



The UK's role in global research: How the UK can live up to its place in the world

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Principles and prerequisites

Introduction

The UK is rethinking its place in the modern world. The Government's Global Britain agenda is beginning to take shape through its approach to trade, foreign policy, defence and security. Meanwhile, the Prime Minister's ambition is for the UK to be a global science superpower, and research spending is now set to increase rapidly. The combination of these conversations and policy decisions will shape what kind of country the UK will be, and how it will position itself within the international research environment.

Research has been a significant strength of the UK for many decades, but past achievements and current capacity will not keep the UK competitive for long. As the scientific and societal problems faced by the world become more complex, the research needed to solve them has become increasingly interdisciplinary, team-based, and international. The scientific landscape has become truly global, a trend that will only increase as worldwide scientific capacity continues to grow. The UK must decide what its new global role in research will be. Decisions made by the UK Government over the next 18 months will be a significant factor in shaping that role for many years to come.

This report sets out the enduring principles that should underpin the UK's research ambitions for the decades ahead. These principles should inform a new long-term vision for UK research, direct the approach to international research policy, and act as a guiding light for the imminent choices facing the Government.

Our thinking has been informed by over 50 interviews with stakeholders from around the world, including scientists working on global challenges, those representing global agencies and top institutions, and voices from industry and politics. As part of this process, we commissioned the Institute for Government to host a series of themed roundtables with key figures to discuss and debate these issues.

We have included quotes from our interviews and roundtables where they bring our arguments to life and provide wider perspectives from around the world. However, our report is not a synthesis of their views. It is our assessment of how to make UK and global research as strong as it can be — through the UK playing its part on the global stage.

The terms 'science superpower' and 'Global Britain' are now used frequently by the Government as a shorthand for its ambitions for research. Our report uses these phrases in that context to explore how the Government's ambitions can best be harnessed, and how actions taken over the next 18 months could set the UK on a path to living up to its place in the world for research.

What does it mean to be a science superpower?

In many respects the UK is already a global leader in research. UK-based researchers are at the cutting edge in many fields, UK institutions are highly respected internationally, and UK representatives are seen to play an important role in rallying international partners around shared scientific objectives.

But being a science superpower is about more than being the source of high-quality research. National superpowers in the fields of defence, security and foreign policy project this power and therefore have greater influence around the world. That same ambition

should apply for a research superpower, using that position of strength to have global impact.

Collaboration is at the heart of being a science superpower. If the UK is to live up to its role in the world it needs to work collaboratively with global partners, share the burden with others, and build worldwide research capacity. The biggest problems the world faces can only be addressed through shared ingenuity, innovation and investment. This has been brought into sharp focus by the Covid-19 pandemic, where no country has the resources to find a solution alone.

In research there is no conflict between acting for global benefit and supporting the national interest — the two are closely aligned. By building a reputation as the go-to research partner of choice, the UK will also supercharge its domestic research, by attracting greater levels of foreign investment and talent.

Four principles for the UK to follow

The UK can fully live up to its place in the world for research by following four principles.

1. The UK must be open

Scientific progress comes from people applying their ideas, technical skills, and passion for discovery to complex problems. Talent is therefore essential for research success. But attracting this talent is about more than providing research funding. Researchers seek an environment where their ideas can flourish, they and their skills are welcomed, and they are part of a thriving, intellectually stimulating and globally connected science community.

As well as attracting new talent, any global science superpower accepts and celebrates the fact that its own researchers will want to study, live and work overseas during their careers. This might initially appear counterintuitive, but outward mobility boosts researchers' networks, creates new opportunities for partnerships, and provides experience of working in different cultures — an increasingly important skill in global research. Some may choose to return to the UK later, bringing a wealth of expertise and networks with them. Others will choose to collaborate with UK-based researchers through connections made here.

2. The UK must build networks around the world

Research collaboration is now essential for producing world-leading science. No longer can a lone scientist, in a single lab, in one country, come up with the answers to the greatest scientific problems. Science moves fast, and combined with the complexity of the challenges at hand, researchers must stay connected globally to remain at the cutting edge.

International collaboration also allows the UK to cover more ground and be involved in many different areas of science and research, without having to create a critical mass in every subdiscipline within one country.

This collaborative approach is not confined to research in academia. Through our interviews, voices from industries with a strong research focus, such as the pharmaceutical industry and aerospace, stressed the importance of international collaboration in underpinning UK competitiveness.

3. The UK must be strategic

As a medium-sized country, the UK must deploy its resources strategically for maximum benefit. This applies to its choice of partners for bilateral and multilateral relationships, and infrastructure projects. It will need to avoid duplication and inefficiency. The UK research system has neither the resources, nor the internal demand, to justify an independent version of every research infrastructure project required by UK-based researchers. Seeking to share access to key infrastructure and coordinate among like-minded partners is critical and means funding for new UK-based infrastructure can be focused on establishing genuinely world-class facilities.

4. The UK must use its influence for global good

Simply being a leading research and academic nation on paper should not be enough for the UK. The UK should build its reputation for being a country that not only finds robust scientific answers, but ensures that solutions are put to good use, and have impact, around the world. In turn, this would reinforce the UK's position as a leading science nation. The UK must combine the knowledge and expertise of its scientific community, with its diplomatic strength and position in multinational organisations (such as the G7, UN and WHO), to drive forward progress on scientific priorities. It must also support the global development of regulation and standards that will underpin future research success.

Our report explores these principles in more detail and sets out actions that should be taken by the UK Government over the coming months and years to put them into practice.

Essential prerequisites

Following the principles above will set the UK on the right path, but there are four essential actions that must underpin this approach.

The first is to secure the UK's domestic research environment. The Government recently published a R&D Roadmap correctly identifying how to do this, including through ensuring that UK research funding is financially sustainable, improving research culture, and driving up innovation. Without these domestic reforms, efforts to make the UK more collaborative and influential internationally will likely fail.

