ROYAL SOCIETY OF CHEMISTRY

Chemistry's contribution

Workforce trends and economic impact

About this publication

Science and scientific skills play a critical role in the UK economy and society.

This summary report highlights key findings from "Chemistry's contribution Workforce trends and economic impact". Commissioned by the Royal Society of Chemistry and conducted by Cambridge Econometrics, the study provides evidence on the scale and skills of the UK's chemistry-using workforce and its substantial direct and indirect contribution to the UK economy. The full report is available at **rsc.li/chemistry-workforce**

Action Plan

Our five-point action plan aims to strengthen the chemistry workforce to enable economic recovery from COVID-19.

1. **SME support:** Research intensive SMEs in the chemical sciences have clearly demonstrated that they can operate COVID safe. Government, should consider sector specific conditions when deciding on business or sector closures should there be a second wave. If locked down financial support will be critical to research intensive SMEs to retain talent and ideas within the UK economy and support future economic growth.

2. **Place is important:** Monitoring is required to inform a place based understanding of sector capacity and strategies which support levelling up across the UK.

3. **Chemical science professionals are key to recovery:** Effective collaboration between government and professional and sector bodies is essential to supporting environmental and economic recovery.

4. **Teacher support:** Teachers in the chemical sciences are a diversely and highly skilled workforce. Wider evidence suggests that the most effective teachers have good knowledge of their subject and how to teach it successfuly. High-quality subject specific training and development should be an ongoing entitlement for all teachers, whatever stage they are in their teaching career.

5. **Chemistry knowledge and skills retention:** Chemistry knowledge impacts the generation of an average of £83bn annually for the UK economy. In these challenging times the workforce's professional standards and underpinning knowledge must be retained within the UK economy to support Government's ambitions for R&D and deliver a sustainable green recovery.

Why do we need chemistry to drive economic growth?

Chemistry plays a vital role in the UK economy, in shaping our society and the environment in which we live.

The UK needs a strong chemistry sector that will continue to play this role in the coming years, to help deliver on key health and environmental challenges and to create new jobs..

Skills are important for growth. Skills *improvements* have accounted for one-fifth of UK labour productivity growth in recent decades. But skills *shortages* have a real impact on firms' day-to-day ability to do business.

The report concludes that:

The chemistry-using workforce is a significant contributor to the UK economy, the exchequer and to employment.

The chemistry-using workforce has vast and varied knowledge, skills and abilities which they apply in a wide variety of roles throughout the economy. These skills are not just chemistry-related.

Chemistry-using professionals tend to be highly qualified which leads to greater levels of innovation, higher productivity and therefore economic growth.

The remainder of this summary report provides the evidence for these conclusions which should help policymakers when developing economic, environmental and skills strategies for the UK.

What is a chemistry-using professional?

Chemistry-using professionals encompass a wide range of occupations; from academic chemists in universities and professional chemical scientists in industry, to chemistry teachers in schools and those in sales and marketing roles.

Occupations fall into four distinct groups. The classification of each group does not reflect the level of importance of the occupations or roles themselves, only the extent to which chemistry knowledge is required.

Group A includes occupations where deep chemistry knowledge is of highest importance (academics, professional chemists), while Group D includes those where deep chemistry knowledge is less important, but still a significant component of the role (sales, marketing, some engineering and science professionals).[1]

Table 1 sets out the occupations of chemistry-using professionals and typical job roles, using standard occupational classifications. (A breakdown of the skills, knowledge and abilities that apply to each group are included in the full report).

