Royal Society of Chemistry Budget Representation

September 2024

With over 60,000 members and a knowledge business that spans the globe, the RSC is the UK's professional body for chemical scientists, supporting and representing our members and bringing together chemical scientists from all over the world. Our members include those working in large multinational companies and small and medium enterprises, researchers and students in universities, teachers, and regulators. Our Royal Charter aims include: "to establish, uphold and advance the standards of qualification, competence and conduct of those who practise chemistry as a profession."

As a Professional Body and Learned Society, we also have an important role to play in ensuring the UK has the people and skills needed in Science, Technology, Engineering and Maths (STEM), for example through supporting members' continuous professional development of STEM and other skills and knowledge, supporting chemistry teachers, bringing chemical scientists together, disseminating knowledge and researching and campaigning on key issues for our science, such as inclusion and diversity in the chemical sciences.

Chemistry makes a significant contribution to the UK economy, so it is vital that government creates the right conditions for chemistry-using companies, including SMEs, to flourish and for chemistry education and skills. Research by Cambridge Econometrics for the RSC in 2020 showed that over the period 2013-19:

- The chemistry workforce contributed an average of £83 billion per annum to UK GDP
- It contributed an average of £39 billion per year of GVA.[1]

Research by Lightcast for the RSC, showed that:

- The chemistry workforce is projected to grow by 6.5% over the next decade. This is considerably faster than the wider economy (5%) and translates into at least 12,000 new jobs in core chemistry occupations and approximately 100,000 new jobs in chemistry-centred industries.
- However, the sensitivity analysis on this projection shows real risks this growth won't be realised, due to the potential for insufficient workforce supply.[2]

This response covers some of our policy asks in responding to the issues of today and the future. If you have any questions about our submission, or would like to discuss any in more detail, please contact our Parliamentary Affairs Adviser Emily on woode@rsc.org.

We are calling on Government to place science and technology at the heart of the political agenda to create a resilient, sustainable economy to enhance growth and allow UK science to thrive. To achieve this, it is vital to:

1. Create an ambitious, inclusive, and stable R&D policy environment for UK science and innovation, to achieve sustainable economic growth

2. Ensure a world class chemistry education for all to enable economic growth and break down barriers to opportunity

[1] workforce-summary-report.pdf (rsc.org)
[2] Chemistry future workforce and education pathways data report (rsc.org)

3. Implement a strategic, science-informed approach to sustainability, chemicals and a circular economy of materials, to improve our health and our environment

1. **Create an ambitious, inclusive, and stable R&D policy environment for UK science and innovation to thrive.**

Research, development and innovation **drives productivity, economic growth and raises living standards**, benefitting individuals and communities across the UK. Long-term investment in R&D will **create good jobs in all nations and regions,** ensuring that the UK is **equipped to meet challenges** such as mitigating and adapting to climate change, achieving net zero ambitions, improving human health and tackling other emerging global challenges like improving the UK's food and energy security.

To maximise the benefits that research, development and innovation bring, we call on the Government to:

i. Provide clarity and certainty **on longer-term R&D investment plans and a stable policy environment** to give private and public sector partners, including international investors, the confidence to make their own long-term R&D investment decisions.

ii. Ensure the UK workforce is **equipped with skills that are fit-for-purpose for a modern world**, including the digital and sustainability skills science requires and **attract the best talented researchers and innovators through an internationally competitive visa scheme**.

iii. **Support a science culture** that prioritises inclusion, good scientific practice and individual wellbeing, as well as heightening participation in science and innovation.

Below, we set out how these asks can be achieved.

i. Longer-term R&D investment plans and a stable policy environment

- **Maintain real-term uplifts to R&D budgets in the short term** and **work with the sector to develop 10-year funding cycles**, allowing private and public sector partners to plan more strategically and be confident in their funding decisions.
- In the longer term, enable the **UK to be a leading G7 country in R&D investment** and aim to be among the top science and innovation nations globally.
- **Ensure sufficient financial support for and investment in innovative R&D-driven SMEs**, particularly at the scale-up stage to maximise economic growth and allow for SMEs to thrive.
- **Protect and support universities** to continue to deliver world class R&D:
    - Urgently address the financial sustainability of higher and further education so that quality chemistry teaching and research, including practical teaching, remain available to meet economic, employer and student needs and, at the same time, reduce student debt burdens.
    - Ensure quality provision of both higher education and vocational and technical routes for chemistry in all nations and regions, so that FE and HE in chemistry are accessible.
    - The potential closure of university chemistry departments e.g., University of Hull, could pose risks to the supply of STEM graduates needed for future jobs, for example for a bio-based economy and renewable energy technologies.
    - **Support for curiosity-driven research must be sustained** alongside funding explicitly focused on strategic priorities. Quality-related research (QR) funding is important to underpin this and to protect our national R&D capacity and capability in universities.