The second action is to craft a clear vision and an engaging narrative for the UK's approach to international research. The previous Government's International Research and Innovation Strategy attempted this,¹ but did not create a clear enough vision or provide enough direction for the many choices that need to be made.

The third is to craft a new narrative to engage researchers. We learned from our interviews that the UK currently faces an uphill struggle to inspire the research community both at home and abroad. In the eyes of the people we spoke to, the UK's reputation has been damaged by the previous Government's 'hostile environment' for immigration, ongoing Brexit uncertainty and perceived poor handling of Covid-19. Whether such criticisms are valid is irrelevant — the fact that these perceptions exist means that there is more work to be done in communicating the Government's ambitions effectively.

Specifically, phrases such as ‘Global Britain’ and ‘science superpower’ appear to be reinforcing perceptions that the UK will take a self-interested approach to research collaboration and tackling global challenges.

This can be overcome with the right actions and messaging. The Government should use its expertise in targeted political messaging to cast UK science in a global light and work with the sector to ensure it resonates with researchers. This is likely to involve presenting research policy decisions in terms of collaboration and their broader benefit to research, rather than UK interests.

“Since Brexit, the perception of the UK has changed for many international partners and there is a lot more uncertainty about what it will be like to work with the UK. Scientists are now needing to spend time reassuring and convincing our potential scientific partners around the world that the UK is still worth working with.”

Professor Chris Petkov, Laboratory of Comparative Neuropsychology, Newcastle University

Fourth, the UK must continue to be an internationally engaged country committed to solving global, as well as national, problems. The UK’s commitment to Official Development Assistance is an important part of this commitment and should be maintained.

Actions to be taken in 2020–21

- Implement the actions highlighted in the BEIS R&D Roadmap to supercharge the UK’s domestic research environment.
- Commission an ‘international’ equivalent of the BEIS R&D Roadmap that sets the overall vision for Britain’s place in the world for research. This should become the ‘North Star’ for Government decision-making, based around clear goals.
- Create an engaging narrative for the UK’s research ambitions that resonates with the community who are needed to deliver it. Develop phrases and slogans in the same way as for any political campaign—by message-testing with the intended audience.

Chapter 1: The UK must be open

Make the UK a hub for global talent

“ It’s worthwhile reflecting how strong the UK is right now in research, especially compared to where it was 25 years ago. That’s because you’ve become a nexus for talent.

Professor Brian P. Schmidt, Vice-Chancellor & President, The Australian National University

The UK has a long history of being a hub for global research talent. This has been one of the key factors in making the UK one of the world’s leading scientific nations.

The UK needs to continue to be able to attract great people. Earlier this year, the Government introduced the Global Talent Visa, which is an excellent first step towards ensuring that administrative barriers facing researchers coming to the UK are as low as possible. UKRI PhD funding is also now open to international students,² representing a significant widening of the talent pool who can participate in UK research.

In July 2020, the BEIS R&D Roadmap announced the creation of a new “Office for Talent”, tasked with taking a “new and proactive approach to attracting and retaining the most promising global science, research and innovation talent to the UK”. A centralised Office for Talent will provide important cross-Government coordination to support international research talent, but for this to be a success it must address three key issues.

First, there is a significant difference in visa costs paid by researchers coming to the UK compared with other countries. We heard repeatedly in our interviews for this report that these costs are making the UK less attractive compared to its competitors. From October 2020, the Immigration Health Surcharge will increase to £624 per year — meaning an upfront cost of more than £13,000 for a family of four on a five-year Global Talent Visa.³ In contrast, the French Talent Visa is approximately £1,000 for the same family.⁴ For the Global Talent Visa to be a globally competitive offer for researchers, and particularly for those early on in their careers, this must be revisited as a priority.

“There will always be talented people who want to come to the UK. What the UK will lose is the very very best people who have a choice.”

Dr Lynette Lim, Group Leader, VIB-KU Leuven Centre for Brain and Disease

Second, the Office for Talent will need to improve researchers’ ‘user experience’ of the immigration system. For many, applying for a visa will feel confusing, expensive, and risky, even from the moment of trying to find the right page on the Government’s website. This is in stark contrast to other countries’ approaches to attracting talent. For example, in 2019, Canada assigned CA\$79.6 million to help improve the processing of work and study permits. It also established a dedicated unit to handle applications from researchers to streamline the process.⁵ Action to improve user experience could include making it immediately obvious to researchers from the Government website which visa routes they are eligible for and making this accessible in different languages.

Finally, the Government must work to ensure that researchers coming to the UK for conferences or collaborations can more easily secure a visitor visa. In the past there have been embarrassing instances of researchers funded by UK Government capacity-building schemes having their applications for visitor visas rejected by the Home Office because of difficulties in

“It sends the wrong message. You have your science partners and collaborators in other parts of the world—they are good enough to work with you, they are good enough to be your scientific partner—but they are not good enough to set foot on your soil or come for a visit.”

Dr Zulfiqar A. Bhutta, Co-Director, Centre for Global Child Health, The Hospital for Sick Children, Toronto

verifying that the applicant is a legitimate researcher. As a first step, the Office for Talent could ensure UK Government funding is linked to the UK visa system and provide greater coordination between different Government departments to resolve problems quickly when they arise.

More broadly, the Government will need to find the right balance between attracting the “brightest and best” to the UK without harming the wider global research system. Talent needs to flourish in other countries to build worldwide research capacity and better tackle scientific challenges. To address this, the UK could support joint research exchange programmes and embrace short-term mobility so relationships and partnerships can be built without permanent migration. Building sustainable research environments in partner countries will help support jobs and career development there, without researchers needing to move to elsewhere. It will also provide opportunities for UK researchers to work overseas.