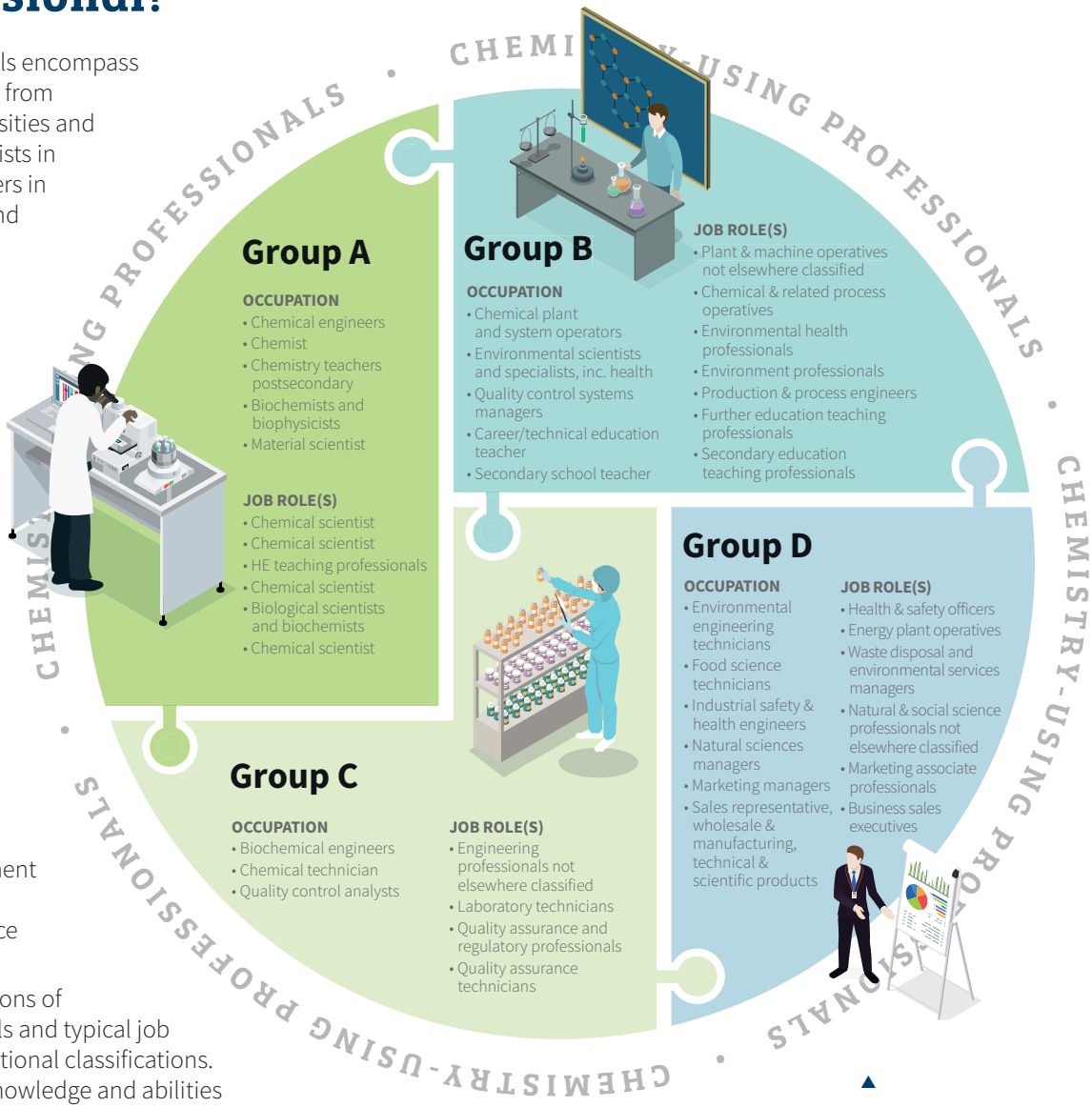


Table 1: Occupations of chemistry-using professionals and typical job roles

[1] For more information on the methodology, please read Chapter 2 of the full report.

Where do chemistry-using professionals work?

In 2019, the total number of chemistry-using professionals in the UK was estimated to be 275,000. This includes

- around 6,000 academic staff
- approximately 41,000 chemistry and general science teachers in education
- about 228,000 others who were in employment.[2]

