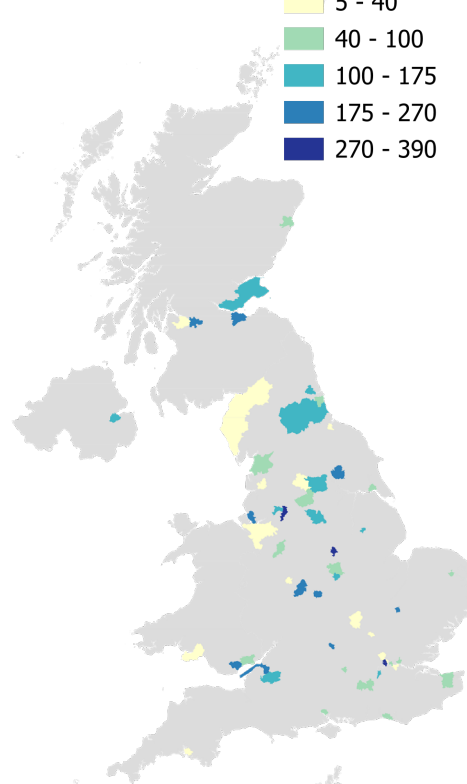
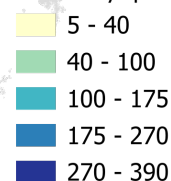


Figure 22. Share of qualifiers in chemistry by local authority district

Share of qualifiers in chemistry

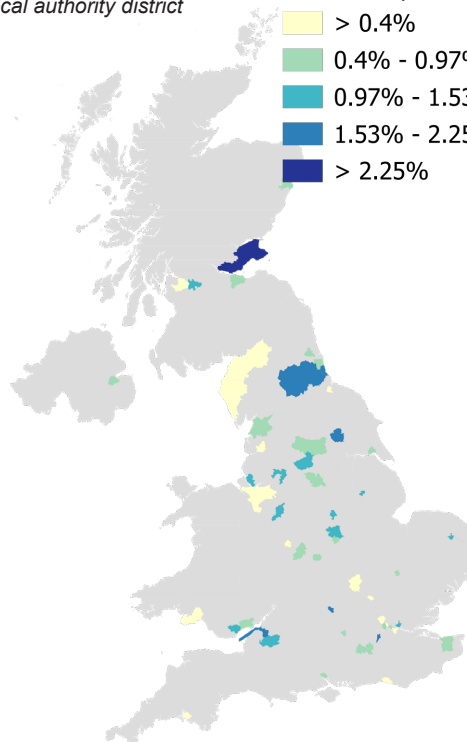
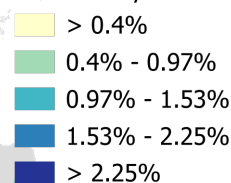
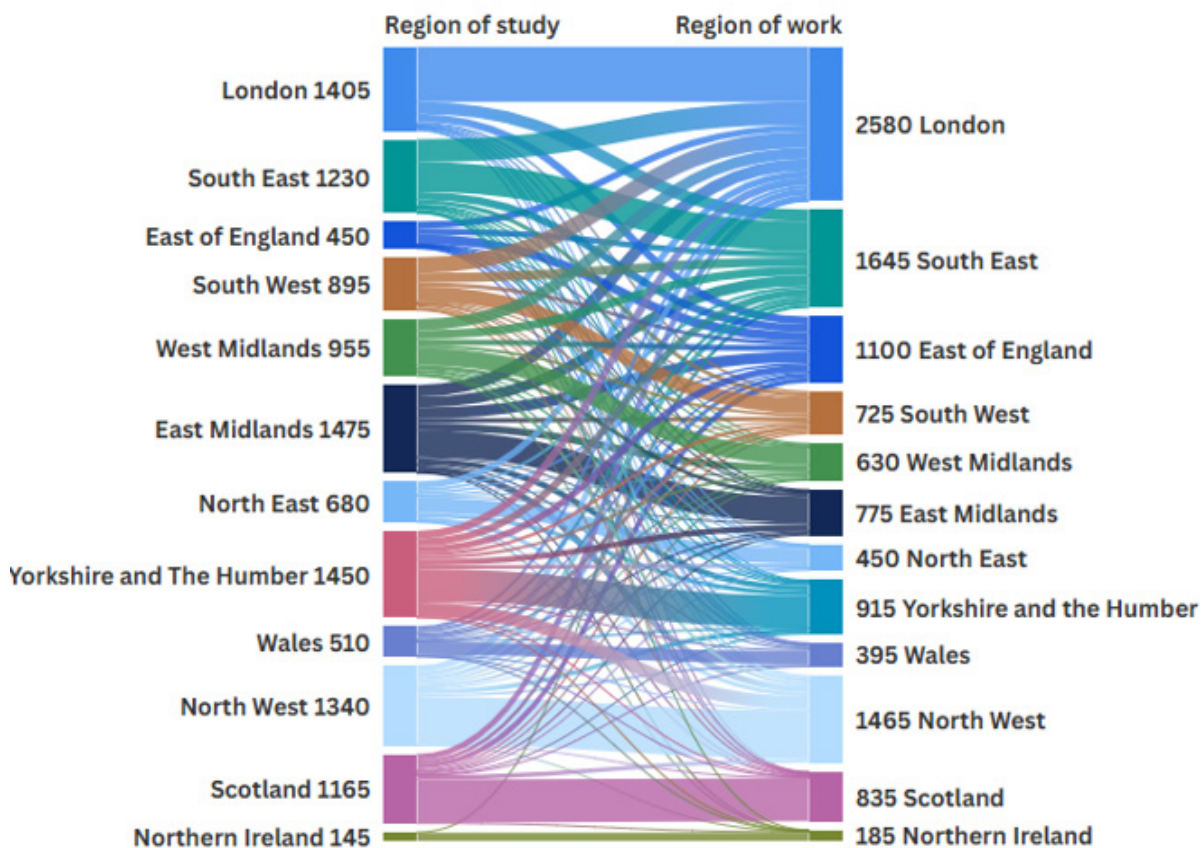


Figure 23. Flows of chemistry graduates from the nation or region of study to the nation or region of work

Working in any occupation



Working in chemical sciences



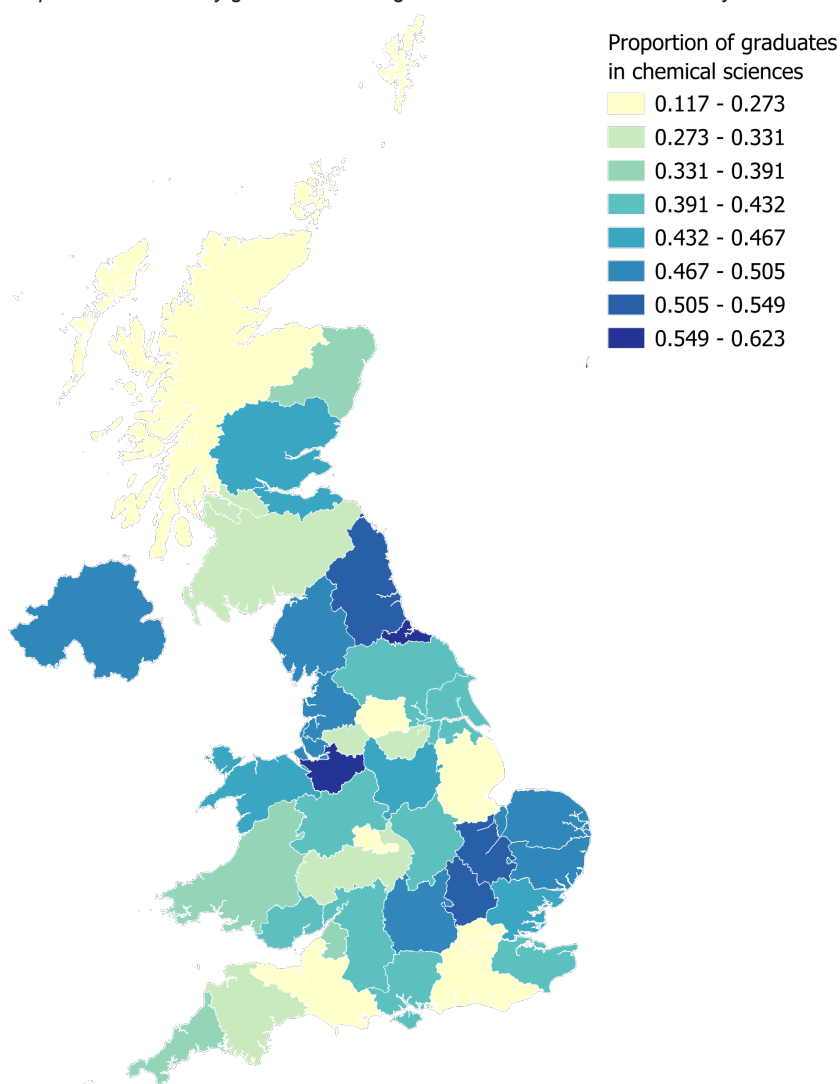
Figure 23 shows that London, the South East and the East of England attract the largest absolute numbers of chemistry graduates overall. These are all net importers, reflecting the scale and diversity of their wider economies. However, when focusing specifically on graduates employed in chemical sciences, a different geographic story emerges, with the South East, East of England, North West, and parts of Yorkshire and the Humber showing particular concentrations of the chemistry-using workforce relative to their labour market sizes.

This suggests that whilst some regions act as broad graduate employment hubs, others demonstrate a stronger specialisation in retaining and attracting chemistry talent specifically into chemistry-intensive activity.

Whilst absolute figures illustrate flows, using proportions allows us to see where graduate employment is particularly concentrated.

Figure 24 shows that the South, from Thames Valley to Cambridgeshire and Peterborough, attracts a large proportion of graduates into the chemical sciences in the region, although this does not extend into the West of England (Bristol, Bath). In the North, Cheshire and Warrington and Tees Valley show strong employment shares. Though smaller in absolute terms, regions in the East of England, such as Norfolk and Suffolk have seen a relatively large proportion of graduates becoming employed in chemical sciences, highlighting the region as a potential area for research-intensive work, with strong connections and knowledge sharing with Cambridge through the Cambridge-Norwich life sciences corridor. Comparing to overall graduate market trends, chemistry graduates are more likely to work in the South East, East of England and North West than other graduates.

Figure 24. Proportion of chemistry graduates working in chemical sciences industries by location of work



The University Spinout Landscape

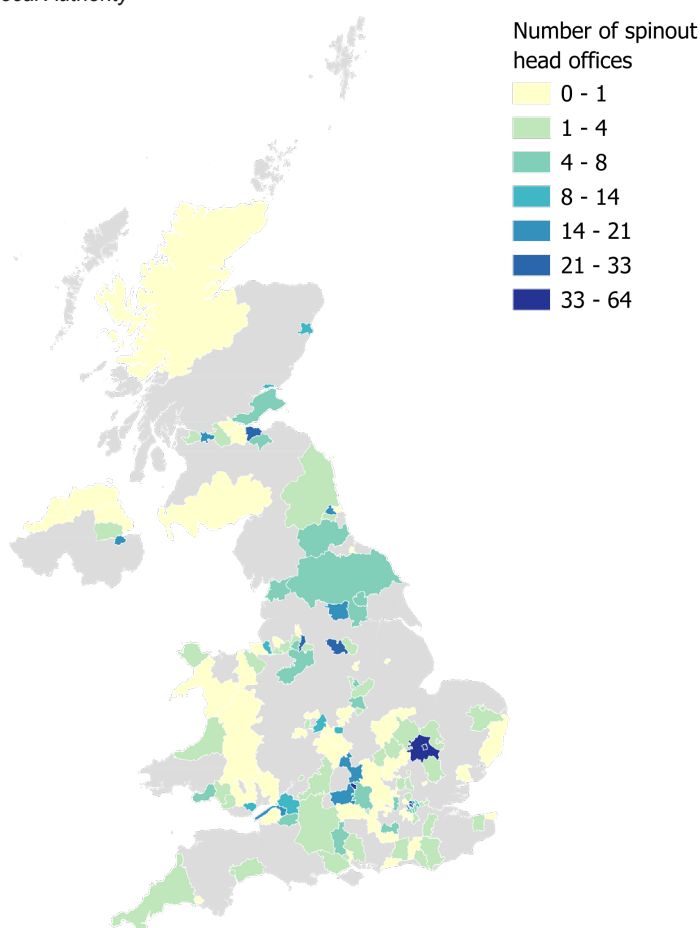
Graduate flows provide one lens on how chemistry capability supports economic activity in place. Another is the commercialisation pipeline, particularly the extent to which chemistry-related research is translated into new firms, products and services through university spinouts.