“ You should ask the question ‘Is it possible for countries to attract the brightest and the best without reducing the capacity of other countries?’ I would say that the answer depends where you are sitting. The UK could attract the brightest and the best from a country such as Germany without disrupting the German system too much. If the UK was to attract the best and brightest from the South African system, we would be up a creek without a paddle”

Dr Molapo Qhobela, Chief Executive Officer, National Research Foundation of South Africa

Actions to be taken in 2020–21

- Mandate the Office for Talent to radically improve the ‘user experience’ for researchers and their teams coming to the UK for both short-term visits and long-term work. Requesting a visa should be a smooth process and joined-up with any funding applications the applicant has made.
- Make visas for researchers and their teams cheaper. Find innovative ways to ensure that the UK does not price itself out of the market, or restrict itself to research talent that already has considerable financial means at its disposal.

Maximise the benefits of outward mobility

“ Outward mobility has positive aspects for Israel as many researchers return after being abroad and have gained a strong network as well as additional skills.

Nili Shalev, Director General, ISERD, Israel

UK-based researchers move around the world to learn new skills, build networks, and gain experience of different research cultures. This outward researcher mobility has benefits for the UK itself. Encouraging and supporting outward mobility would also demonstrate the UK's commitment to global collaboration and openness to work with partners around the world. It is an essential part of the UK being a 'hub' for research — with both inward and outward flows of researchers.

During the interviews conducted for this project we heard first-hand the benefits of working overseas. For example, Professor Pamela Kearns, Director of the Institute of Cancer and Genomic Sciences, told us that she still works closely with individuals she met studying for her PhD in Amsterdam. In fact, the relationship has gone full circle and they regularly send their own PhD students to work in each other's labs. Professor Andrew Harrison, CEO of Diamond Light Source, told us his selection for his current role depending critically on the experience he gained working as Director General of the Institute Laue-Langevin neutron source, France. Although only anecdotal, these stories reflect the types of benefits, both to individuals and to UK science, of outward mobility.

Other countries have looked to build on these benefits of outward mobility. In Israel, outward mobility helps to build networks and collaborations around the world, particularly with the USA. Israel also has an established track record of researchers returning to set up new businesses, or offshoots of companies established elsewhere, with clear economic benefit.

In Germany, the Federal Foreign Office has created a network of German research 'alumni' around the world to connect people who have previously studied or carried out research in Germany.⁶ It aims to consolidate international ties with German institutions, to follow career paths, and to strengthen professional exchange. Although this is still a relatively small programme in Germany, the UK Government should draw inspiration from this approach.

Trade deals create new opportunities for supporting outward mobility. For example, the UK is currently negotiating a Free Trade Agreement (FTA) with the USA. A current weakness of UK-US collaboration is a lack of mobility programmes, and an FTA could explore ways of addressing this. New FTAs could also be used to explore other “downstream” obstacles to researcher mobility, for example making it easier for UK students to take student loans to overseas universities.

Actions to be taken in 2020–21

- Fully embrace the benefits of outward mobility and strengthen the UK's existing overseas network, for example by setting up a UK research alumni network.
- Further encourage an exchange of research talent with strategic partners around the world. This could include provisions in Free Trade Agreements or science and innovation agreements, or singular standalone programmes such as joint PhD or exchange schemes.

Create a ‘single front door’ for UK research

“The UK needs to appear more joined up externally and be more aligned internally. It needs to present a single front door to the world”

Professor Paul Boyle, Vice-Chancellor, Swansea University

The global nature of research means that any science superpower will want to ensure that it is easy to work with and has a clear offer to the international research community.

In addition to the Government’s diplomatic missions, the UK has many bodies representing the research sector overseas, including the UK Research Office (UKRO) in Brussels, and UKRI offices in Washington and New Delhi. UK universities also have a growing presence in other countries, and the National Academies have international funding programmes.

This means that the UK has a wide global reach and a variety of different contact points and avenues for collaboration. This breadth of entry points has many strengths, but the UK would benefit from showing a ‘single front door’ to those who might wish to partner with the UK — joining up what might otherwise be a disjointed international image.

The UK must get its message out to researchers, universities, companies and politicians in other countries. This can partly be achieved through speeches and policy announcements from the Government in London, but also needs people on the ground building networks, communicating UK policy to those it is aimed at, and building and maintaining connections.

The UK Science and Innovation Network (SIN) has approximately 100 officers in over 40 countries and territories around the world.⁷ This is a significant asset to the UK — providing local knowledge and cultural insights, as well as identifying opportunities and building relationships. SIN will be an indispensable part of the UK’s effort to build and expand its global networks.

An enhanced SIN would be well placed to present a ‘single front door’ to UK research. From its position within overseas countries and territories it could make connections between research in the UK and overseas, help international researchers navigate the often-complex UK funding landscape, and promote the opportunity to work with the UK.

To do this effectively, SIN must link back to stakeholders in the UK, as well as connecting with their host country. This will ensure that SIN staff based overseas have an up-to-date picture of UK research priorities and opportunities. It can also play a critical role domestically, encouraging and supporting UK researchers and organisations to have a more global outlook and helping them to build overseas partnerships. SIN may also have to become comfortable in “pushing” the UK’s research ambitions and actively promoting UK interests, alongside its intelligence-gathering and networking role.

Actions to be taken in 2020–21

- Create a ‘single front door’ for UK research around the world. The existing Science and Innovation Network could be resourced to provide this.
- Conduct an internal review of the capacity of the Science and Innovation Network to ensure it can clearly signpost the UK’s research offer, in terms of its capabilities and strengths, and guide potential collaborative partners. It should become a true network that is both well-connected in the host country, connected with stakeholders in the UK and across the rest of SIN.

Chapter 2: The UK must build networks across the world

Understand the importance of collaboration

“A key part of being a global leader is how you become a global collaborator. The UK needs to be globally competitive, but also globally collaborative at the same time.”