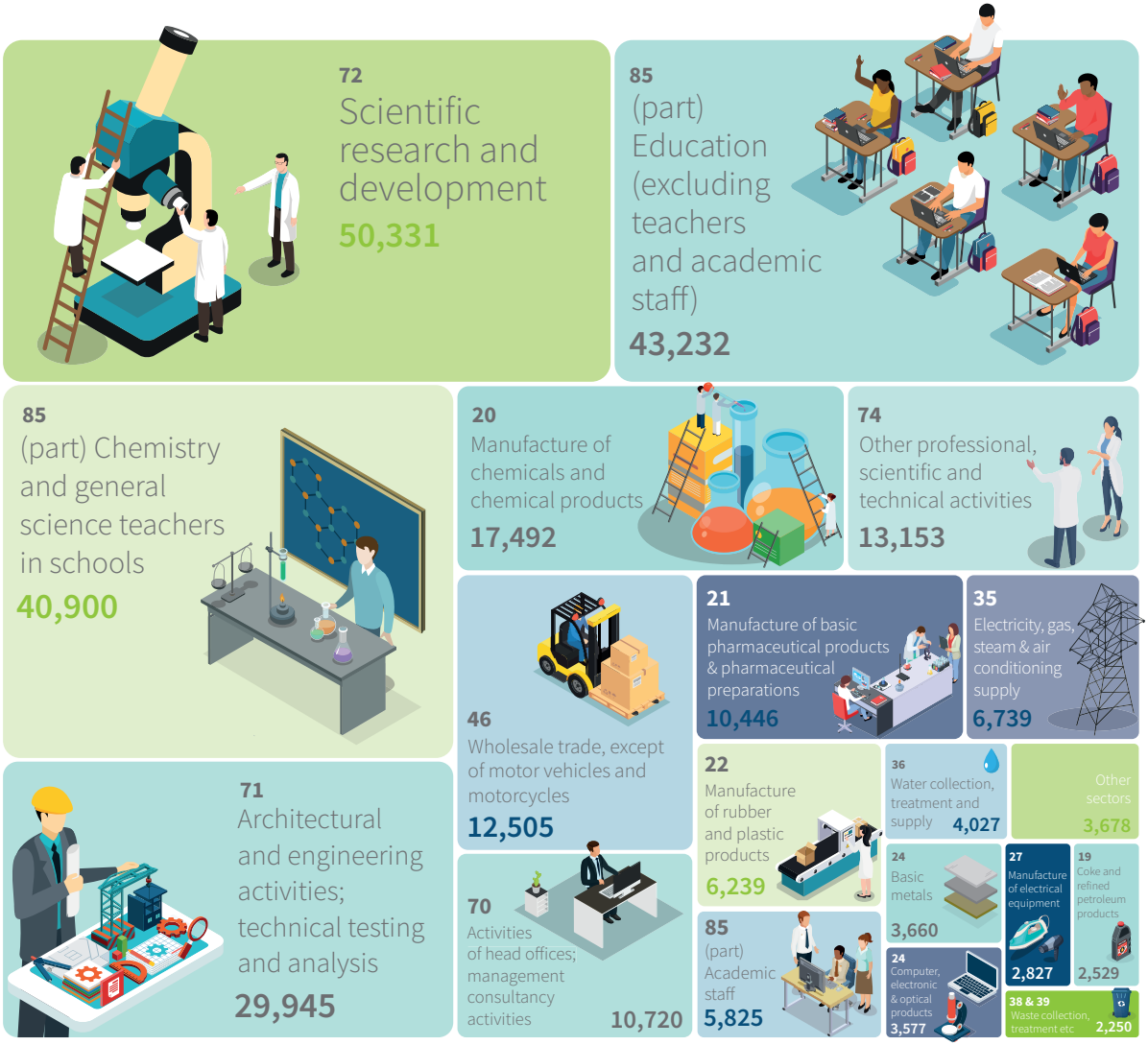


Figure 1: Chemistry-using professionals in each of the main occupational categories in the UK in 2019

[2] Sector split uses ONS Standard Industry classifications - please see the full report for more details.

