

Championing the chemical sciences' contribution to a sustainable world

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Our planet and our communities are under increasing pressure. While on average people around the world enjoy longer, healthier lives than they did a century ago — thanks in large part to advances in science and technology — our collective wellbeing is under growing threat from climate change, environmental damage, threats to food and energy security, and health and economic inequalities.

The impacts of COVID-19 also continue to reverberate globally, putting progress on poverty and other United Nations Sustainable Development Goals (UN SDGs) at risk. According to the World Bank¹, the pandemic pushed 70 million people around the world into extreme poverty.

While the pandemic has caused widespread suffering, it has also highlighted the power of the scientific community to solve urgent problems. Chemical scientists, along with colleagues in other disciplines, have made major contributions, not least in helping to develop vaccines at record speed.

We are entering an era of unprecedented discovery and impact in our discipline. Today's researchers have tools and techniques that I could only have dreamt of when I did my PhD 30 years ago, from cryo-electron microscopy and molecular machines, to advanced computational models and Artificial Intelligence.

These methods are transforming our understanding of chemistry and revolutionising areas such as drug discovery and delivery. We can now understand chemical structures and reactions in finer detail than ever before.

There is no doubt that, in a world where global sustainability challenges and advances in technology bring both uncertainty and new possibilities, chemists have a central role to play.

Wherever you look, there are chemical solutions to the problems we face, whether that's solid-state batteries or re-using waste materials. Ninety-nine percent of chemical researchers say their work has potential application in at least one global challenge area, according to a survey² by the Royal Society of Chemistry (RSC). Of the 560 scientists surveyed, 15 percent were based in Asia.

I am therefore honoured to be invited by the Chemical Society of Japan (CSJ) to contribute to such a prestigious journal on this theme, on behalf of the RSC.

At the RSC, we aim to catalyse change at multiple levels, and we work closely with partners across the global chemical science community to achieve this.

Our work touches on a range of sustainability priorities. For example, we campaign to improve inclusion and diversity³ in the profession. Our focus is on empowering chemical scientists to contribute into areas where their expertise is sorely needed.

First, we facilitate knowledge sharing between scientists. For example, ahead of the 2021 United Nations Climate Change Conference (COP26), we brought together chemical entrepreneurs, industry experts, academics and researchers from around the world for a series of online discussions on sustainability challenges.

Our twenty virtual events highlighted the huge range of areas where chemists

are needed, from developing protective paints for wind turbines, to improving air quality in the Global South, and researching sustainable alternatives to plastics and cement.

We also showcased innovative SMEs that are developing essential technologies for the future, including better carbon capture solutions, faster charging batteries, more efficient solar power and higher efficiency green hydrogen production.

As a leading science publisher, we have also signed the SDG Publishers Compact⁴, which aims to accelerate progress to achieve the SDGs by 2030.

We publish a range of journals related to green chemistry and global challenges, including *RSC Sustainability*⁵, *Sustainable Food Technology*⁶ and *EES Catalysis*⁷. This year, we also announced the publication of two new titles: *RSC Applied Interfaces* and *RSC Applied Polymers*.

Each of these new journals is gold open access and we will cover all article processing charges until mid-2025, so that scientists and institutions from around the world can share research at no charge.

Those closest to problems are often the best placed to solve them. It is therefore essential that scientists in countries most impacted by sustainability challenges have access to the research they need.

That is why we are committed to being a fully open access publisher within five years and to supporting open science more widely, to enable fair access to scientific knowledge around the

world.

As well as helping to share knowledge, we support bringing together key players to tackle complex problems. For example, we have created an industry taskforce⁸⁾ to tackle the environmental impact of polymers in liquid formulations (PLFs).

PLFs are found in millions of consumer and industrial products, from the paints on our walls to the shampoo and detergents in our cupboards. But the way they are made, used and disposed of is putting unnecessary strain on the environment by releasing carbon dioxide into our atmosphere, using up the earth's finite resources and generating physical waste.

Our taskforce brings together stakeholders across the value chain, including multinational companies like Dow and BASF, to identify ways to reduce the environmental impact of PLFs.

Education and skills are another important part of the puzzle. We want to make sure that future scientists are equipped to tackle the challenges they will face and to thrive in a green economy.

Last year, we asked young people, teachers and industry professionals across the UK and Ireland what they think of the way the science of climate change and sustainability are currently taught in schools.

The overwhelming consensus was that chemistry lessons should place greater emphasis on sustainability and climate change. We published a report⁹⁾ of our findings last year, and we are talking with education policymakers about how to embed green topics in the

curriculum.