Dr Sheuli Porkess, Executive Director, Research, Medical and Innovation, ABPI

International collaboration is becoming increasingly important as the challenges, tools and global context of research change. In 1981, only 5% of UK publications had international co-authors; 25 years later, over half did.⁸ International collaboration also leads to better science. Evidence shows that research involving at least one international partner has greater impact than those with only national collaborators.⁹ To tackle international problems, such as climate change and pandemics, working across borders to share resources and exchange ideas is essential. No single individual, team or nation could take on these challenges alone. The UK must build networks around the world because any country that ignores this trend will fail to be competitive.

Secure the UK's research relationship with Europe

“EU programmes have a much larger impact than any single bilateral relationship. Bilaterals are usually limited in scope and funding, and they can't be compared with magnitude of the EU programmes.”

Nili Shalev, Director General, ISERD, Israel

For research, Global Britain starts in Europe. One of the most research-intensive areas of the world is on the UK's doorstep. Europe, including the UK, produces a third of the world's scientific publications with just 7% of the global population. Any country that aims to be a science superpower must have an effective partnership with the EU, due to its scientific strength and density of talent.

Deep research collaboration with the EU is not in tension with developing new relationships around world, rather it provides a ready-made bridge for cooperation with many other countries. Through Horizon 2020, the current EU framework programme, more than 7,500 collaborative projects have been funded, with participants from 149 countries.¹⁰ Currently 60% of the UK's internationally co-authored papers include EU partners and a third of UK papers with co-authors from outside of the EU also have an EU partner.¹¹ For example, Dr Qilei Song at Imperial College London is researching next-generation renewable energy storage and conversion with

“The UK is friendly to the USA, Canada, and Australia but you are also friendly to the whole of Europe, and to Africa and Asia. You have been able to do much of what the USA did through spending huge amounts of money, without the financial investment. That's largely due to your ability to interact with the ERC, and to really be seen as the most attractive destination in Europe to do research.”

Professor Brian P. Schmidt, Vice-Chancellor & President, The Australian National University

industrial partners in the UK, EU and China, supported by an ERC Starting Grant.¹² Horizon 2020 Marie Skłodowska-Curie Actions have also supported around 800 Chinese scientists to work in the UK, and around 850 UK-based researchers to work in China.

Partnership with the EU also creates access to other countries through established frameworks for collaboration, as the EU has agreements for scientific and technological cooperation with 20 other countries and the UK participates in many large, pan-European projects with strong international links.¹³ For example, Canada is a fully participating member of the European Space Agency, which regularly works with other non-EU countries such as the USA and China. The UK also plays a leading role in the European and Developing Countries Clinical Trials Partnership — a collaboration between UK researchers, 14 EU countries and 26 sub-Saharan African countries¹⁴. Projects such as these give UK researchers impact and influence well beyond Europe.

Put simply, the research community does not divide neatly into ‘EU’ and ‘non-EU’, and an international research strategy that prioritises one at the expense of another will be weaker as a result. Full association to the EU’s Horizon Europe research programme must therefore be at the heart of the research strategy for Global Britain. If association cannot be achieved, the UK should participate as an ‘industrialised third country’ as a key part of an alternative package. However, this should remain a back-up option, since it would lead to restricted UK access to certain funding themes, no access to EU joint infrastructure and UK researchers would be unable to lead programme projects.¹⁵

The challenge of recreating links to European partners through bilateral agreements with individual Member States should not be underestimated, as many EU and European Free Trade Association (EFTA) countries would not have the additional funding needed to create suitable bilateral funding arrangements outside of the EU programme. Having already paid into the EU, the financial incentive for member states will be to compete within the framework programme and win back more of the money already committed. This is likely to make it difficult to sustain current levels of UK cooperation with EU partners, should the UK not associate to Horizon Europe.

“ If Irish researchers want to keep working with the UK through a new bilateral agreement we would have to find maybe an additional €150 million more — on top of the additional money we need to pay into the EU because the UK left. My finance minister is going to say “Go win more back under Horizon Europe. Go work with Germany, the Netherlands, the Nordic countries”. It’s not that I don’t want to do it, I would love to do it, but the numbers just don’t add up.

Professor Mark Ferguson, Director General and Chief Scientific Adviser to the Government of Ireland

Actions to be taken in 2020–21

- Make every effort to secure full association to the Horizon Europe research programme, as the first step in building research relationships around the world.
- If full association is not possible following wider Brexit negotiations, the UK should seek opportunities to remain involved in the European research community — including through third country participation in funding programmes.

Forge new partnerships beyond Europe

To be a science superpower, the UK will need to have strong networks beyond its immediate neighbours and build on global links it already has. This will need funding structures that support and incentivise new international research collaborations. As it stands today, these structures are not of a sufficient scale to make the Government's ambitions a reality.

Support researchers to identify new collaborators

“ I think the majority of the papers in the top journals in economics, political science, sociology, psychology, philosophy etc. are from spontaneous partnerships — where the research is funded by the university or by their research partner. That's not to say that “big project” grants are not important, but rather that they are only one part — and perhaps even only a small part in the social sciences.

Professor Simon Hix, Pro-Director, Research, London School of Economics and Political Science

Support is needed for organic, “bottom-up” international collaboration that enables researchers to work with whoever they choose to, wherever in the world they may be. This type of collaboration has the benefit of being researcher-led, flexible and responsive.

This organic collaboration is driven by individual scientists and institutions. It is not reliant on complex, rigid overarching structures that need to be negotiated upfront, and is instead supported by flexible funding that can take advantage of emerging opportunities. In a hyper-competitive environment, this ability to move quickly is a considerable benefit.

Increasing ‘quality-related’ (QR) funding would give universities the ability to fund more international collaboration from the bottom up — making the most of researchers’ scientific expertise and international networks to guide decision-making. To ensure accountability, a measure of international collaboration could be incorporated into the existing Research Excellence Framework (REF) assessment process which determines QR allocations. This would generate a long-term incentive for universities to build productive international partnerships that produce excellent research.