	2013	2014	2015	2016	2017	2018	2019
Academic staff	4,725	5,210	5,415	5,535	5,625	5,720	5,825
Chemistry and general science teachers in schools	40,300	39,800	39,600	40,200	40,200	40,500	40,900
WFJ/LFS employment totals	226,963	226,471	234,463	222,795	211,096	226,460	228,367
Grand total	**271,988**	**271,481**	**279,478**	**268,530**	**256,921**	**272,680**	**275,092**

Table 2:
Recent trends in the number of chemistry-using professionals in the UK by category

Regions	2013	2014	2015	2016	2017	2018	2019
South East	36,988	38,764	45,748	47,467	39,968	50,658	51,093
London	31,218	26,196	17,409	34,175	32,588	30,091	30,349
North West	41,444	46,520	36,787	36,738	33,382	29,849	30,105
East of England	22,435	30,747	38,507	33,653	23,325	28,649	28,895
Scotland	23,433	23,957	25,445	19,862	24,142	27,618	27,855
South West	20,448	18,707	24,792	17,627	22,872	23,381	23,582
Yorkshire & the Humber	23,763	17,522	20,691	22,901	16,059	21,891	22,079
East Midlands	14,563	18,785	15,960	8,418	25,630	18,550	18,710
West Midlands	22,273	17,203	17,431	19,980	17,061	14,183	14,305
North East	16,133	15,445	13,543	14,814	11,022	12,147	12,251
Wales	14,881	12,758	17,040	6,890	7,690	10,792	10,885
Northern Ireland	4,408	4,877	6,126	6,006	3,182	4,938	4,981

Table 3:
Recent trends in the number of chemistry-using professionals in the UK by region (excludes academic staff and teachers)

How do chemistry-using professionals contribute to the UK economy?

There are three ways in which chemistry-using professionals contribute to the UK's economic activity:

- **direct impact** – economic output through the sectors in which they are employed
- **indirect impact** – supply chain expenditure associated with their work, eg raw materials, IT and other equipment
- **induced impact** – personal expenditure which, in turn, generates further spending.