  - Ensure the science budget fully enables **maintaining, repairing and upgrading existing university infrastructure,** where this is a feasible alternative to building new infrastructure. This can be a cost-effective way to meet changing student needs and to achieve the UK's science ambitions.

- Enable **international collaboration** by continuing to fund and support participation in international funding schemes such as the €95 billion Horizon Europe research and innovation programme and its successor.

- Address the critical **shortage of laboratory facilities in the UK**, ensuring chemical scientists can access appropriate laboratory space across the country.

ii. A highly skilled UK workforce and attractive place for international talent

- RSC research shows the chemical sciences workforce has the potential to grow at a faster rate than the overall UK workforce over the next 10 years (6% vs 4%). These tend to be highly-qualified and well-paid jobs, with a current median salary of £38k (25% above overall UK median). To ensure the long-term supply of skilled workers for the sector, government should:
  - Ensure education, skills and higher education policies enable the full growth potential of chemistry sectors, to maximise their contribution to productivity and economic growth, and remain at the forefront of developing and commercialising new chemical technologies.
  - Ensure an up-to-date science curriculum that imparts knowledge, technical and transferrable skills; that features content preparing students for the challenges and opportunities society and business have including net zero and sustainability; that is taught by teachers with subject specialist training and CPD.
  - Promote a variety of routes into the chemical sciences sector including vocational training options that award recognised qualifications. Ensure policy and messaging support parity of esteem between academic and vocational routes.
  - Incentivise CPD for existing workers to help them develop skills relevant to the current and future trajectory of the chemical sciences, to increase productivity.

- To attract and retain the best talented researchers and innovators, the government must develop an **immigration system** that:
  - Works for the research and innovation sector, recognising that high-skilled roles which draw on a global talent pool (e.g. very specialist scientific research roles) are not always afforded a commensurate salary, particularly in academia and start-ups. High-Skilled and Global Talent routes must reduce financial barriers, recognising the soft power and economic benefits of attracting top global talent.
  - Is welcoming in tone and attitude, appropriate to attracting the best scientists, researchers, technicians, teachers, innovators and entrepreneurs to work in the UK for a period or settle permanently. Short-term academic mobility must not be penalised for length-of-stay requirements or as an entry reason to the UK.
  - Keeps costs and burdens to a realistic minimum and allows payment over the period of the visa, rather than up-front. Scientific mobility often happens early in individuals' careers, when salary and savings are not sufficient to cover the

significant expense of moving to a new country, especially when moving with a family.

iii. An inclusive science culture

- Break down barriers to opportunity in science by supporting and encouraging efforts to increase **diversity and inclusion.** Achieving this will require efforts from a range of organisations in the research landscape, including employers (universities, institutions and companies), funders, learned societies, academies and publishers, to ensure that policy levers and organisational practice make a step change in diversity in research and innovation environments.
- Work with UKRI and the wider sector to continue to implement and build on the work started in the 2021 **R&D People and Culture strategy** to improve the attractiveness and inclusiveness of R&D careers and drive equality of opportunity in research, development and innovation.
- Mandate **sustainable laboratory practices** that are realistic, ambitious and embed sustainability in organisational culture.
- Continue implementing measures to **reduce research bureaucracy** as outlined in the Tickell Review.

2. A world-class chemistry education for all

Addressing shortages of subject expert teachers

Education is a leading determinant of economic growth**, productivity,** employment, and earnings. Shortages of teachers, including those with the expertise to teach chemistry, is an issue that needs to be **resolved.** Having enough chemistry subject-expert teachers in our schools is key to giving all young people access to an excellent education, helping to break down barriers to opportunity and preparing young people for careers and the challenges we face.

Teachers' working conditions (including excessive workload) must be addressed to ensure that the profession can both retain good teachers and attract new ones. We want to see long-term solutions to make teaching a more desirable profession that can withstand population and economic fluctuations so that young peoples' future job prospects are not adversely affected by teacher shortages. That requires a balance between getting the right financial incentives and making teaching a job people want to do because they enjoy it. Retaining more of our qualified teachers will reduce spending on recruitment and initial teacher training.