An alternative approach is to make researcher grants more flexible. For example, UK public funding agencies could allow a specific proportion of a UK-held grant to be used to directly support a collaborator abroad. This “co-investigator” policy would not require further justification from the researcher, with the funder trusting the discretion of the UK-based grant holder to act in the best interests of their research. This approach can be implemented unilaterally by UK funders without the need for joint administration. Adopting this approach would clearly signal the UK's commitment to international collaboration and ensure UK researchers were sought out as agile and well-resourced collaborators of preference.

Create new national-level partnerships

“ UK funding structures currently don't leave us with much agility on the global stage. If we need to re-define the position of the UK through bilateral and multilateral arrangements, we need structures that allow us to do this.

Professor Sir Adrian Smith, Director, Alan Turing Institute, and President-Elect, Royal Society

Cooperation between countries can be enhanced through bilateral and multilateral Government-led frameworks. These can sit within wider agreements like an FTA or be a standalone ‘science and innovation’ agreement.

If Global Britain is to become a reality, the UK will need funding to support new bilateral or multilateral deals. The Smith-Reid review proposed establishing an ‘Agility Fund’ to “enable the UK to invest in emerging international programmes of significant potential benefit to UK research” and capture unexpected opportunities “including during interactions with other countries at Ministerial levels”.

Multilateral agreements should be the UK’s default option when building new partnerships. As science becomes more global, multi-country programmes are the best way to achieve maximum impact. They are also more efficient and effective than a fragmented patchwork of smaller, siloed, funding pots.

Although multilateral agreements should be used where possible, bilateral agreements can be a powerful strategic tool to develop and deepen a specific relationship. They provide an opportunity to build joint programmes around areas of shared interest, for example, Franco-British co-operation on defence research, which sits within wider bilateral military cooperation.^{16,17} In addition to funding, targeted bilateral agreements can be used to address other factors important to science cooperation like mobility, mutual recognition of qualifications, and alignment of scientific standards. This is explored further in Chapter 3.

Actions to be taken in 2020–21

- Increase funding sources which provide flexibility at the front-line, such as QR funding, to allow universities to support organic collaborations.
- Establish an ‘Agility Fund’ to support different types of top-down international collaborations, as recommended in the Smith-Reid Review.
- Use multilateral funding programs where possible to ensure a more strategic, coordinated and efficient approach to funding international partnerships.

Chapter 3: The UK must use its resources strategically

Avoid duplication and inefficiency in infrastructure

“ You can say you are going to build a world leading ‘something’ but by the time you have done it, is it still world leading? Is it still what industry wants? Has someone else done it better in the meantime? The UK has to have the humility and confidence to be able to look elsewhere and ask, ‘are they are doing it better?’.

Dr Sheuli Porkess, Executive Director, Research, Medical and Innovation, ABPI

As a medium-sized nation, the UK will need to use resources efficiently and strategically to continue ‘punching above its weight’ in research. Cutting-edge research infrastructure — from synchrotron light sources to biobanks — is an essential part of any research environment, but the investment needed is significant and the risks involved are high.

The UK is the host of some cutting-edge facilities. Jodrell Bank hosts the coordinating infrastructure of the Square Kilometre Array — a network of telescopes distributed around the world but managed from Britain. The UK also has an exceptionally strong track-record in longitudinal datasets, with facilities such as UK Biobank being among the very best in the world.

Infrastructure is expensive, shown by the £200-million needed to build a prototype fusion reactor to rival the internationally funded ITER nuclear fusion project based in France.^{18,19} The UK research system has neither the resources, nor the internal demand, to justify an independent version of every research infrastructure required by UK-based researchers. Like every other medium-sized nation, the UK has rightly pursued a strategy of coordination rather than duplication, seeking to share access to key infrastructure among like-minded partners.

International cooperation on research infrastructure has a long history — CERN (European Organization for Nuclear Research) was established by partners including the UK in 1954, predating the European Economic Community by three years. Joint approaches to infrastructure have even succeeded during hostile political situations, as seen with the ‘SESAME’ synchrotron project in the Middle East.²⁰

To avoid wasting resources, the Government must ensure that everything it does, particularly when looking to build large infrastructure projects or invest in other research equipment, is globally competitive, genuinely world-leading and does not duplicate without a clear scientific need.

Sometimes the best use of UK funds will be to invest in projects outside of the UK. This may be because funding something internationally gives the UK access and influence without having to cover the whole cost, or the risk, of building experimental, cutting-edge, infrastructure. Building outside of the UK may also be a better long-term investment if the conditions elsewhere are better suited to that

“In most cases it is better to be part of something truly cutting-edge outside of the UK, than build a second-rate equivalent just to have something UK-based.”

Professor Andrew Harrison, Chief Executive Officer, Diamond Light Source

specific project. For example, the Square Kilometre Array approach of a network of space telescopes positioned around the world takes advantage of better climate conditions for astronomy in other countries.

The location of these investments should be driven by their scientific merit and pragmatic access considerations – which is likely to mean that joint European projects on our doorstep will continue to be of particular importance. The UK must negotiate access to other facilities around the global, and allow global access to UK facilities, to avoid unnecessary duplication.

“ Access to international infrastructure is critical. No one country alone could bankroll an incredible facility like CERN. Crick scientists regularly use the Diamond Light Source in Harwell, but when it can't provide a specific service or is down for maintenance, synchrotrons such as the Synchrotron Soleil near Paris and the Swiss Light Source at the Paul Scherrer Institute in Zurich are invaluable.

The Francis Crick Institute (BEIS Roadmap consultation response, 2020)

Actions to be taken in 2020–21

- Pursue a strategy of coordination, rather than duplication, to ensure access to cutting-edge research infrastructure.

Ensure bilateral and multilateral funding is efficient

Unnecessary duplication and inefficiency can arise when two funders both need to independently approve a project for it to receive any support — often referred to as double jeopardy. This adds uncertainty and delay to international collaboration as well as placing a substantial administrative burden on researchers and institutions.