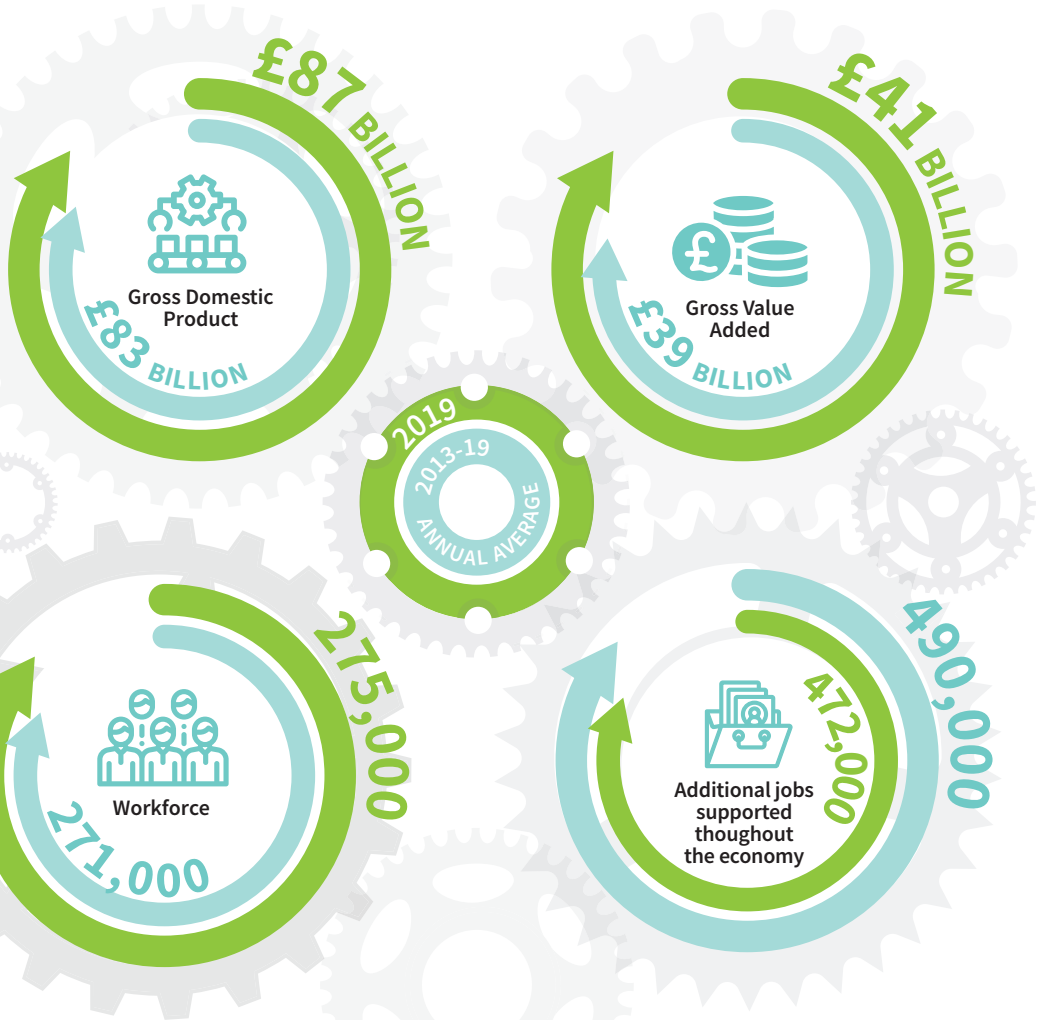


Table 4 sets out chemistry-using professionals' numbers and economic contribution in 2019 and their average annual contribution 2013-19 Figures 2-4, opposite, illustrate the trends.

In 2019, chemistry-using professionals contributed £3.2 billion to the public purse[3]:

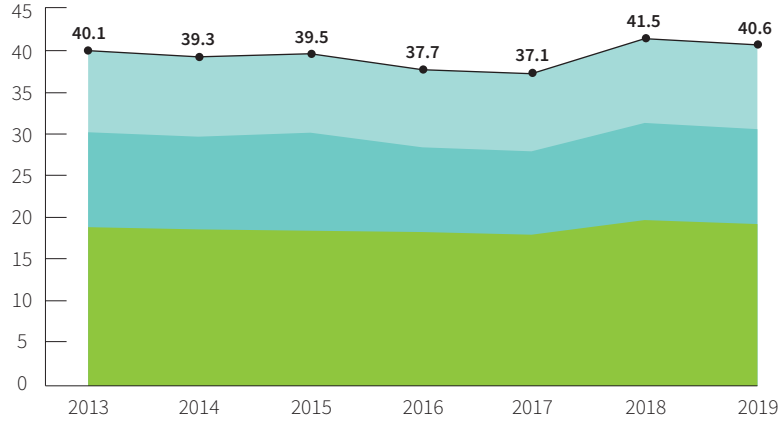
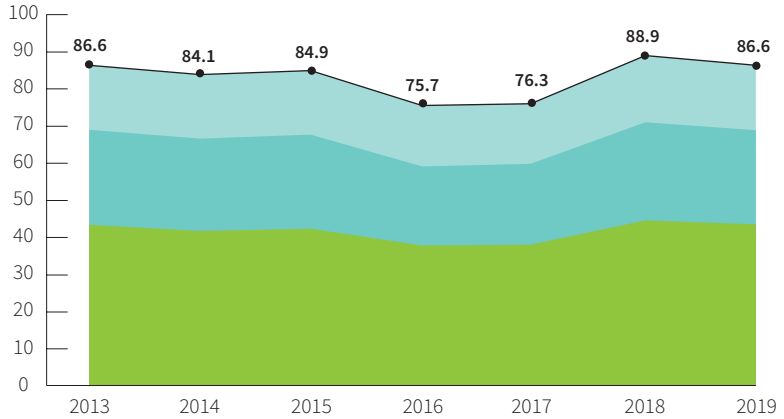


Figure 2:
Impact of chemistry-using professionals on UK GVA (£bn)



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Impact of chemistry-using professionals on UK GDP (£bn)

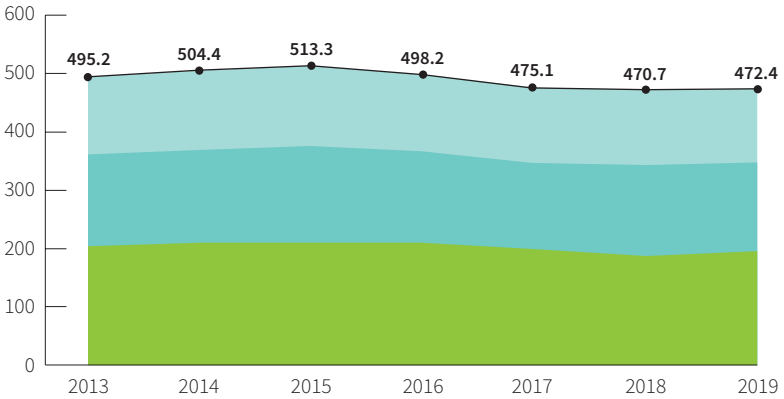


Figure 4:
Impact of chemistry-using professionals on employment ('000s)