Using Beahurst data, 949 active chemistry-related spinouts have been identified. Prior to 2024, the number of active chemistry-related spinouts had risen steadily over two decades. However, these have been declining as a share of the wider spinout base.

This reflects both the plateauing of chemistry-related spinouts in recent years and the rapid growth of software, data and electronics spinouts since around 2012.

Around 74% of chemistry-related spinouts are at seed or venture stage and are therefore more likely to remain geographically concentrated in their early phases of growth. As a result, the geography of spinouts provides an insight into the location of chemistry research capability, commercialisation support and early-stage innovation ecosystems.

Figure 25. Locations of spinout head offices by Local Authority



Geographically, this pattern aligns closely with the graduate base, with higher numbers of spinouts associated with Cambridge, Durham, parts of the North West and Tees Valley. This suggests that spinout activity is shaped not only by the presence of research excellence, but also by the surrounding ecosystem needed to support translation into commercial activity. The geography of spinouts therefore points to where chemistry is not only being discovered and taught, but also where there is early evidence of commercialisation. For places, this matters because early-stage spinouts can act as a mechanism through which upstream research generates local economic benefits over time, provided there is sufficient local capacity to support scale-up, including specialist finance, lab and production space, and experienced operators. Where spinout activity is weaker relative to the size of the academic base, this may indicate barriers in translation rather than a lack of research strength, or where there is less focus or capacity on commercialisation.

The Economic Value Landscape

Employment and GVA are largely correlated, although some areas produce disproportionately higher economic value, with production-intensive sectors driving economic value in place.

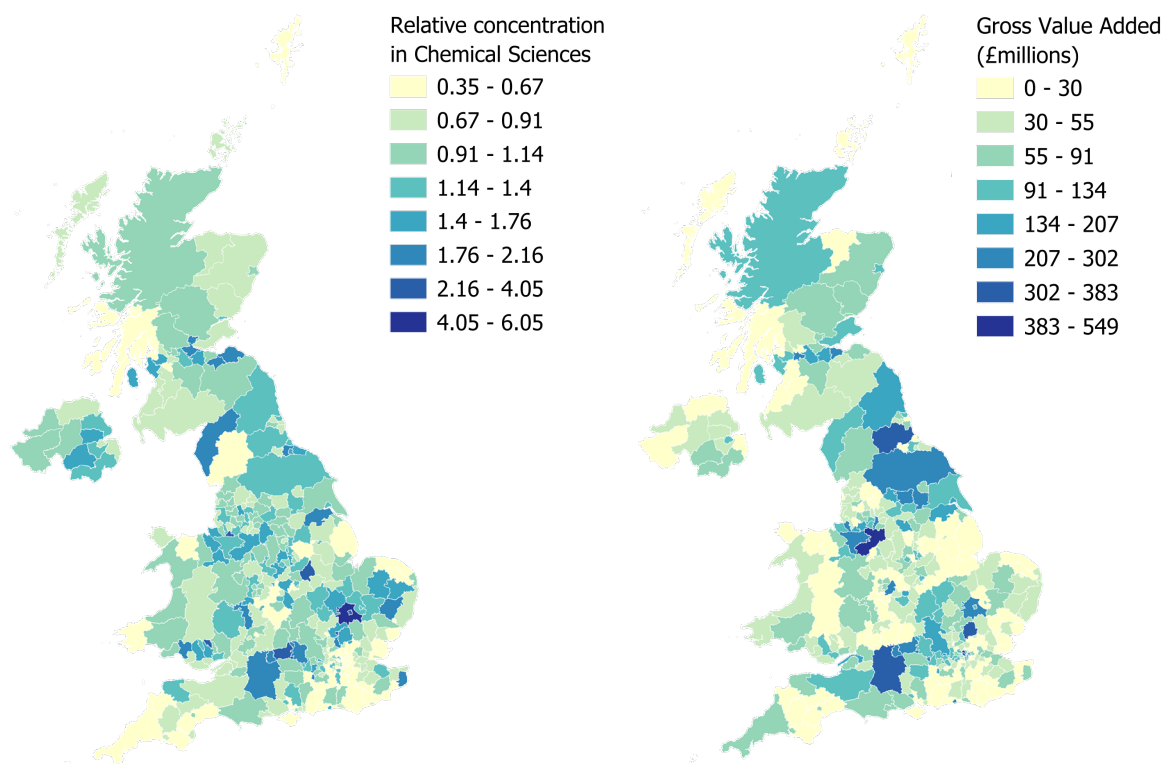
The analysis in this section excludes secondary teachers and higher education staff due to the differing methodology and data availability. Therefore the chemistry-using workforce in this section is defined as those identified by the SIC/SOC framework (see definitions section on page 6) only.

The chemistry-using workforce is widely distributed across the UK in absolute terms, but there are clear regional concentrations of activity. The Location Quotient map (Figure 26) highlights areas with a high relative concentration of the chemistry-using workforce, showing where the sector is particularly important to local labour markets, such as Cambridge and the Thames Valley.

This pattern is broadly reflected in Gross Value Added (GVA). However, some areas generate higher economic value than their employment concentration alone would suggest. Examples include Cheshire and Warrington (home to Alderley Park and AstraZeneca's manufacturing site in Macclesfield) and Durham (with Thomas Swan and INEOS).

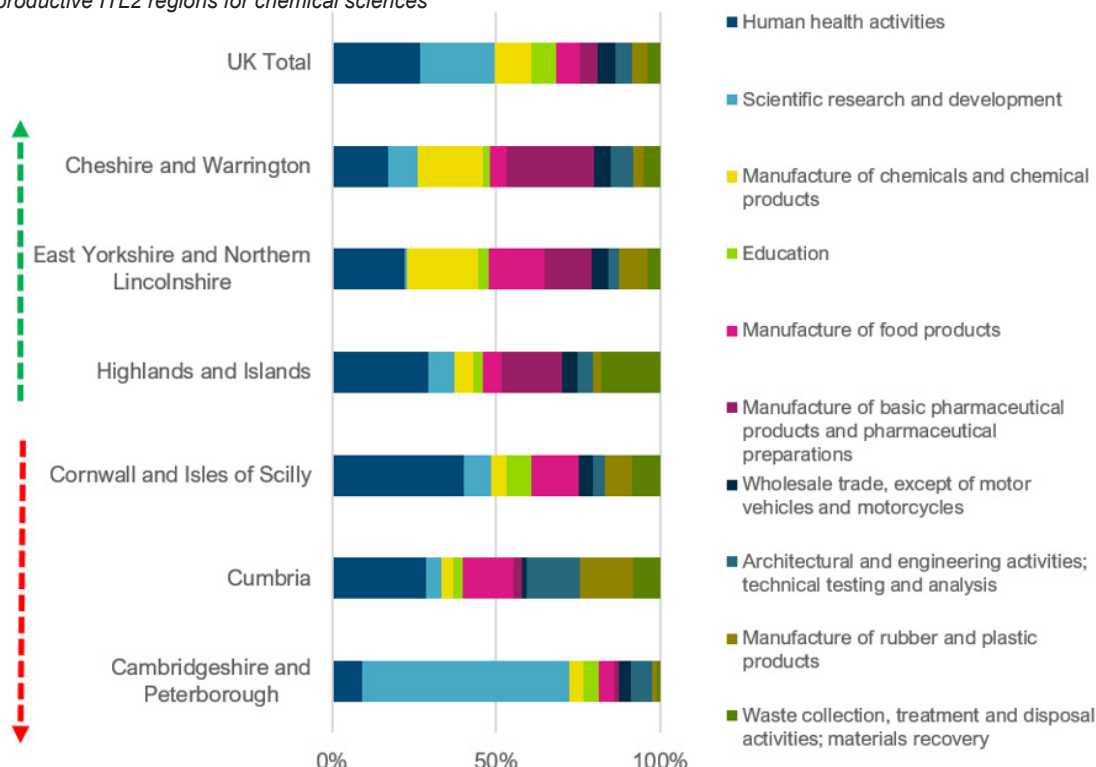
This reflects the nature of GVA as a measure of economic output. Areas with a strong presence of production-intensive activities, such as pharmaceuticals and chemicals manufacturing, tend to generate higher GVA per job. By contrast, research-intensive but lower-output activities do not always translate into high measured economic value using traditional metrics. This means using GVA figures alone risks undervaluing or missing more research-focused, upstream activity vital for production.

Figure 26. Employment Location Quotients and Gross Value Added by Local Authority



Looking at a broader regional level allows us to consider wider economic ecosystems. Figure 27 on the next page shows the three ITL2 regions with the highest and lowest GVA per worker in the chemistry-using workforce. Each region shows the breakdown of which sectors employ the most chemistry-using professionals, across the top 10 highest employing 2-digit SICs. In general, the chart shows that regions with the highest chemical science productivity (measured by GVA per worker) have a stronger concentration of the chemistry-using workforce in the manufacture of chemicals and pharmaceuticals, whilst regions with lower productivity are less production-oriented, with greater employment in sectors such as human health activities or scientific research and development.

Figure 27. Share of the chemistry-using workforce across top employing sub-sectors, for the most and least productive ITL2 regions for chemical sciences



The Cambridgeshire and Peterborough data highlights an important feature of how economic value is measured and realised.

Cambridge is a historic centre of excellence in research, with a world-renowned university and a strong employment hub for the chemical sciences, both for the current workforce and through attracting and retaining a relatively high proportion of chemistry graduates. An overwhelming proportion of total chemical sciences employment is concentrated in scientific research and development activity, reflecting the region's strength in discovery, innovation and knowledge creation.

However, as highlighted, traditional productivity measures such as GVA tend to capture economic output where production, manufacturing or large-scale commercial activity takes place, rather than where upstream research and early-stage innovation occurs. As a result, places with significant concentrations of research and pre-commercial activity can appear to generate more modest levels of direct economic value than manufacturing-intensive areas, despite playing a critical role in the wider innovation economy. This is not a reflection of low importance or weak impact. Rather, it demonstrates that the economic value generated through research activity is often realised downstream, whether through manufacturing, commercialisation or supply chain activity elsewhere. In practice, this means that whilst Cambridge generates significant research capability and innovation potential, the associated economic value may ultimately be captured in other places where scaling, production and commercial deployment occur.

This therefore raises a broader strategic question for places across the UK. Not simply how to support research excellence, but how to strengthen the pathways through which research activity translates into local economic value, and how to retain this over the long-term. This includes considering how places connect skills, research, industry and innovation activity across the local chemistry ecosystem.