In our 2024 Science Teaching Survey[3], 82% of science teachers from mainstream secondary schools in England, reported that not having enough non-contact time (e.g. for planning, marking, practising practical work) had a detrimental effect on their students' learning outcomes in the last year. Furthermore, 39% said that their school was understaffed for chemistry teachers, and more than 53%

[3]Our 2024 Science Teaching Survey captures the experiences of science teachers and technicians across secondary schools and FE colleges in the UK and Ireland. Due to be published late 2024.

of chemistry teachers said that they had not had enough subject-specific professional development in the past twelve months.

Supporting and developing the existing teaching workforce is a cost-effective way of improving the current retention crisis and ensuring that all young people, irrespective of their background or circumstances, receive an excellent science education**. Investment is needed to set up a systematic approach to subject-specific CPD in the sciences (including pre-service Subject Knowledge Enhancement courses and the Early Career Framework)** to ensure that quality assured subject-specific CPD is available for all teachers of the sciences as part of the government's proposed teacher training entitlement.

Practical chemistry education

Practical chemistry is an essential part of the chemistry discipline because it supports the understanding of the subject as an empirical science and is core to understanding the question 'How do we do chemistry?' The skills developed through practical work can be used by young people in their future studies and careers in the sciences and beyond.

We believe that all learners should have access to relevant and regular practical chemistry activities. However, our research has shown that teachers in the UK and Ireland are finding it increasingly difficult to run them. In our science teacher survey 2023, cost of consumables and chemicals (37%) and a lack of equipment (35%) were identified as top barriers to running practical work. **Schools should be supported to provide hands on practical activities as a part of their curriculum through sufficient funding for consumables and chemicals.**

Shortages of school science technicians[4] also make it harder for schools to support practical chemistry. The **Government should review science technician pay and conditions, considering what policy measures might help to attract and retain science technicians in the future.**

Further education in the sciences

Technical education offers opportunities to secure a pipeline of skilled future scientists and technicians – who are vital to the chemical sciences workforce and the contribution it makes to the UK economy, society, and the environment in which we live. We acknowledge that the Government has paused the defunding of Level 3 courses pending review, but providers need certainty for the upcoming recruitment cycle. **We would like to see a guarantee of funding for courses running in 2025/26, with the results of the review to be implemented the year after. Longer term, we ask that the Government reverses the decision of the previous administration to defund science qualifications at level 3 that aren't T Levels or A Levels, specifically BTECs**. These qualifications are well understood by employers and Higher Education providers; they provide a route to skilled employment and HE for a greater diversity of students, including those from lower socio-economic

[4] https://www.rsc.org/news-events/articles/2020/nov/school-science-technicians/ see also results from our Science Teaching surveys https://www.rsc.org/policy-evidence-campaigns/chemistry-education/education-reports-surveys-campaigns/the-science-teaching-survey/

backgrounds, those suited to a more 'hands on' approach to learning, and neurodiverse individuals. Removing funding from these qualifications' risks closing off the option to progress in sciences for thousands of students each year, jeopardising attempts to increase participation in the sciences to ensure ongoing development of skills for initiatives such as the Industrial Strategy, increase of spend on RDI, and achievement of Net Zero targets. The Science T-level route is currently not able to accommodate anywhere near the order of 25,000 students who traditionally study applied generals in science (only 128 students achieved a result in 2023/24).

The Government should make budget available to enable training providers to use apprenticeship levy payments to cover certification costs for qualifications where they are not mandated in the apprenticeship standard. This supports the maintenance of robust knowledge requirements in apprenticeships, to support progression and recognition of apprentices.

Governmnent should ensure that there are approved qualifications at levels 4 and 5 in chemical sciences to support development of specialised technical skills in the chemical sciences, which are understood and valued by employers. The value of robust qualifications at this level (Higher Technical Qualifications, or HTQs) was described in the Sainsbury report, in terms of their positive impact on economic productivity and international competitiveness. An approval system has been set up to make sure that qualifications delivered at this level are good quality. However, as yet, there are not any approved qualifications relevant to occupations found in the chemical sciences sectors, e.g. technician scientist, on the approved register. If the UK is to transition to become a skills-based economy, HTQs in the chemical sciences will play a vital part.