[3] Income tax and National Insurance contributions

How do the skills within the chemistry-using occupations impact economic growth?

The suite of evidence available suggests a strong link between, skills, innovation and productivity.

Higher skills are shown to be related to greater levels of innovation, and both are associated with higher productivity and therefore, economic growth. There is also evidence to suggest that those holding higher degrees can have a significant impact on innovation and output.

Chemistry-using professionals are likely to make a significant contribution to innovation and economic growth, both through the nature of the occupations they undertake and because they tend to be highly qualified.

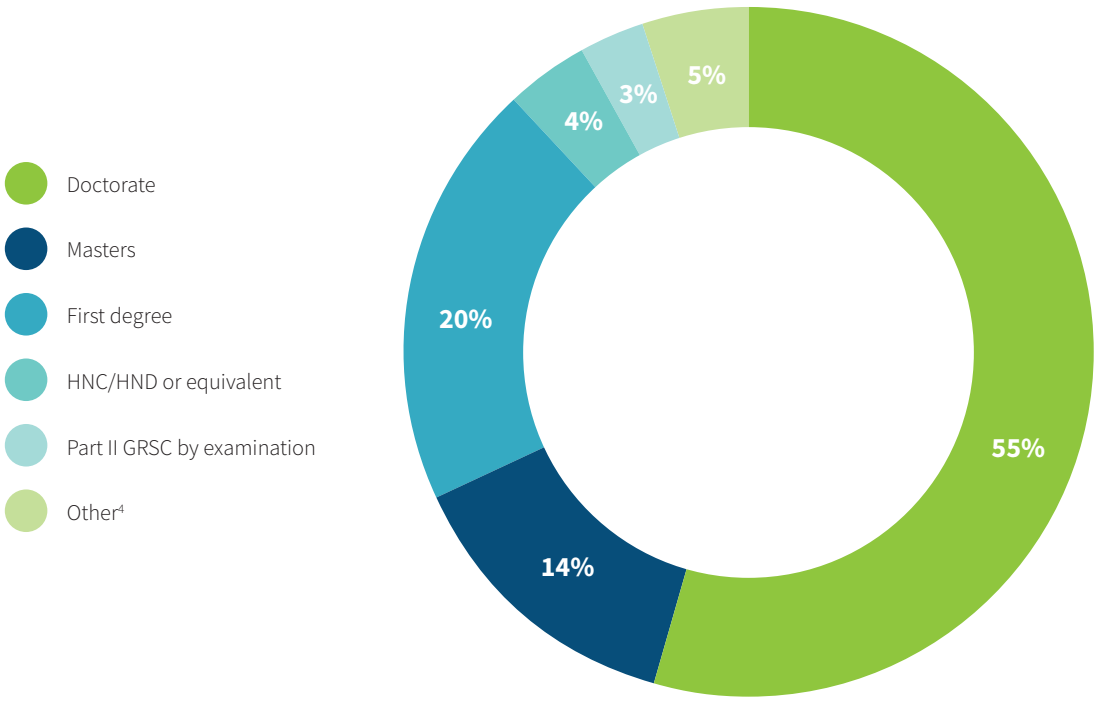


Figure 5:
The breakdown of educational attainment among chemistry-using professionals

It's also worth noting that chemistry-using professionals share several common characteristics that relate to the ability to innovate. These include complex problem solving, critical thinking, coordination and troubleshooting skills.

[4] 2019 RSC Pay and Reward Survey

In summary

The chemistry-using workforce is a significant contributor to the UK economy, the exchequer and to employment.