For regions with significant chemistry research or employment activity, understanding their role within the wider value chain is therefore critical. Some places may primarily function as centres of discovery and knowledge creation, others as hubs of manufacturing and commercial scale-up. The challenge (and opportunity) is ensuring these functions are better connected so that the UK captures more of the long-term economic value generated through its chemistry capability.



Chemistry Ecosystems

Integrating the Story

To bring together the different dimensions of chemistry activity explored throughout this report, a typology approach has been used. This provides a way of understanding how different combinations of industrial activity, skills, research and commercialisation shape the role of chemistry in place.

The typologies integrate characteristics of both the local industry base and university system, helping to identify where chemistry activity is concentrated and the form it takes, whether this is driven primarily by industrial production, research and education activity, or a combination of both. In doing so, the approach helps move beyond looking at individual indicators in isolation towards a broader understanding of local chemistry ecosystems and the different pathways through which chemistry contributes to economic activity.

The typology framework categorises places across two broad dimensions:

- **The industry landscape**, using four indicators: scale (employment and GVA), productivity (GVA per worker) and employment share.
- **The university landscape**, using three indicators: enrolments, postgraduate share and spinouts.

This creates a structure for understanding the different types of chemistry activity taking place across the UK and how these interact locally. The analysis has been aggregated at ITL2 level, balancing data availability with ecosystem coverage. Areas were identified as being above or below the 75th percentile for each indicator.

Using this approach, four broad types of chemistry ecosystem were identified, reflecting different combinations of industrial activity, research capability and economic scale. Within this, two of the typologies were further subdivided to distinguish places with particularly strong economic scale or productivity characteristics.

The map on the next page illustrates how these typologies are spread across the UK. Following this, the section presents a case study to illustrate each category.

Figure 28. The Four Typologies with 2 sub-categories

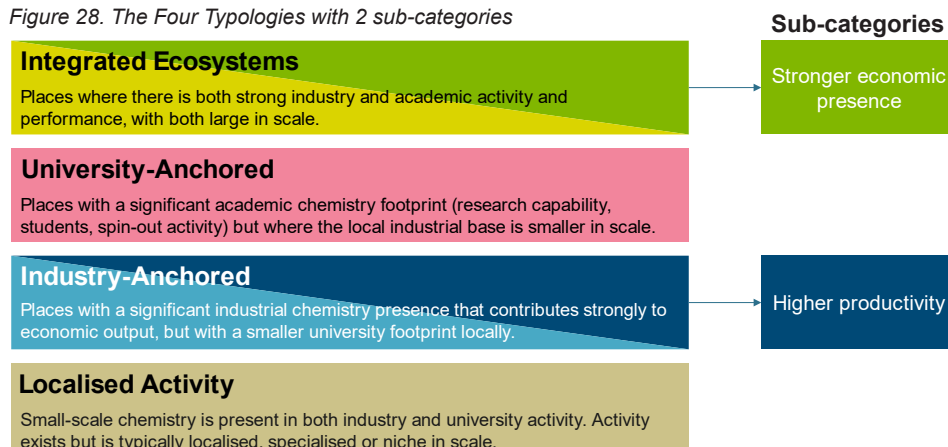
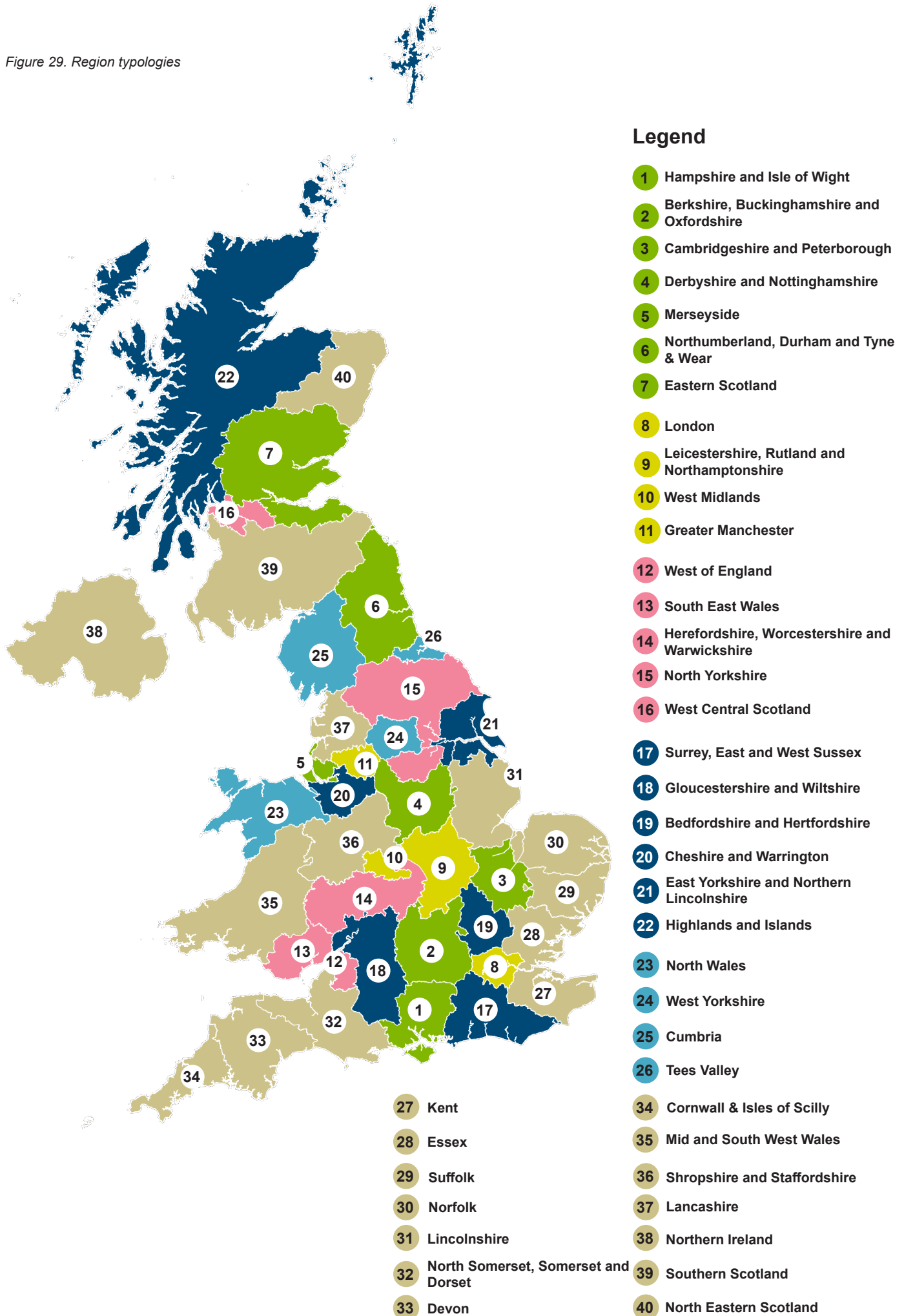


Figure 29. Region typologies



Integrated Ecosystems, Stronger Economic Presence | Spotlight on Merseyside

Places where there is both strong industry and academic activity and performance which are large in scale and highly concentrated.

Merseyside brings together a strong and high value local industry with a leading university landscape providing new graduates and research outcomes.

Merseyside has a long-established and relatively concentrated chemical science sector, with the bar chart showing performance consistently at or above the 75th percentile benchmark.

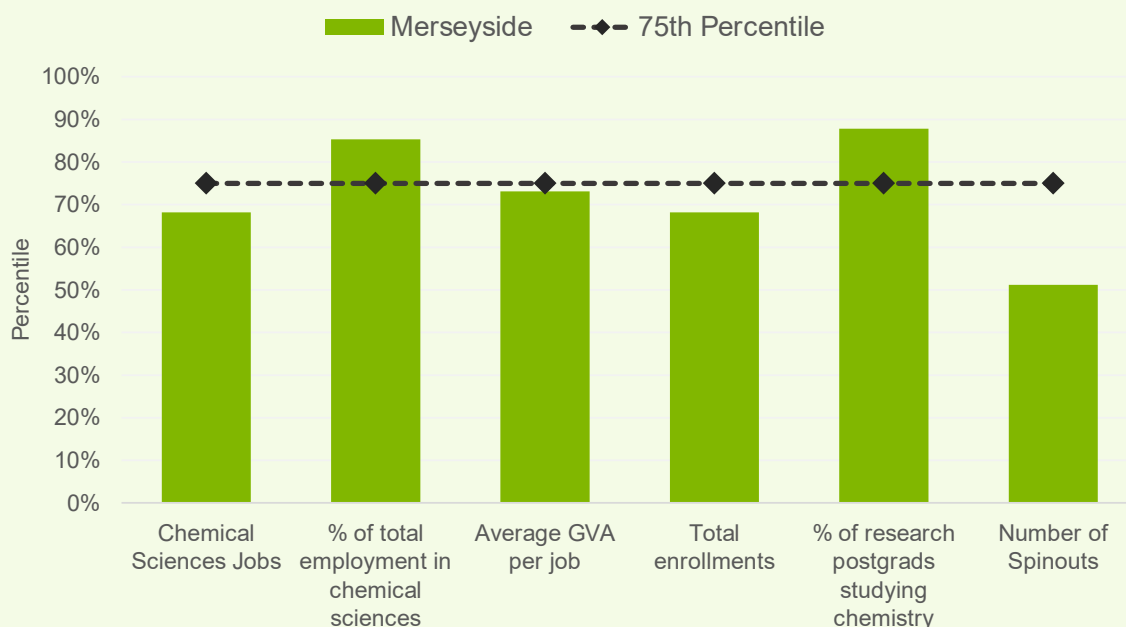
Employment of 7,300 is slightly below the threshold but it accounts for a high share (1.07%), highlighting that the sector is concentrated in the region and plays an important role within the local economy.

The sector is **anchored by major firms such as Unilever's Port Sunlight site**, which remains a cornerstone of the local chemical sciences landscape, **CSL Seqens**, a final chemicals producer and **Bristol Myers Squibb**, alongside a diverse supply chain spanning specialty chemicals, consumer products and pharmaceuticals. The combination of heritage manufacturing and modern innovation supports Merseyside's continued strength in chemistry intensive industries.

Universities are a critical asset, with the **University of Liverpool** and **Liverpool John Moores University** delivering chemistry, materials and life sciences research, and high-skilled graduates with industry collaboration. A notable example is the **long-standing partnership between the University of Liverpool and Unilever**, which dates back to 1919, reflecting over a century of collaboration. More recently, this relationship has included joint research initiatives and the establishment of the Materials Innovation Factory, co-developed to accelerate innovation in advanced materials, digital chemistry and sustainable product development. This collaboration exemplifies the close integration between academia and industry in the region, supporting both research translation and skills development.

What next for Merseyside? The structure of the sector reflects a combination of industrial heritage and growing innovation capacity. With most indicators at or above the 75th percentile, Merseyside is well positioned to expand further in sustainable chemicals and life sciences and innovation-led manufacturing, taking a leading role in driving forward national government engagement through its importance to key IS-8 sectors.