To help eliminate double jeopardy the UK should use a “lead agency” approach, with one partner designated to oversee the application and review process, wherever possible. This approach is well-established but should become standard practice, requiring the UK to become comfortable with trusted partner nations adopting the lead role. This will also represent an important gesture that the UK is willing to collaborate on other's terms.

Actions to be taken in 2020–21

- Avoid double-jeopardy in setting up bilateral and multilateral funding arrangements by allowing partner nations to take a lead role where appropriate.

Choose international partners strategically

The UK has finite resources and will need to think strategically about who it partners with internationally to meet its own objectives, and to advance science globally.

As a nation well-known for its scientific strengths, the UK should expect to be in demand as an international partner. The Government will therefore come under pressure to use science as a mechanism to drive cooperation in other areas, such as trade. The scientific community will have to accept that it is unrealistic for every international agreement to be driven solely, or even predominantly, by scientific need. The UK Government will also have to acknowledge that the domestic scientific community has limited resources and spreading them too thinly, over a patchwork of small bilateral deals, will reduce the impact of UK science and ultimately its competitiveness. A balance between the two positions will need to be found. This must start with adopting a strategic approach when choosing new international partners, with a clear national objective, and an understanding of what benefits it will bring to UK research.

This national objective could be to increase scientific collaboration with one of the global scientific superpowers — the U.S, China or EU. Alternatively, the UK could look to work more with similar mid-sized countries with a strong research base, such as Japan, South Korea, or Australia. A third option is to build on existing networks of countries, such as the Commonwealth. Meanwhile, it is also in the UK's own interest, and in the interest of good science, to boost global capacity for research by working with lower and middle-income countries (LMICs). Ideally, the UK should build new networks with all of the above but whichever direction it takes, it must be strategic.

The UK should base these relationships on shared principles, drawn up as equal partners. This will ensure both sides are mutually invested in the relationship and the chances of delivering impactful research are maximised. This is important when building partnerships with the Global South, where the imbalance of financial resources can easily distort the balance of power. However, it can be equally relevant when the UK works with larger economies, like the USA and China, where this imbalance works in reverse. This approach will ensure UK interests are not overlooked.

“The downside of bilateral agreements is the politics might mean we spread the jam too thinly. I haven't been on a ministerial trip yet where a politician didn't say 'yes' to an agreement of some kind or another.”

Professor Sir Steve Smith, International Education Champion, outgoing Vice-Chancellor and Chief Executive of the University of Exeter

“In Rwanda, we have some great partnerships and have done some significant research. However the majority of UK funds we directly compete for do not concern subjects that match the needs of our country. I am writing a research application for a programme with a UK university based on UK priorities — because that is where the money is. I would love to put my energy into equally exciting research that will also help to build my country”.

Professor Agnes Binagwaho, Vice Chancellor and co-founder, University of Global Health Equity, Rwanda

Once agreed, partnerships must be nurtured for the long term, supporting research for decades, instead of years. Short-term funding leads to short-term goals and short-term outputs. International links take time to become deep-rooted. This is most important when partnering with a low-resource country, where long-term stability is critical to building lasting research capacity.

Strategic global cooperation also means conducting research where it makes most sense to do so, and where it will have greatest impact. The UK should plan accordingly and help shift the centre of gravity (including leadership and decision-making) to where the knowledge and experience needs to be built. For example, research to tackle malaria in communities is best led by people with the insight of living where malaria is present. Countries outside of the OECD also represent an increasing share of global R&D spend. This creates an opportunity for the UK to both support the global expansion of research capacity and enhance its own collaborative networks.

Scientists are predominantly concerned with science and less about the wider political or diplomatic agenda. In fact, science has a rich history of crossing divides that governments could not — through science diplomacy. For example, at the height of the Cold War U.S. and Russian scientists continued to collaborate on mechanisms to prevent the accidental use of nuclear weapons.²¹ In uncertain political times, the UK Government needs a research strategy for how it will engage with countries that it may have fundamental disagreements with in other areas. Without being naïve to the wider political ramifications, science collaboration should proceed wherever possible, as it has so successfully in the past — acting as a “tunnel” through which cooperation, and communication can be sustained.

“One of the problems the UK has is that it has these funding ideas, it sets them up, and even if they are successful it doesn’t follow through with long term funding. It is really really frustrating. The money is only there for 3–5 years and then it’s gone. It’s not strategic and it is not a strategic investment in those countries.”

Professor Sir Ian Boyd, Professor in Biology, University of St Andrews

Actions to be taken in 2020–21

- Ensure new research partnerships have a clear strategic purpose built around shared priorities and are invested in over the long term. The UK needs to have a clear overarching strategy setting out what it wants to achieve from these partnerships, and ensure any new relationship fits that strategy.
- Reframe relationships with the Global South by shifting the centre of gravity, including funding, leadership and decision making, to where it is best suited and will have the greatest impact.

Chapter 4: The UK must use its influence for global good

Progress from ‘world-leading’ to global leadership

“ Part of being a global leader in research is having the courage to lead into new places, to take on challenges that to others might seem insurmountable.

Amanda Solloway MP, Minister for Science, Research and Innovation (Vitae Connections speech, September 2020)

If the UK wants to influence the global research agenda, it needs to be clear and consistent about the areas it is looking to focus on and champion them internationally. The UK has previously used its scientific reputation to take on a true leadership role in tackling global challenges, combining research expertise with political and diplomatic knowhow. For example, it has successfully put the need for action on anti-microbial resistance (AMR) on the global agenda.

However, more recently the UK’s leadership track record on AMR has been patchy and inconsistent. Ultimately, commitments have not been converted into the action needed. This shows the importance of pursuing a clear strategy, communicating it, nurturing enduring partnerships, and following through over the long term to have real and sustained global impact.

“The UK helped turn AMR into a political and media topic and raised its profile hugely in the EU and globally.”