Official data has been used to make an estimate of the number of chemistry-using professionals in the UK economy. There are estimated to have been 275,000 chemistry- using jobs in the UK in 2019, with a further 425,000 jobs supported by this workforce throughout the UK economy.

The contribution (direct, indirect and induced) of chemistry-using professionals to UK GDP was estimated to be £87 billion in 2019.

The chemistry-using workforce has vast and varied knowledge, skills and abilities which they apply in a wide variety of roles throughout the economy. These skills are not just chemistry-related.

This study has investigated the types of knowledge, skills and abilities that chemistry-using professionals make use of in their everyday work. Through the Group classifications, the report highlights the diversity of job roles that require and use chemistry knowledge.

There is a strong, causal link between skills and innovation which in turn boosts productivity and therefore economic growth. Because of this link, the chemistry-using workforce plays a vital role in boosting the UK economy. This role will remain vital in the years to come. Digital skills are becoming increasingly important across the economy and the chemical sciences are no exception, as highlighted in the RSC's recent Digital Futures report.

Higher skills are shown to be related to greater levels of innovation. Chemistry-using professionals tend to be highly qualified. A first degree or higher is generally (but not always) required for professional, associate professional and technical occupations. Chemistry-using professionals are therefore likely to make a significant contribution to innovation and, in turn, productivity and economic growth.

Introducing our new perspectives series

In a world where global challenges and advances in technology bring both uncertainty and new possibilities, the chemical sciences have a critical role to play. But what will that role be? How can we maximise the impact we make across academia, industry, government and education? And what actions should we take to create a stronger, more vibrant culture for research that helps enable new discoveries?

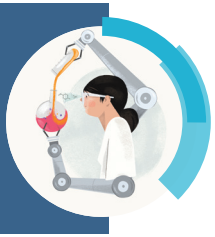
Our perspectives series addresses these questions through four lenses: talent, discovery, sustainability and research culture. Drawing together insights and sharp opinion, our goal is to increase understanding and inform debate – putting the chemical sciences at the heart of the big issues the world is facing.

Talent

Talent is the lifeblood of the chemical sciences. But how do we inspire, nurture, promote and protect it? Where will we find the chemical scientists of the future? And what action is required to ensure we give everyone the greatest opportunity to make a positive difference?

Discovery

Chemistry is core to advances across every facet of human life. But where do the greatest opportunities lie? How will technology and the digital era shape the science we create? And what steps should we take to ensure that curiosity-driven research continues to unlock new opportunities in unexpected ways?



Sustainability

Our planet faces critical challenges – from plastics polluting the oceans, to the urgent need to find more sustainable resources. But where will new solutions come from? How can we achieve global collaboration to address the big issues? And where can the chemical sciences deliver the biggest impacts?

Research Culture

Globally, scientific research in academia and industry fuels both progress and innovation. But how do we create more inclusive, diverse and vibrant environments for research, that lead to better, more open science? And how should we recognise the breadth and diversity of the people, contributions and achievements that enable new discoveries?

Find out more at **www.rsc.org/new-perspectives**

About us

The Royal Society of Chemistry

We are an international organisation connecting chemical scientists with each other, with other scientists, and with society as a whole.

Founded in 1841 and based in London, UK, we have an international membership of over 50,000. We use the surplus from our global publishing and knowledge business to give thousands of chemical scientists the support and resources required to make vital advances in chemical knowledge. We develop, recognise and celebrate professional capabilities, and we bring people together to spark new ideas and new partnerships. We support teachers to inspire future generations of scientists, and we speak up to influence the people making decisions that affect us all. We are a catalyst for the chemistry that enriches our world.

Cambridge Econometrics

CE is an economic consultancy with offices in Cambridge, Brussels and Budapest. We specialise in economic modelling and data analysis for policy assessment. We offer in-depth knowledge and expertise in local, national and international labour market and economic impact modelling, and have an international reputation for providing rigorous, insightful and policy-relevant analysis.

We began life in the late 1970s as a spin-off from the University of Cambridge, taking forward the work carried out in the Cambridge Growth Project founded by Nobel Prize winner Richard Stone. Since 2005 CE has been a trading subsidiary of a charity, the Cambridge Trust for New Thinking in Economics; the charity upholds the independence of the company.

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