Regional performance against typology indicators



All Integrated Ecosystems, Stronger Economic Presence Regions | Spotlight on Merseyside

Regional employment and University assets

 Liverpool John Moores University

 The University of Liverpool

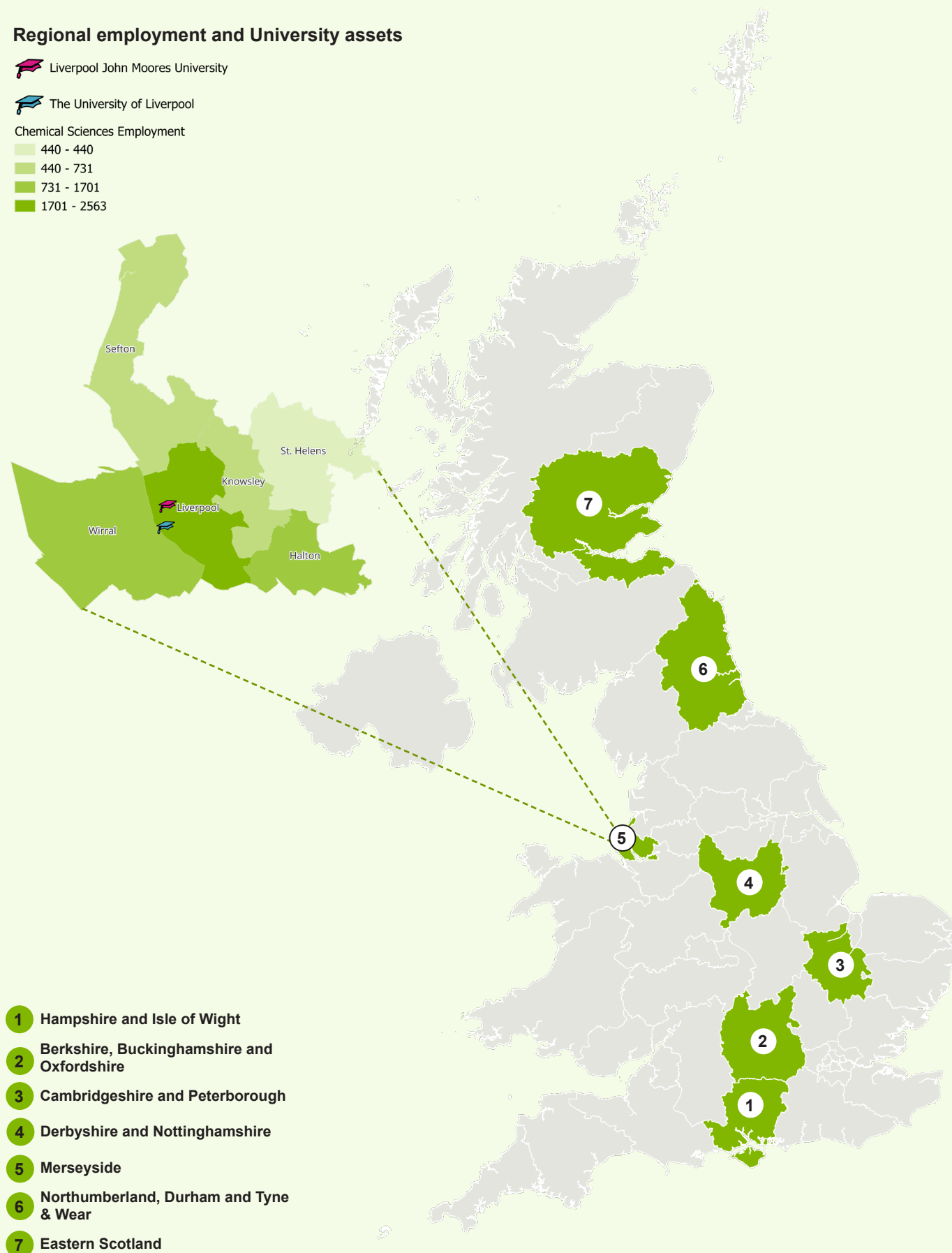
Chemical Sciences Employment

440 - 440

440 - 731

731 - 1701

1701 - 2563



Integrated Ecosystems I

Spotlight on Leicestershire, Rutland and Northamptonshire

Places where there is both strong industry and academic activity and performance, with both large in scale.

Leicestershire, Rutland and Northamptonshire fall into the group characterised by a strong university landscape and an industry base which is large in absolute size, compared to other regions, but which may be less prominent locally as it makes up a smaller share of total employment and is, on average, lower in the economic value generated per job.

Leicestershire, Rutland and Northamptonshire **demonstrates a broad and relatively well-balanced chemical science sector**, with several indicators at or above the 75th percentile benchmark. **Employment at 8,100 exceeds the benchmark, as does the number of enrolments**, highlighting that the standout feature across the industry and university landscape is the scale of activity.

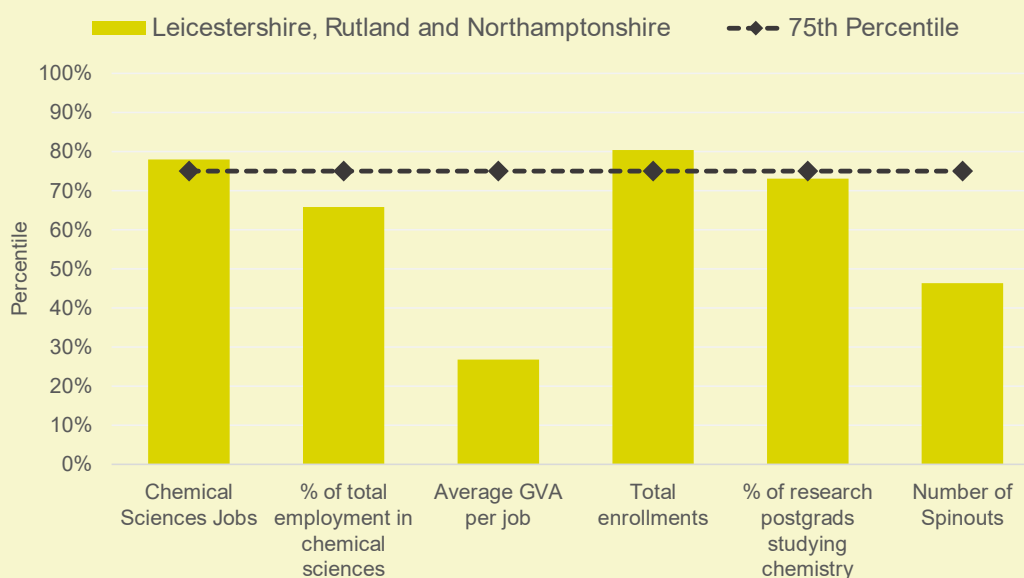
The sector is supported by strengths in **food manufacturing, pharmaceuticals and applied life sciences, with firms such as Samworth Brothers and 3M** contributing to steady demand for chemistry skills. Large domestic employers such as Samworth Brothers generate sustained demand for chemistry skills in food formulation, processing and quality assurance, whilst multinational firms such as 3M support applied chemical and materials capabilities across manufacturing and engineering. Together, these activities point to a sector characterised by practical, process-oriented innovation embedded within production environments.

University indicators are relatively strong, with **chemistry enrolments above the 75th percentile** and postgraduate share close to it, **though spinout activity is below**.

Loughborough University is a global leader in materials science and engineering, and **University of Leicester** provides a strong pipeline of graduates and undertakes research in chemistry, materials and engineering. **De Montfort University** in Leicester also contributes to the regional chemical science ecosystem, offering applied chemistry courses such as pharmaceutical and forensic science. Together, these support workforce development, and collaboration with local firms on practical research projects. The structure of the sector reflects a diverse, application-driven base, where innovation is closely linked to manufacturing and product development rather than frontier research commercialisation.

What next for Leicestershire, Rutland and Northamptonshire? With several indicators already at or above the 75th percentile, future growth is likely to come from scaling applied innovation in food chemistry, advanced materials and manufacturing technologies, as well as strengthening pathways from research to commercialisation.

Regional performance against typology indicators



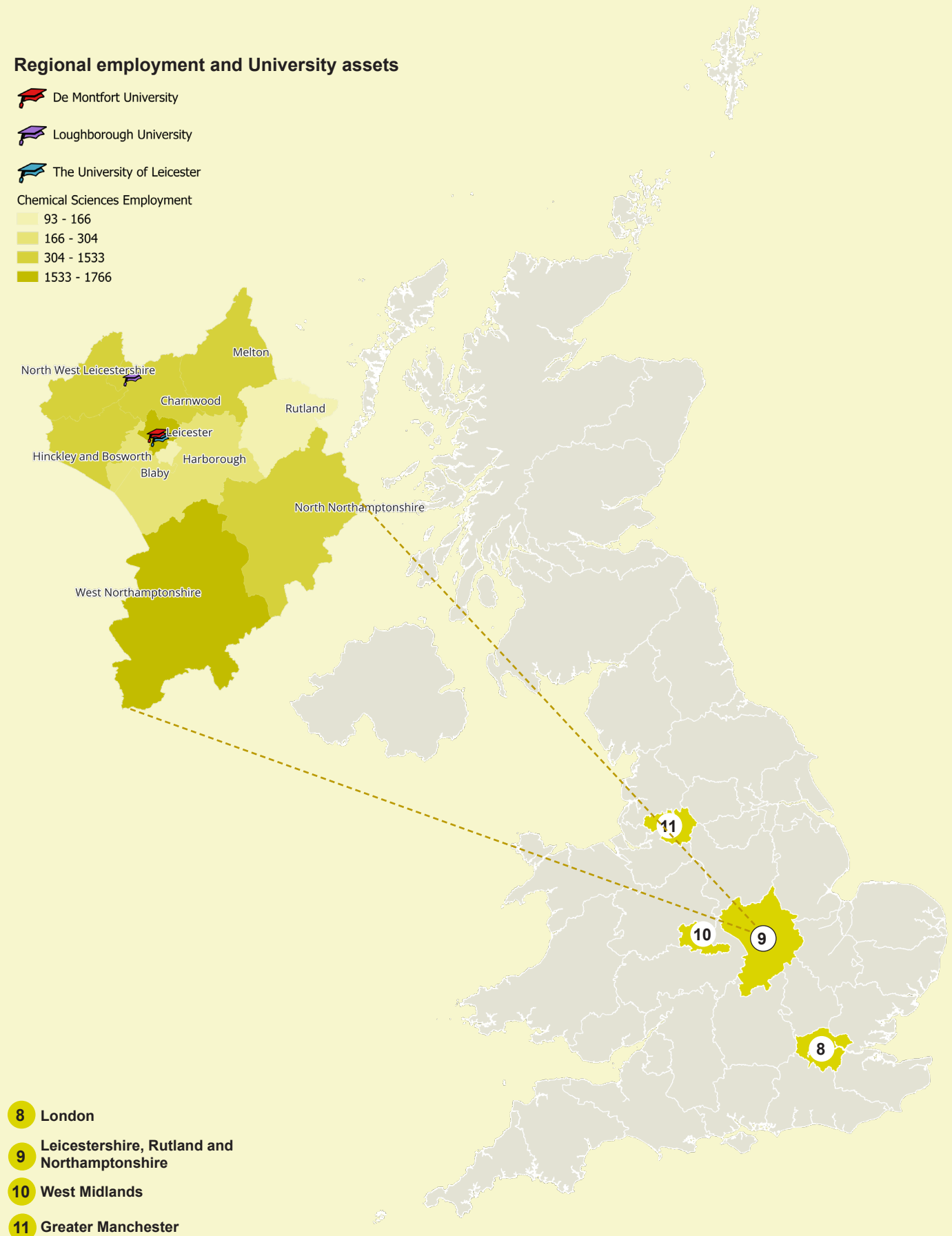
All Integrated Ecosystem Regions | Spotlight on Leicestershire, Rutland and Northamptonshire

Regional employment and University assets

-  De Montfort University
-  Loughborough University
-  The University of Leicester

Chemical Sciences Employment

-  93 - 166
-  166 - 304
-  304 - 1533
-  1533 - 1766



University Anchored I Spotlight on West Central Scotland

Places with a significant academic chemistry footprint (research capability, students, spinout activity) but where the local industrial base is smaller in scale.