3. A strategic approach to the management of chemicals and resources for a robust and sustainable economy

Enabling a circular economy of materials

The Royal Society of Chemistry is calling for the development and delivery of a clear overarching strategy – coordinated by central government – to enable **a circular economy of materials which will deliver substantial economic, social and environmental benefits across the UK** [i].

We welcome the UK government's commitment to double onshore wind, triple solar power and quadruple offshore wind by 2030 as an important step in the trajectory towards the UK's net zero obligations. Meeting this commitment comes with significant material demands. The Royal Society of Chemistry estimates that nearly 40 million tonnes of materials (including steel, concrete, composites and rare earth elements) will be required for offshore and onshore wind alone.

At present, the UK has a largely linear economy where resources are extracted, used in products and services before being thrown away as waste. There are **three key problems with our current linear economy**:

1. **The economic value that these materials have is lost from the UK economy** if they end up in landfill or are exported abroad, with some estimates suggesting that at present as little as 7.5% of materials are circled back into the UK economy [ii].
2. Many of the materials that are vital to meet the UK's clean energy commitments are also essential in a range of other sectors including healthcare, defence and electronics, and there is significant global demand for these materials. Some of the materials essential for wind energy and solar photovoltaics are classed as 'critical' because of their economic importance and supply chain risks. **Unresolved supply versus demand imbalances pose risks to UK economic growth and national energy security**.
3. **The current unsustainable use and management of resources is driving the triple planetary crisis** of climate change, biodiversity loss and waste and pollution. The UK's population consumes 15.3 tonnes of materials per person per year [ii] which is well above the global average.

In a circular economy, materials are kept in circulation at their highest possible value for as long as possible, which helps to reduce the need for primary extraction and the volumes of waste produced as well as prevent the economic value of materials being lost from the economy.

There is a strong case for enabling the transition to a circular economy given it will have **far-reaching economic and social benefits**, help us **diversify supply chains**, and be a vital measure to **address the triple planetary crisis**. 2021 estimates suggest that more than 57,000 net jobs could be created leading to an **increase in Gross Value Added (GVA) of £3 billion by 2030** if the current trajectory towards a circular economy is maintained [iii]. Some more transformative scenarios suggest that GVA could be increased to £82 billion by 2030. In addition, usage of 2.8 million tonnes of materials could be avoided and a further 13 million tonnes could be diverted from disposal to the circular economy, leading to 14 million tonnes of associated greenhouse gas emissions being avoided.

[i] A strategy for a circular economy of materials, Royal Society of Chemistry, 2024.

[ii] The Circularity Gap Report United Kingdom, Circle Economy Foundation, 2023.

[iii] Delivering climate ambition through a more circular economy, WRAP, 2021.

Establishing a national Chemicals Agency

Chemicals are an integral part of everyday life and well-regulated chemical innovation can bring huge benefits, from driving economic growth to supporting the green transition. At the same time, there is mounting global evidence of the risks to health and the environmental that some substances can pose if they are not managed properly.

However, the current regulatory regime for chemicals in the UK is not fit for purpose. Responsibility falls to a range of government departments and agencies, leading to fragmentation, duplication of efforts and a lack of clarity. This situation presents significant barriers for businesses, which are hampered by rising regulatory complexity, uncertainty and costs. There is a real danger that companies may struggle to remain viable under the growing regulatory burden or choose to relocate outside of the UK. These challenges have only been exacerbated by the increased volume of work for civil servants following the UK's departure from the European Union.

We urgently need a new approach to chemicals regulation that protects human health and the environment against the life-cycle risks of chemicals; supports innovation and economic growth; and offers good value for money for taxpayers. That is why the Royal Society of Chemistry is calling for the **establishment of a national Chemicals Agency to spearhead a coordinated, centralised and systems-thinking regulatory regime**.

With our strength in the chemicals sector, the UK can be a world leader in both the manufacture and regulation of chemicals. A national Chemicals Agency could support a wider UK chemicals strategy by providing a clear, effective framework that enables rapid and safe innovation, facilitates trade and attracts inward investment. Most importantly, it would enable risks to be anticipated and mitigated before irreversible harm occurs. Putting in place a Chemicals Agency could be expected to generate income through granting REACH Registrations and Authorisations, pesticides and biocides authorisations and active substance approvals, and other opportunities such as delivering training programmes. Our modelling suggests that this, along with resulting efficiency gains, could make the agency cost neutral in the longer term.