Sascha Marschang, Acting Secretary General, European Public Health Alliance

The UK enjoys formal influence via its diplomatic presence in many parts of the world, and a prominent position within international organisations like NATO, G7, UN, and WHO. In 2021 the UK will assume the G7 presidency and the Chair of the UN Climate Change Conference, providing the perfect opportunity for the UK to use these routes of influence to progress its priorities. The UK can also demonstrate its commitment to tackling scientific challenges and its ability to work with others, internationally, to achieve its goals.

At a time when some are questioning the role of multilateral organisations, the UK will have to work hard and strategically to build a ‘coalition of the willing’ on its priorities. For example, identifying areas of alignment such as the UK and EU’s shared position on AMR and committing to action on climate change.

UK leadership should also be reactive and responsive to global events. The UK must step up as opportunities arise to deliver coordinated action. The UK has done this successfully in the past in developing and deploying an effective Ebola vaccine alongside the

“Multilateral organisations have not had a strong enough science component historically. Post-Covid, changing this is going to be essential. One call to action from Covid is for countries to improve how science and policy can work better together. Historically, this is something the UK has been very good at, and can be in a very strong position to lead on.”

Dr Marga Gual Soler, Science Diplomacy Consultant

Norwegian Government and the UK Department for International Development

The profound impact of the Covid-19 pandemic means that this must be an immediate priority. The strong UK research response, including the Oxford Vaccine Trial and RECOVERY trial, have had global impacts.²² The Government should build on this scientific foundation and take a leadership role in international efforts to tackle the virus and to prepare better to prevent future pandemics. In tackling the virus, the UK must champion investment for developing global public goods like vaccines, therapeutics and diagnostics, and make the case for equitable access to these products. The Prime Minister recognised this during his 2020 address to the UN General Assembly when he said, “The health of every country depends on the whole world having access to a safe and effective vaccine” and announcing a 30% increase in the UK’s contribution to the WHO.²³ This the right message, and the UK’s global leadership on this point now needs to be sustained over time.

“The Covid-19 crisis is a good way of showing ‘We are not in the EU but we are still willing to work together’. It’s not just about the pandemic, and what happens during the pandemic, but what will happen post this pandemic and beyond. Will this level of cooperation carry on into the future?”

Dr Sridhar Venkatapuram, Acting Deputy Director, King's Global Health Institute
Director, Global Health Education & Training at King's College London

The UK should also use its international platform to advocate for pandemic preparedness to remain a political priority beyond the end of the current crisis, particularly to drive the establishment of new financing mechanisms for global public goods and prevent the next epidemic from becoming a pandemic.

Actions to be taken in 2020–21

- Strategically select scientific challenges for long-term UK leadership, building on and amplifying existing research expertise. This could include challenges where the UK has a strong track record like AMR and areas where it has already heavily invested in research efforts, like Covid-19.
- Use opportunities such as the upcoming UK G7 presidency to make progress on priority issues, including the global effort to develop and deliver Covid-19 vaccines, diagnostics and treatments, and new financing mechanisms for these global public goods.

Maximise diplomatic and informal influence

“ We are very much welcome at the table because of our willingness to be collaborative.

Professor Pamela Kearns, Director, Institute of Cancer and Genomic Sciences, University of Birmingham

The knowledge and expertise of the UK science community is welcomed on the global stage. The UK has a reputation for being able to run and administer international funding and projects, convene different voices, broker solutions, and maintain a focus on high quality science. This provides the UK with informal influence and ‘soft power’. We are also entering a new age of scientific diplomacy with political issues increasingly underpinned by questions of science — recent security concerns about the UK 5G network being a prominent example. The role of scientific advice has never been more important.

The UK’s science advice mechanisms for government are among the strongest in the world, and many other countries look to the UK’s model for inspiration. The network of Chief Scientific Advisers (CSAs) in every Government department could be deployed more internationally, demonstrating both the UK’s commitment to science and willingness to cooperate with others. Dame Sally Davies showed how the Chief Medical Officer’s role can be used to establish global leadership with her efforts on Antimicrobial Resistance.²⁴ The network of CSAs could also be used as part of international government missions to underline and maximise the benefit of this UK strength, and increase the scope for building new routes for research collaboration.

The UK’s ability to successfully influence international science is best demonstrated in our relationship with the EU. Colleagues in Europe are particularly candid in acknowledging the role the UK has played in helping to shape aspects of the European Research Area (ERA), the current EU framework programme and research policies. UK researchers are also reported to have high impact and influence on joint projects and collaborations.

At the end of the transition period, the UK will no longer have a formal influencing role into EU research programmes. However, in science, and particularly at EU level, decisions are made through consensus and a lack of formal influencing channels has until now rarely been a barrier to shaping the outcomes of discussions. This is recognised by many other countries that work closely with the EU but are not Member States. The UK should build on, and engage with, its existing expansive informal influencing role within the EU and across Europe. Doing so will ensure interests are aligned and cooperation can continue as smoothly as possible.

Actions to be taken in 2020–21

- Continue to make use of the UK’s informal networks across Europe, particularly if the UK associates to Horizon Europe.
- Harness the global reputation of the UK’s scientific advice mechanisms, by giving CSAs leadership roles on tackling global challenges and including them in trade missions.

Be a pioneer of regulatory diplomacy

International cooperation on regulation would allow the UK to help shape the future of global science and innovation, and reduce barriers to trade through avoiding unnecessary divergence.

Historically the UK has been a regulatory leader in emerging science and technology. For example, the UK's robust approach to the regulation of human embryos has contributed to the UK becoming a world leader in the study of human development. However, it is no longer enough to simply have a great approach to regulation nationally. The UK must also look outward, sharing these technical advances and regulatory approaches through global engagement and diplomacy, while also learning from others. This was recognised in the Prime Minister's 2019 address to the United Nations General Assembly that called on countries "to agree a common set of global principles to shape the norms and standards that will guide the development of emerging technology".