West Central Scotland falls into the group characterised by its performance across university metrics. Whilst industry activity is also present across this group, it is not at a scale which sets it apart from other UK regions, and these places do not enter the top quartile on any of the industry indicators. These are areas where we see at least one of: a large pipeline of graduates, many spinouts or chemistry accounting for a high share of PhD research activity.

West Central Scotland's chemical science sector reflects a **large, industrially rooted cluster that has evolved into a significant centre for manufacturing, chemicals production and applied research**. The bar chart shows strong performance consistently across economic indicators, **above the median for employment (with 6,300 jobs) and economic value**, highlighting the presence of core industrial activity. This is not however at the scale of employment or economic contribution as other regions.

The sector is **anchored by major multinational firms including INEOS, Evonik and GSK**, alongside a **well-established supply chain** spanning polymers, industrial chemicals and life sciences. This industrial base supports a broad employment footprint and contributes to spillovers into adjacent advanced manufacturing sectors. All of this is **greatly complemented by a dense supply chain of specialist manufacturers and service firms across Greater Glasgow, supporting downstream manufacturing activity**.

However, the region's chemistry ecosystem is characterised more by the strength of its research and university activity than by the scale of its industrial economy.

Universities play a central role in underpinning the sector, a clear regional strength, with chemistry enrolments and postgraduate share comfortably above the 75th percentile. Innovation indicators are more mixed, with spinout activity sitting around the top 25% threshold. The **University of Glasgow, University of Strathclyde** and the **University of the West of Scotland** provide a strong pipeline of high-skilled graduates, alongside leading research in chemical engineering, materials science and industrial chemistry - their collaboration with industry supports both innovation and workforce development.

What next for West Central Scotland? The region's future opportunity lies in strengthening the connections between its research base, graduate pipeline and industrial activity. With strong university capability and established industry partners already in place, there is significant potential to support greater commercialisation, scale-up and adoption of innovation in areas such as sustainable materials, chemical engineering and industrial decarbonisation.

Regional performance against typology indicators



All University Anchored Regions | Spotlight on West Central Scotland

Regional employment and University assets

 The University of Glasgow

 The University of Strathclyde

 The University of the West of Scotland

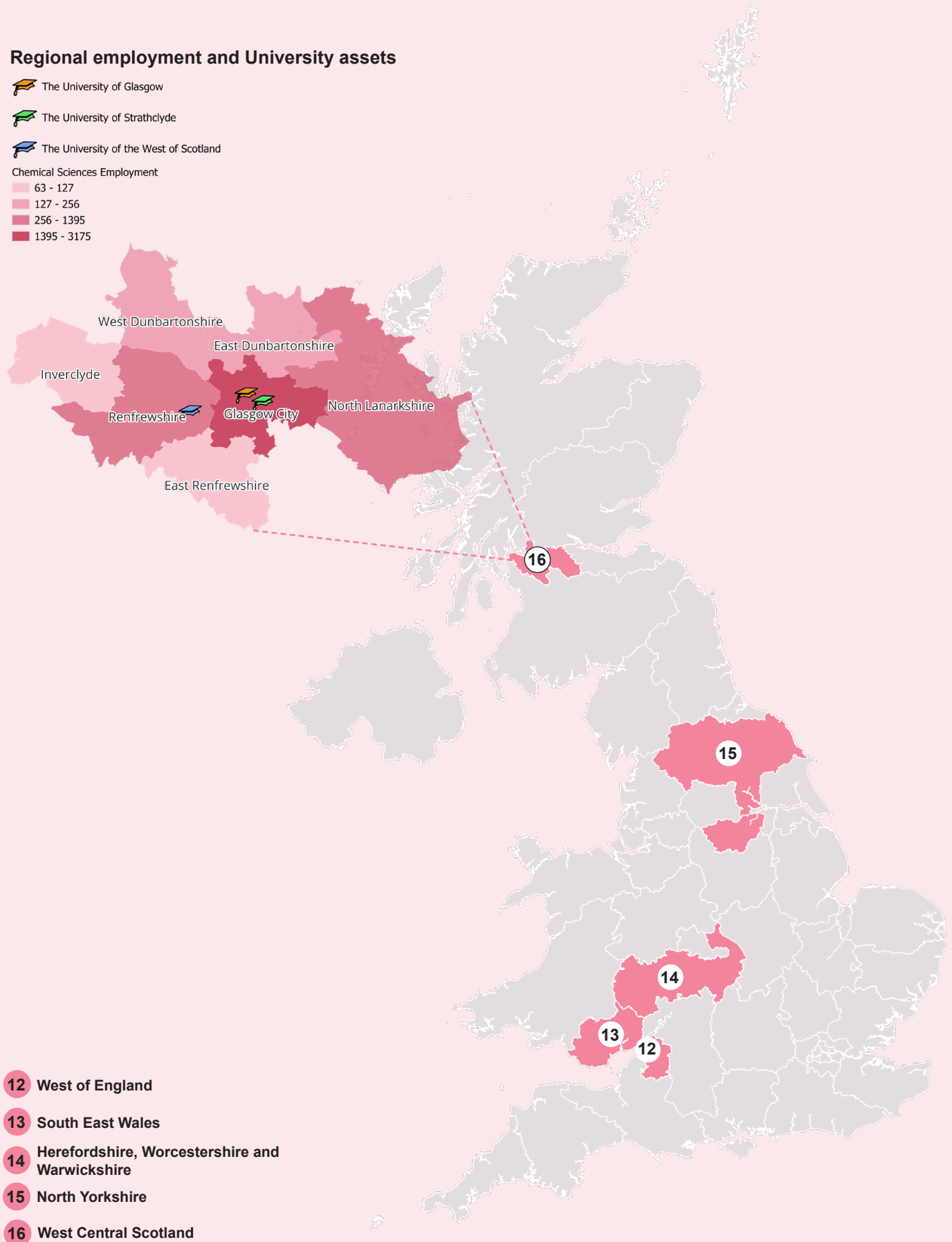
Chemical Sciences Employment

63 - 127

127 - 256

256 - 1395

1395 - 3175



Industry Anchored, Higher Productivity I Spotlight on Gloucestershire and Wiltshire

Places with a significant industrial chemistry presence that contributes strongly to economic output and economic productivity, but with a smaller university footprint locally.

Gloucestershire and Wiltshire is an example of the regions characterised by strong performance across industry metrics, with highly productive activity. These places, which in many cases are areas without large urban centres, do not contain large university systems, though they are often neighbours to regions which do.

Gloucestershire and Wiltshire's chemical science sector **combines relatively strong scale with a more limited local innovation base.** Employment, at 7,800, is in the top quartile of regions, and it **accounts for 1.2% of total employment, one of the highest shares in the UK.**

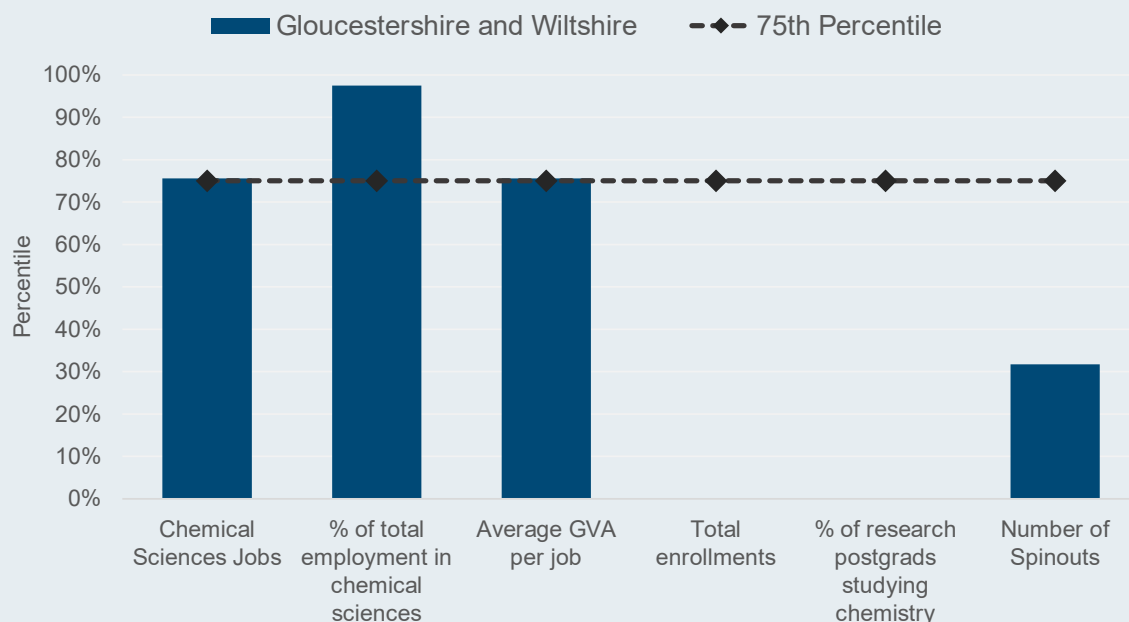
The sector is shaped by **strengths in life sciences, advanced materials and high-specification manufacturing**, including firms such as **Dyson**, alongside specialist companies linked to aerospace and defence supply chains. Wiltshire in particular hosts a concentration of high-value science and engineering activity, anchored by Dyson's Malmesbury campus, which undertakes advanced product development and materials-intensive R&D. Alongside private sector activity, the regional ecosystem is reinforced by public and defence-linked research institutions such as the **Defence Science and Technology Laboratory at Porton Down**, which contributes to high-value scientific capability and demand for specialised skills. However, no chemistry enrolments or postgraduate share mean the area is clearly below the 75th percentile, with limited spinout activity, suggesting **reliance on external skills and innovation inputs.**

Universities are therefore a critical external enabler, with the **University of Bristol, University of Bath** and other nearby institutions providing high-skilled graduates and research collaboration, as opposed to universities native to the region. This **reflects a networked ecosystem model, where innovation and talent are regionally imported rather than generated locally**, supporting the region's productivity despite a limited on-the-ground academic base.

The structure of the sector reflects a **high-value, industry-led cluster** and, as a result, the sector is characterised by strong firm-level innovation leveraging external research and talent pipelines.

What next for Gloucestershire and Wiltshire? Whilst Gloucestershire and Wiltshire exceed the 75th percentile in some areas, future growth will depend on strong connections to skills provision and innovation capacity.