While advancing scientific solutions and skills is crucial, we also need to help policymakers and the public to understand and act on the science.

Our Precious Elements¹⁰⁾ campaign aims to raise awareness of the many rare elements in personal electronics and highlight the need to recycle these products. It has been covered by news outlets around the world and was highlighted by the UK Parliament, leading to the RSC submitting evidence to a key UK Government report on electronic waste.

We have now taken the campaign international¹¹⁾ by surveying attitudes toward technology, sustainability and precious elements in ten countries, including Japan.

We found that there is a real appetite for more sustainable technology options, but that people are frustrated with the lack of information around the topic, as well as the lack of straightforward options for recycling or extending the lifespan of electronics.

As well as urging individuals to be more conscious about how they use and reuse technology, we are calling on companies and policymakers to make it easier for consumers to repair, update or recycle technology.

Lots of the sustainability challenges we face require a coordinated international response. In addition to highlighting shared challenges, we advocate for a global approach to chemical governance where this is needed.

For example, we are campaigning for the creation of an independent intergov-

ernmental panel on chemical and waste-management. Together with international partners, we are engaging with UN processes to help make this a reality and to keep the issue of chemical pollution firmly on the agenda.

Finally, while chemists have an important role to play in providing solutions, we must also make sure we are not part of the problem.

Many areas of chemical research and industry are by their nature resource and energy intensive. We support efforts to reduce the environmental footprint of the chemical sciences, as well as working to achieving net zero carbon emissions in our own operations by 2040.

We recently asked chemical scientists to share their views on how scientific research can be conducted in a more environmentally sustainable way. Researchers in Japan made up four percent of the 671 respondents, forming the basis of our new Sustainable Laboratories¹²⁾ report, and will inform our ongoing efforts to support the community in their efforts towards creating greener labs.

The challenges we face are complex and no single organisation or country can solve them in isolation. Collaboration is crucial to transition to a low carbon, circular economy and create a world where everybody has the opportunity flourish.

The UK and the Japan share a rich tradition of scientific discovery and the CSJ is one of our most valued international partners. We first signed a formal partnership in 2010, which we renewed for the second time in 2023.

Our two societies share a strong commitment to championing sustainability in the chemical sciences and we have long worked together to strengthen scientific links between our countries.

This includes organising more than ten joint symposia, bringing together thousands of researchers to discuss advances in wide range of chemical research areas.

We also work together as members of the Chemical Science and Society Summit (CS3), which brings together key scientific nations to discuss how to maximise chemistry's contribution to solving global challenges.

We are looking forward to actively participating in the 2023 CS3 summit on *Chemistry for Sustainable Food: Challenges and Perspective* from 19-22 September, which will be hosted by the CSJ at The Chemistry Hall in Tokyo.

The scale of the challenges we face is great and the future is hard to predict. Ten years ago, for example, we had little

use for indium tin oxide. Today more than half¹³⁾ of the world's population use it daily in their smartphones, and we are at risk of running out.

However, I believe the pace of scientific advances and the willingness of scientists to work together across borders, and across disciplines, are good reasons for optimism. And chemical societies such as the RSC and the CSJ can help make sure that the global chemical science community fulfils this potential for positive impact.

We are looking forward to continuing to work closely with the CSJ for many years to come, to facilitate scientific collaboration between our countries and enable chemists to make their full contribution to a sustainable world.

- 1) <https://www.worldbank.org/en/news/press-release/2022/10/05/global-progress-in-reducing-extreme-poverty-grinds-to-a-halt>
- 2) <https://www.rsc.org/new-perspectives/discovery/science-horizons/>
- 3) <https://www.rsc.org/new-perspectives/talent/inclusion-and-diversity/>
- 4) <https://www.un.org/sustainabledevelopment/>

- sdg-publishers-compact/
- 5) <https://www.rsc.org/journals-books-databases/about-journals/rsc-sustainability/>
- 6) <https://www.rsc.org/journals-books-databases/about-journals/sustainable-food-technology/>
- 7) <https://www.rsc.org/journals-books-databases/about-journals/ees-catalysis/>
- 8) <https://www.rsc.org/new-perspectives/sustainability/polymers-in-liquid-formulations-plfs/>
- 9) <https://www.rsc.org/new-perspectives/sustainability/a-sustainable-chemistry-curriculum/>
- 10) <https://www.rsc.org/new-perspectives/sustainability/elements-in-danger/>
- 11) <https://sustainability.rsc.org/explore-global-attitudes/>
- 12) <https://www.rsc.org/new-perspectives/sustainability/sustainable-laboratories>
- 13) <https://www.statista.com/statistics/330695/number-of-smartphone-users-worldwide/>

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