Regulatory diplomacy is likely to be particularly important and beneficial for emerging science and technologies and there is an opportunity for the UK to take a lead. Cooperation is most likely to be successful in "new" sectors where a significant body of regulations does not yet exist. Regulatory diplomacy can therefore be used to support progress towards a common rule book or consistent approaches that reduce friction in trade. Emerging areas are often complex and fast-moving, making it difficult for individual countries to meet these regulatory challenges efficiently and effectively alone. Working together allows for expertise and resources to be shared, ultimately leading to better regulation and reducing costs.

The government has recognised the role regulation plays in creating a successful innovation environment by creating Regulatory Horizons Council (RHC).²⁵ However, the RHC's remit is currently only domestic and a broader view is needed to seize the opportunities of regulatory diplomacy.

Actions to be taken in 2020–21

- Deliver on the Prime Minister's invitation to host an event in London on the global regulation of emerging technologies to make progress on determining shared norms and standards.
- Broaden the remit of the Regulatory Horizons Council to have an explicit international focus. Doing so will allow the Council to monitor, work with, and learn from, similar bodies around the world.

Next Steps

The UK Government has made a clear commitment to research, aiming to put it at the heart of both its domestic and international policy agenda. This reflects the critical role that a thriving UK and global research sector will have in securing the health and prosperity of citizens around the world over the decades ahead.

For the future of UK research to be as bright as its past, the UK must be a country that is global in outlook, collaborative in nature, and welcoming at heart. It must be a leader in tackling global challenges — both because it is in the UK's interest to do so, and to share the burden faced by others. The UK must be globally competitive, but recognise that this is achieved by being globally collaborative. The UK must be strategic and make sure that it uses its influence to deliver evidence-driven solutions that improve people's lives. Only then will the UK be able to live up to the title of science superpower.

List of actions to be taken in 2020–21

1. Implement the actions highlighted in the BEIS R&D Roadmap to supercharge the UK's domestic research environment.
2. Commission an 'international' equivalent of the BEIS R&D Roadmap that sets the overall vision for Britain's place in the world for research. This should become the 'North Star' for Government decision-making, based around clear goals.
3. Create an engaging narrative for the UK's research ambitions that resonates with the community who are needed to deliver it. Develop phrases and slogans in the same way as for any political campaign — by message-testing with the intended audience.
4. Mandate the Office for Talent to radically improve the 'user experience' for researchers and their teams coming to the UK for both short-term visits and long-term work. Requesting a visa should be a smooth process and joined-up with any funding applications the applicant has made.
5. Make visas for researchers and their teams cheaper. Find innovative ways to ensure that the UK does not price itself out of the market, or restrict itself to research talent that already has considerable financial means at its disposal.
6. Fully embrace the benefits of outward mobility and strengthen the UK's existing overseas network, for example by setting up a UK research alumni network.
7. Further encourage an exchange of research talent with strategic partners around the world. This could include provisions in Free Trade Agreements or science and innovation agreements, or singular standalone programmes such as joint PhD or exchange schemes.
8. Create a 'single front door' for UK research around the world. The existing Science and Innovation Network could be resourced to provide this.
9. Conduct an internal review of the capacity of the Science and Innovation Network to ensure it can clearly signpost the UK's research offer, in terms of its capabilities and strengths, and guide potential collaborative partners. It should become a true network that is both well-connected in the host country, connected with stakeholders in the UK and across the rest of SIN.

10. Make every effort to secure full association to the Horizon Europe research programme, as the first step in building research relationships around the world.
11. If full association is not possible following wider Brexit negotiations, the UK should seek opportunities to remain involved in the European research community — including through third country participation in funding programmes.
12. Increase funding sources which provide flexibility at the front-line, such as QR funding, to allow universities to support organic collaborations.
13. Establish an 'Agility Fund' to support different types of top-down international collaborations, as recommended in the Smith-Reid Review.
14. Use multilateral funding programs where possible to ensure a more strategic, coordinated and efficient approach to funding international partnerships.
15. Pursue a strategy of coordination, rather than duplication, to ensure access to cutting-edge research infrastructure.
16. Avoid double-jeopardy in setting up bilateral and multilateral funding arrangements by allowing partner nations to take a lead role where appropriate.
17. Ensure new research partnerships have a clear strategic purpose built around shared priorities and are invested in over the long term. The UK needs to have a clear overarching strategy setting out what it wants to achieve from these partnerships, and ensure any new relationship fits that strategy.
18. Reframe relationships with the Global South by shifting the centre of gravity, including funding, leadership and decision making, to where it is best suited and will have the greatest impact.
19. Strategically select scientific challenges for long-term UK leadership, building on and amplifying existing research expertise. This could include challenges where the UK has a strong track record like AMR and areas where it has already heavily invested in research efforts, like Covid-19.
20. Use opportunities like the upcoming UK G7 presidency to make progress on priority issues, including the global effort to develop and deliver Covid-19 vaccines, diagnostics and treatments, and new financing mechanisms for these global public goods.
21. Continue to make use of the UK's informal networks across Europe, particularly if the UK associates to Horizon Europe.
22. Harness the global reputation of the UK's scientific advice mechanisms, by giving Chief Scientific Advisers leadership roles on tackling global challenges and including them in trade missions.
23. Deliver on the Prime Minister's invitation to host an event in London on the global regulation of emerging technologies to make progress on determining shared norms and standards.
24. Broaden the remit of the Regulatory Horizons Council to have an explicit international focus. Doing so will allow the Council to monitor, work with, and learn from, similar bodies around the world.

Acknowledgments

This report has been informed by over 50 interviews with a range of stakeholders in the global research community, scientists working on the front line, and leaders and decision makers.

As part of this process, we commissioned the Institute for Government to host a series of themed roundtables with key figures to discuss and debate issues central to this report.

We are very grateful to everyone who took part in these interviews and roundtables. However, our report is not a synthesis of their views, but is Wellcome's own assessment of how to make global research as strong as it can be — through the UK living up to its role in the world.

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