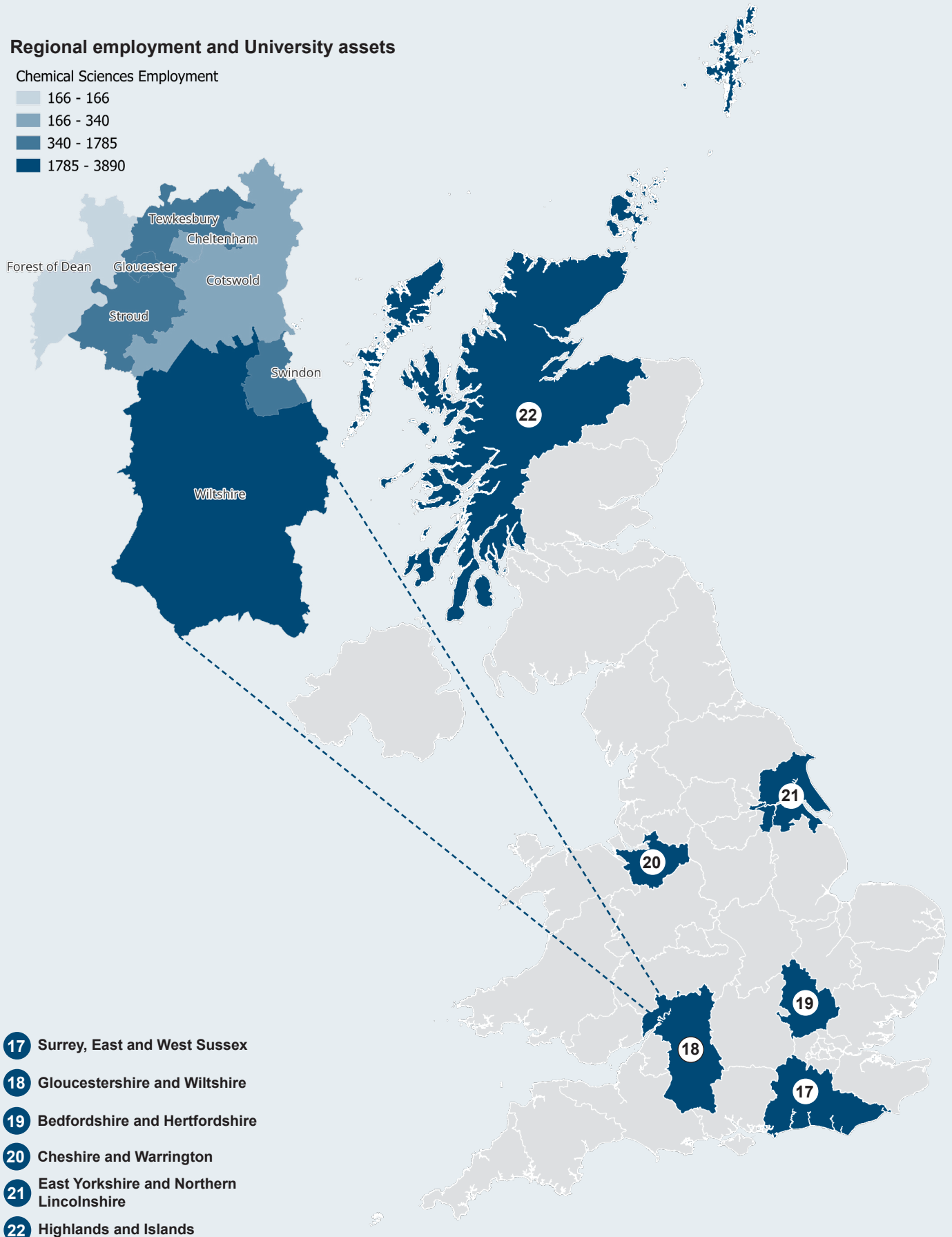
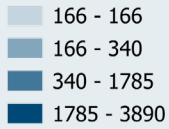
Regional performance against typology indicators



All Industry Anchored, Higher Productivity Regions | Spotlight on Gloucestershire and Wiltshire

Regional employment and University assets

Chemical Sciences Employment



Industry Anchored I Spotlight on North Wales

Places with a significant industrial chemistry presence that contributes strongly to economic output, but with a smaller university footprint locally.

North Wales is part of the group of places which are characterised by a local industry that is large in size and/or large in the share of local employment it accounts for, but which generates lower economic value. Many of these places have longstanding industrial strengths and may have experienced deindustrialisation across these, or faced challenges modernising. In these places, including North Wales, university activity is low across the key metrics.

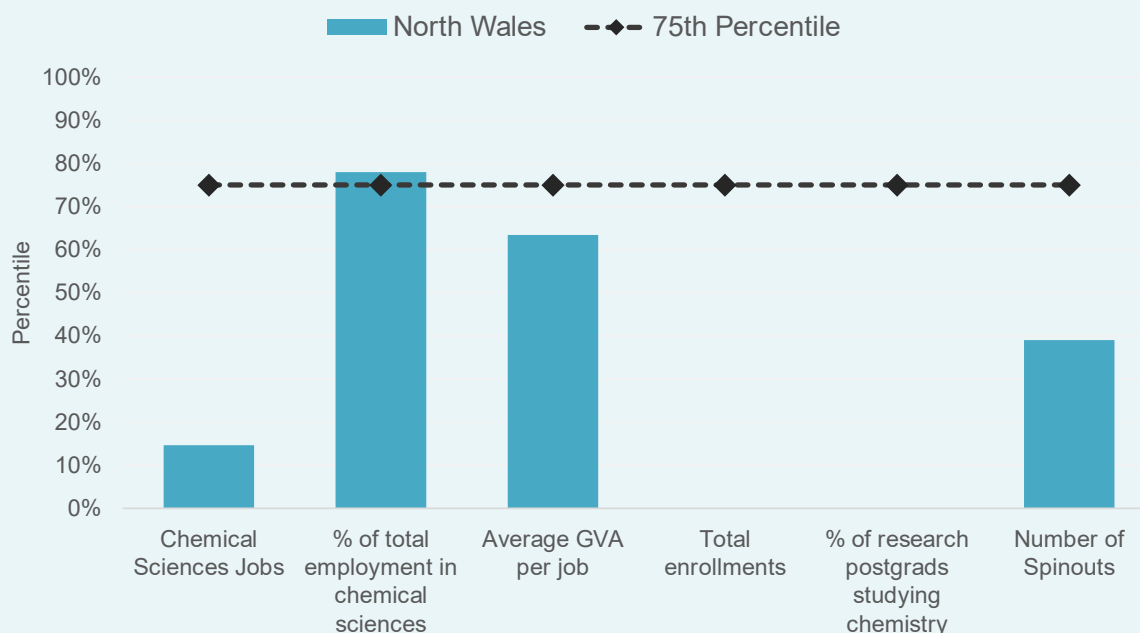
North Wales has a relatively small and uneven chemical science base. Small in the absolute sense, with 3,000 employed, but this does **account for a relatively high share of local employment** (0.98%), which assigns the region to this grouping. Estimated GVA per job is not in the top quartile but, at £81,600 it is a **high value sector in a region which lags behind national productivity performance.**

The sector is concentrated in **advanced manufacturing and chemicals processing, likely integrated with cross-border supply chains with North West England**, effectively functioning as part of a wider regional ecosystem rather than a standalone cluster. Firms such as **Siemens Healthineers**, a major global manufacturing and R&D site for diagnostic reagents, and other specialist manufacturers provide important anchoring activity, but the ecosystem remains relatively small. Siemens Healthineers' Llanberis site plays a central anchoring role, manufacturing diagnostic reagents, with the site also undertaking R&D activity linked to laboratory diagnostics, strengthening North Wales' position in applied chemical and biomedical sciences. The university landscape is limited, with no chemistry enrolments or postgraduate share and modest spinout activity, all well below the 75th percentile.

The structure of the sector reflects a **small, supply-chain-oriented economy, shaped by its proximity to larger industrial centres in North West England.**

What next for North Wales? With most indicators below the 75th percentile, growth opportunities lie in deepening cross-border collaboration, strengthening local skills provision and targeting focused areas such as sustainable manufacturing and environmental chemistry, where smaller-scale, specialised activity can be competitive.

Regional performance against typology indicators



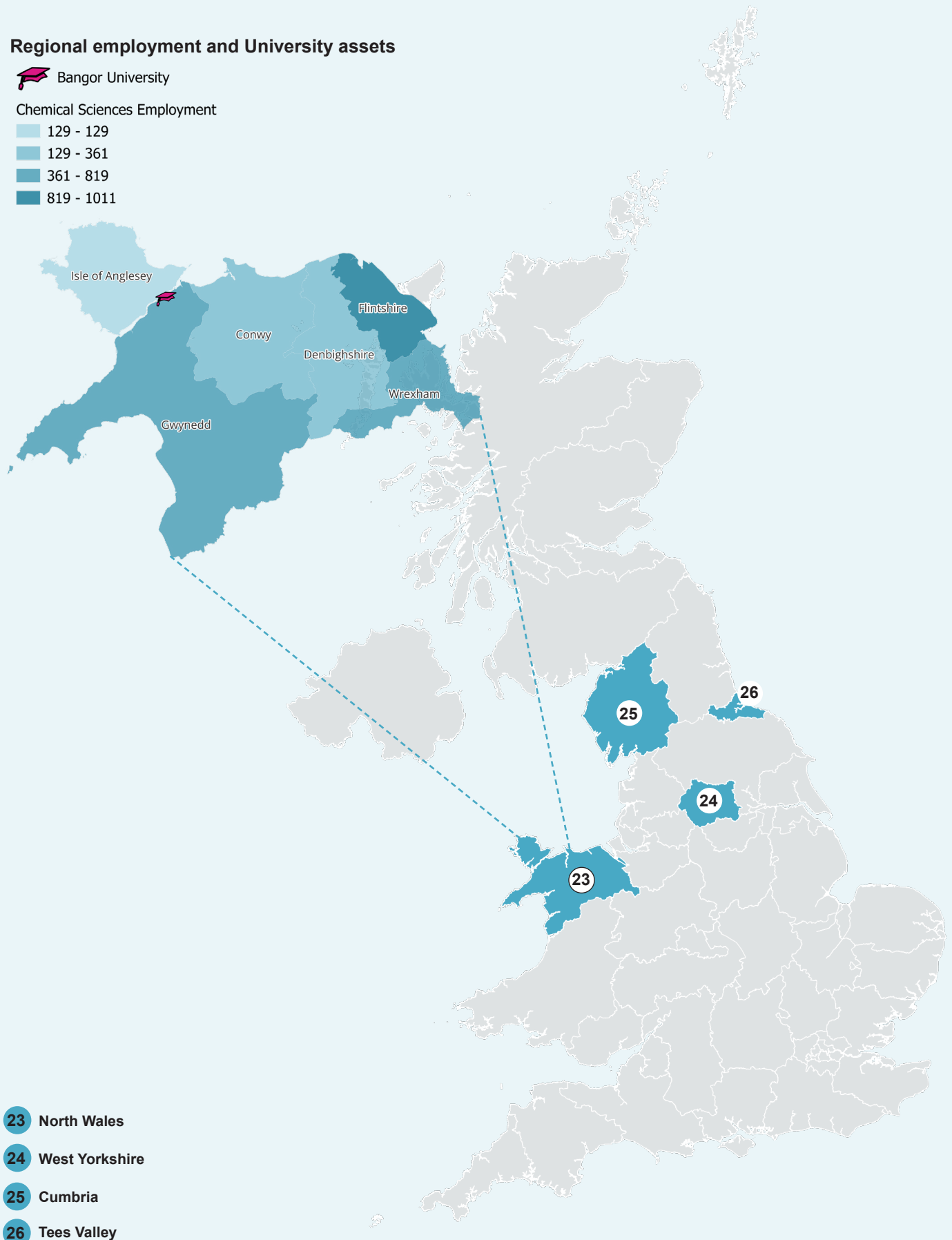
All Industry Anchored Regions I Spotlight on North Wales

Regional employment and University assets

 Bangor University

Chemical Sciences Employment

-  129 - 129
-  129 - 361
-  361 - 819
-  819 - 1011



Localised Activity I Spotlight on Northern Ireland

Small-scale chemistry presence in both industry and university activity. Activity exists but is typically localised, specialised or niche in scale.

Northern Ireland falls into the group largest in member numbers, where chemistry activity across employment and the university landscape is present, but does not enter the 75th percentile against the typology indicators. These are areas where activity is smaller in scale and lower in its intensity relative to other parts of the UK. Activity in these areas is more likely to be small and highly localised.

Northern Ireland's chemical science sector has evolved from a modest industrial base into a highly specialised, innovation-led cluster. **Whilst it employs close to the 75th percentile with 7,200 people**, it lacks the scale and the petrochemical heritage seen in other parts of the UK. The region has however built a **strong base and reputation in pharmaceuticals, diagnostics and advanced materials**. Today, it is part of **Northern Ireland's shift from traditional heavy industry to knowledge-based sectors**, supported by strong research capabilities and close industry collaboration. With chemical sciences roles accounting for **0.89% of total employment**, Northern Ireland has high concentrations of chemistry-using workforce in the manufacture of food and pharmaceutical products, with smaller activity in R&D, chemicals manufacturing and education.

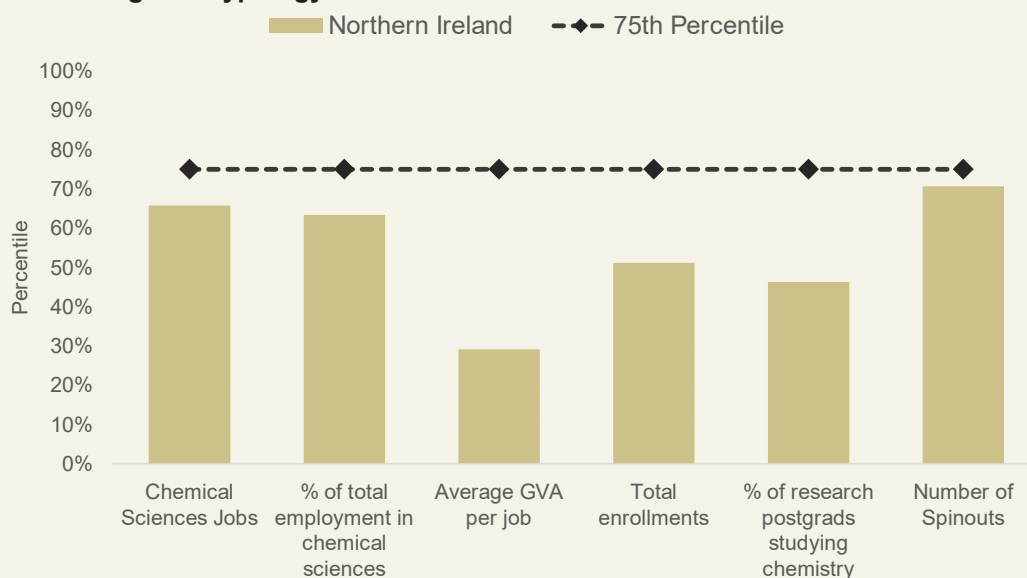
The sector is anchored by a mix of incumbent firms and multinational companies. **Almac Group** has established itself as a world leader in drug development, clinical trial services and commercial manufacturing, exporting to over 160 countries. Alongside it, **Randox** has gained international recognition for its diagnostic technologies, whilst **Norbrook** is a major player in animal health. Multinational firms including **Teva Pharmaceutical Industries** and **Terumo** have also established operations in Larne.

Universities play an important role in supporting the sector. **Queen's University Belfast** and **Ulster University** are the main providers of graduates in chemistry, chemical engineering, and related disciplines and there has been a **combined 26 chemistry-using spinouts produced**. However, only Queen's has a REF submission, with a strong research score of 93%, rated at 3 and 4*, and specialisms in biomedical sciences, advanced materials, and data-driven healthcare. They also maintain links with industry through collaborative projects and knowledge transfer initiatives.

Overall, chemical sciences in Northern Ireland are **characterised by strong links to industries like life sciences** and a reliance on research and skills rather than scale. Its development reflects broader changes in the economy, with growth focused on advanced manufacturing and knowledge-based industries rather than traditional heavy chemical production.

What next for Northern Ireland? Northern Ireland's focus should be on scaling more niche activities and utilising its strong industry links to leverage further collaboration across academic and industrial players in the sector.

Regional performance against typology indicators



All Localised Activity Regions I Spotlight on Northern Ireland

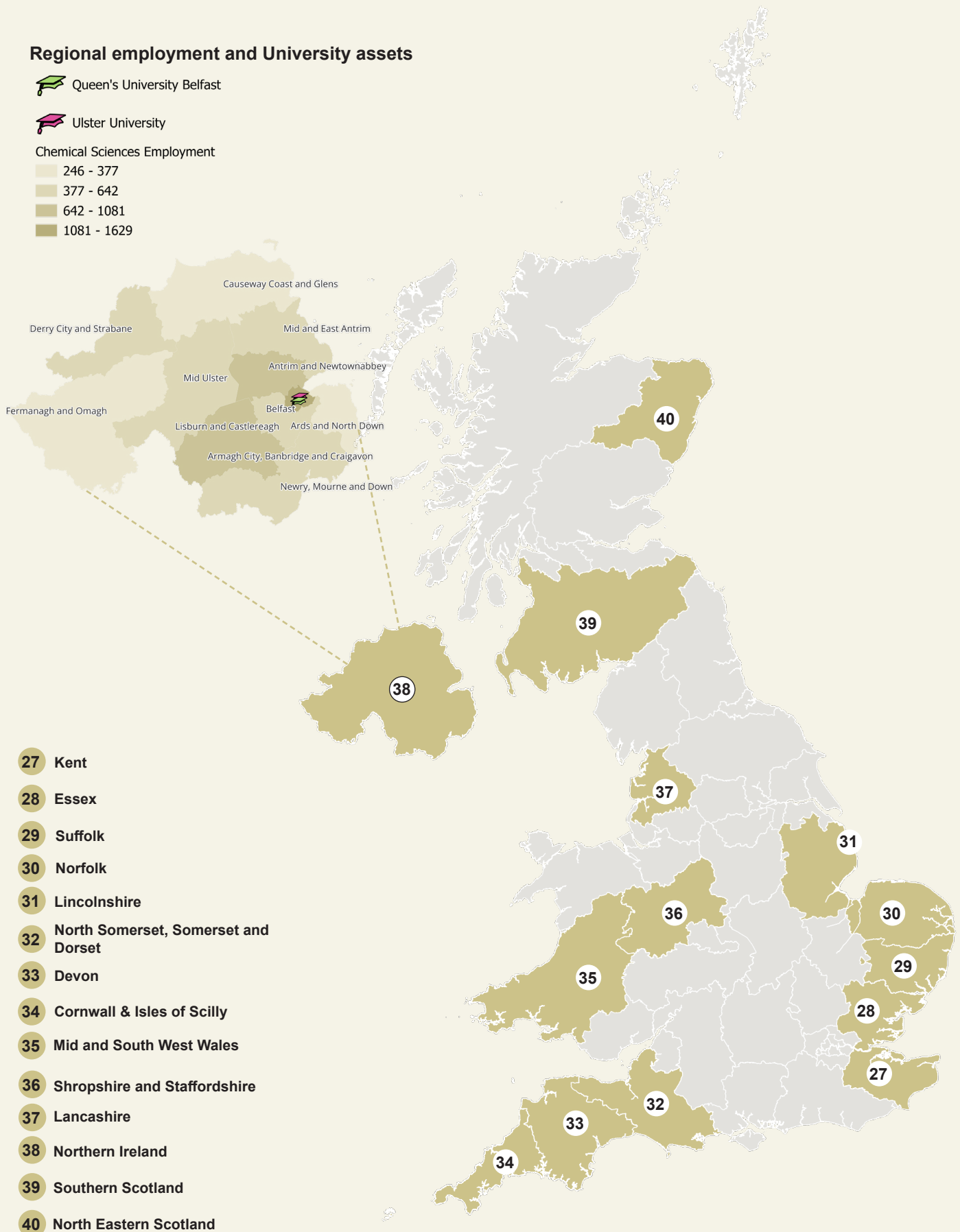
Regional employment and University assets

 Queen's University Belfast

 Ulster University

Chemical Sciences Employment

-  246 - 377
-  377 - 642
-  642 - 1081
-  1081 - 1629



08 Conclusion

The report sets out an evidence base, framework and shared foundation for understanding how, what and where chemistry capability sits in the UK economy. Vitrally, it makes chemistry and chemical sciences activity visible, with a clear illustration of where we are now. The analysis shows the nuances of local and regional chemistry activity, and the respective opportunities and challenges that chemistry and the chemical sciences face across the country, whether that is driven by industry, universities or both.

This visibility is vital to inform and support local leaders decision making. Local Growth Plans and place-led research and innovation investment will only be effective where leaders can see clearly their local chemistry assets, types of activities, dependencies and gaps. This report provides that.

It is clear that chemistry is a strategic enabler of national missions and priority sectors. The evidence shows that chemistry is foundational across the economy, and especially central to IS-8 sectors. If we care about growth, resilience, net zero and economic outcomes, we must therefore also plan for the chemistry skills, research and production base that enables them.

To do so, we must address the chemistry value capture challenge. The UK has significant strengths in chemistry research, skills and innovation, but stronger pathways are needed to translate these into commercial activity, scale-up and long-term economic value. Different places contribute to this process in different ways, with some acting as centres of research and talent generation, and others as hubs of production and deployment. As outlined by the Cambridgeshire and Peterborough case study, there is also a data challenge, with traditional economic measures such as GVA not capturing the importance of upstream research activity. This creates a risk that strategically important capability is underestimated in policy and investment decisions.

Calls to action

This report shows that chemistry is a foundational capability embedded across the UK economy, but one that is not always well understood, visible or connected into economic decision-making. The opportunity now is to strengthen the pathways through which chemistry capability, from research and skills through to production and commercialisation, translates into economic value, resilience and growth.

Different places and institutions play different roles within this ecosystem. The following actions set out how government, industry, universities and the chemistry community can better support visibility, alignment and value capture across the UK. By doing so, we can solidify chemistry's position within the economy, driving innovation, resilience and economic growth across the whole of the UK.

1 For the chemistry community, the priority is making chemistry visible and legible within local economic decision-making.

Use this evidence to inform approaches to raising chemistry's visibility with priority local stakeholders. This could be supported by tailored briefings for local growth plan teams, taking part in roundtables with employers and universities, and a lightweight evidence pack that links chemistry activity to local priorities (skills, facilities, investment propositions and resilience needs). The aim is to encourage clearer consideration of chemistry within local priorities.

2 For chemistry businesses, the priority is sending clear demand signals into the system and strengthening pathways to translation and scale-up.

This includes articulating demand not only for skills and infrastructure, but also the industrial challenges and market opportunities where chemistry capability is required to support competitiveness, resilience, national capability and growth. As noted, many chemistry businesses are coping with difficult market conditions, exacerbated by geopolitical factors. Where possible, they can and should take the opportunity to help shape the conditions for commercialisation and adoption by working with universities, local partners and government to connect research activity to real-world applications, scale-up opportunities and production capability. The role businesses play will vary by place. In production-intensive economies, this may focus on manufacturing competitiveness, supply chains and industrial decarbonisation. In research-intensive places, industry can play a particularly important role in supporting translational collaboration, placements, testbeds and early-stage commercialisation activity that helps retain talent and capture greater local economic value over time.

3 For universities, the priority is strengthening the connection between research, talent and economic outcomes, whilst balancing their role within both global and place-based ecosystems.

Universities operate simultaneously within international research networks, national innovation systems and local economies. This means balancing globally competitive research excellence and advancing knowledge, with a growing expectation to support local growth, innovation and skills priorities. In practice, this includes aligning course provision and placement activity with industry demand, supporting translational and commercialisation capability, and strengthening the pathways through which research and innovation translate into scale-up activity, production and long-term economic value. The role universities play will vary by place, with some acting primarily as research anchors and talent generators, whilst others may play a more direct role in commercialisation, industrial collaboration and ecosystem development.

4 For devolved nations and devolved leaders across the UK, the priority is embedding chemistry within economic strategy and delivery.

In Scotland, Wales and Northern Ireland, this means recognising chemistry as an enabling capability within national approaches to industrial strategy, innovation and skills. In England's increasingly devolved landscape, combined and local authorities should ensure chemistry is properly reflected within local growth plans, investment priorities and innovation strategies. Using typologies such as those set out in this report can help places understand the role chemistry plays within their economy, whether as a research, production or mixed ecosystem, and identify where stronger links between research, skills, industry and commercialisation may be needed. Priorities will vary accordingly, from improving translational pathways and local value capture in research-intensive places, to strengthening competitiveness, resilience and supply chains in production-intensive economies.

5 For national government, the core task is alignment, inclusion and value capture.

The Industrial Strategy, S&T priorities, education, skills and place-based policy must recognise chemistry as a core capability and enabling infrastructure for UK resilience and IS-8 delivery. This includes strengthening incentives and pathways for UK-based scale-up and production and enabling place-based institutions to invest in the chemistry and chemical science skills, facilities and collaboration mechanisms that underpin priority sectors. It also requires decision frameworks that recognise upstream research value, so that reliance on traditional GVA alone does not hide capability in research-intensive places or allow less visible institutions to be overlooked. National missions and their local delivery depend on the critical supply of input materials and chemicals. Resilience in supply chains and the role of domestic capability are key considerations alongside growth.

Appendix

Technical report, methodology and data

This section outlines the approach used to estimate the economic impact of chemistry, as well as the data sources used, assumptions and limitations.

The information from this report draws upon multiple sources to understand the economic impact of chemistry. The vast majority of these are freely available using public datasets such as the Office for National Statistics (ONS) or Higher Education Statistics Agency (HESA). The table below highlights each of the sources used in this report and how they were used.

Table 3. Economic Impact of Chemistry sources and use

Source	Provider	Use
Business Register and Employment Survey (BRES) 2023	ONS & NISRA	Understand the total employment in chemical sciences nationally and locally by workplace.
Annual Population Survey (APS) 2021-2023	ONS	Bespoke request used to understand the breakdown of occupations in each SIC industry.
Annual Survey of Hours and Earnings (ASHE), 2023	ONS	Calculating the mean wages of employees by SOC.
Regional gross value added by industry, 2023	ONS	GVA by sector to estimate the direct economic impact of chemical sciences, both by nation and local authority.
Green Book multipliers	HMT's Green Book	Multipliers provided by the Green Book to estimate indirect and induced impacts of chemical sciences to the UK economy.
School workforce/teacher census, 2023	DfE, StatsWales, Scottish Gov	Understand the total number of secondary chemistry teachers in GB, not easily captured by SOC codes.
Academic staff by academic cost centre, 2023	HESA	Total number of chemistry teaching staff in higher education.
HESA Student record and Graduate Outcomes record (2017/18 - 2022/23)	Jisc (purchased)	Bespoke request from the graduate outcomes survey for chemistry graduates with a range of outcome indicators.
HE qualifiers by subject of study 2024/25 (Table 51)	HESA	Total number of students who are awarded an HE qualification during the academic year.
Chemistry spinouts and start-ups 2025	Beauhurst (subscription)	Understand the number of chemistry spinouts, where they come from, activity and locations.

Employment calculation

The chemical sciences are defined using the standard occupational classification (SOC), including four 'core' occupations and an additional 13 'other' occupations that are only considered chemistry-using when employed in a chemistry industry. This means the total employment in chemical sciences is the sum of:

- **Core chemistry occupations in chemistry industries:** Such as biochemists and biomedical scientists in scientific research and development.
- **Core chemistry occupations in non-chemistry industries:** Such as laboratory technicians in healthcare.
- **Other chemistry occupations in chemistry industries:** Such as engineering professionals in the manufacture of pharmaceuticals or chemicals.

The first step in calculating employment in these three groupings is to find the share of core and other chemistry jobs in chemistry and non-chemistry industries. This can be done using a bespoke dataset from the Annual Population Survey which finds the estimated employment by 4-digit SOC in each 4-digit SIC. These proportions are then applied to employment by industry figures from the Business Register and Employment Survey which provides more accurate employment figures at a national and local level.

To calculate chemical sciences employment at a local level, the key assumption applied is that the share of chemistry occupations in each 4-digit SIC locally is equivalent to national shares. The Annual Population Survey has also seen declining sample sizes in recent years, so the approach taken uses the 2021-2023 dataset.

However, the SIC and SOC system does not account for the identification of teaching staff that are chemistry-using at schools and universities. Teachers and academic staff are most likely to be categorised as 'secondary education teaching professionals' or 'higher education teaching professionals' under the SOC system which do not distinguish the subject taught.

In schools, chemistry-using teachers have been identified using the school workforce and teacher censuses in each devolved nation, which provides a breakdown of teachers by subject taught. Chemistry-using teachers have been identified as those who teach either Chemistry or general science, who cover all fields of science. Data on teachers by subject taught is available for England, Scotland and Wales. To estimate the employment in Northern Ireland, the proportion of all teachers which are chemistry-using in Great Britain has been applied to the total in Northern Ireland.

To estimate employment of chemistry-using higher education teaching staff, this report uses public data from the Higher Education Statistics Agency (HESA), which provides employment figures for academic staff by cost centre. Academic staff teaching either chemistry or chemical engineering are classed as chemistry-using.

The teacher census data does come with some limitations. For example, the census only includes teachers at state-funded schools, excluding independent schools, sixth-form colleges or further education establishments, likely underestimating the full number of chemistry-using teachers. The method of data collection by subject also differs, resulting in some teachers categorised as chemistry-using in one devolved nation versus another. Higher education teaching staff by cost centre is only available for the full UK.

Economic contribution and impact

The ONS provides Direct Gross Value Added (GVA) by broad industry groups. The direct contribution therefore can be estimated by applying an estimated proportion of a broad industry group represented by chemical sciences to total GVA. To calculate the proportion of GVA represented by chemical sciences in each industry, the previous Workforce trends and economic impact report applied the share of total employment in each industry represented by chemical sciences. However, this approach assumes that all workers contribute an equal amount to an industry's GVA, so this report builds on the approach by considering mean earnings by occupation, as a benchmark for an individual's contribution to GVA alongside employment in each occupation. These proportions have been calculated for each industry in each devolved nation and local authority, then applied to total GVA to estimate the direct economic contribution of chemical sciences.

The GVA data used in this calculation is in 2023 prices. Industry groupings which GVA is reported as is a broader definition than 4-digit SICs, therefore some modelling is applied to aggregate proportions to match GVA industries.

However, the industry groupings which GVA is reported as varies by the geographic level, resulting in a methodological change between devolved nations and local authority districts. A notable example is in manufacturing industry codes, in which the manufacture of chemicals and pharmaceutical products are aggregated with the manufacture of non-metallic mineral products such as rubber and plastic for local authority districts. Due to the manufacture of non-metallic mineral products having a significantly lower share of employment in chemical sciences and a lower overall GVA per worker, this has resulted in the aggregation of GVA by districts to be less than the devolved nation total.

Devolved nations

CD-CE (19-20): Manufacture of coke, refined petroleum and chemicals

CF (21): Manufacture of pharmaceutical products

22: Manufacture of rubber and plastic products

23: Manufacture of other non-metallic mineral products

District Authorities

CD-CG (19-23):

Manufacture of petroleum, chemicals and other minerals

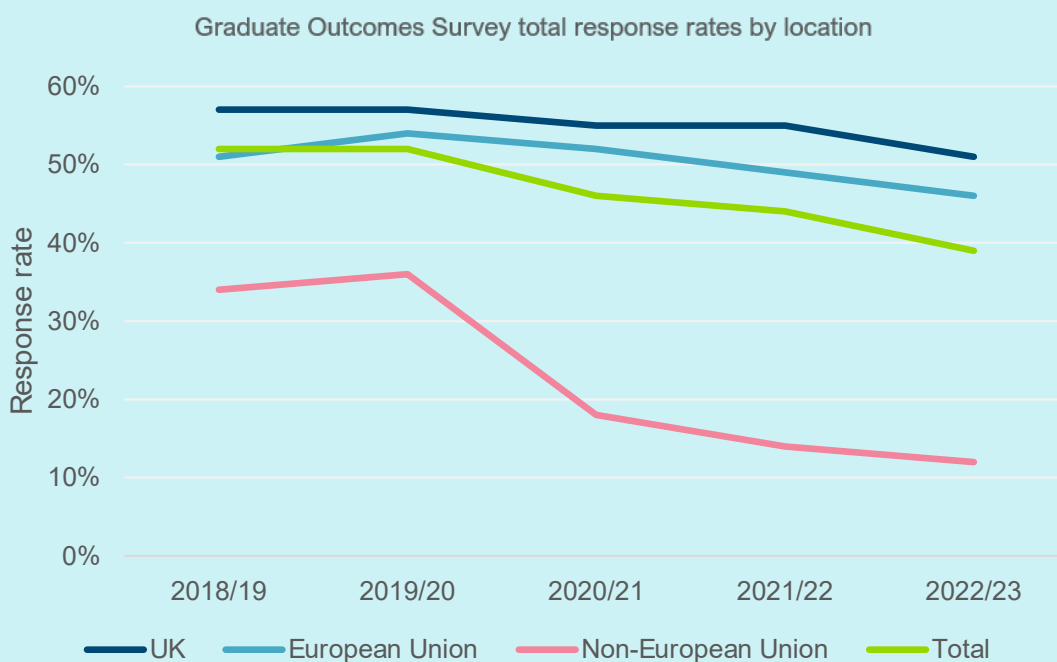
In addition to the direct GVA contribution of chemical sciences, this report also calculates the indirect and induced GVA impacts of chemical sciences using economic multipliers (see Economic Impact: Value, Productivity and Contribution section on definitions). These have been calculated using Metro Dynamics' Input-Output model, which uses the ONS' UK I-O tables that show the structure of the UK economy in terms of interlinkages between industries and products. The Indirect/Induced multipliers are based on 2023 only.

University impact

The Higher Education Statistics Agency (HESA) is a trusted source of higher education data and analysis, providing information on students, staff and universities. To understand graduate diffusion, HESA openly publishes details on the number of students obtaining qualifications by level of qualification, subject taught, and university attended. Graduate outcomes data derive from the Graduate Outcomes Survey, which is conducted 15 months after course completion. However, open-source data from HESA is high-level and does not provide sufficient detail on the industries, occupations, and locations where graduates work. As a result, this report draws upon a bespoke data request from Jisc for chemistry graduates.

The Beahurst platform has been used to understand chemistry-using spinouts from universities. As the chemical sciences definition used earlier is based on occupations, it is not straightforward to translate it into industries where business data is categorised. Therefore, the approach taken to identify chemistry spinouts is to take the chemistry industries in the chemical sciences definition with a high concentration of core chemistry occupations.

The graduate outcomes survey is not a complete representation of all graduates in the UK. The response rate was around 39% for 2022/23 graduates and has seen significant decreases since pre-Covid-19. The graph below shows that response rates are especially low for graduates outside of the UK or European Union.





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