



HM Government

International Research and Innovation Strategy





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Foreword

We are at a pivotal moment in a rapidly changing world.

We face pressing global challenges and we are on the brink of technological transformations that will impact us all. The importance of global cooperation to find solutions and to drive our long-term prosperity has never been greater.

The UK is ready to play its part—we are a global, outward-looking nation. We have a world-leading research and enterprise environment that attracts collaboration from across the globe. The UK wants to go further. Our global engagement involves the entire UK's science and innovation community, our people, our organisations and institutions, and our world-leading infrastructure.

Through this strategy we will bring a new coherence and sharper focus to the UK's international research and innovation effort. As the UK redefines its relationship with the European Union, the UK Government is committed to pursue a far-reaching relationship with the EU, and with individual member states, on science, research and innovation as an integral part of our approach.

We have a strong track record; from bilateral initiatives to multilateral engagement. We are leading from the front to address global challenges from climate change to infectious diseases. We are also driving technological

change by putting science, research and innovation at the heart of our Industrial Strategy, a strategy built on partnerships and with global reach. We have set four Grand Challenges to put the UK at the forefront of the industries of the future: Artificial Intelligence and Data, Clean Growth, the Future of Mobility and the Ageing Society.

We are bringing forward the largest investment in R&D for four decades and we are committed to reaching 2.4 per cent of GDP invested in R&D by 2027 and three per cent of GDP in the longer term. This forms one part of our overall offer to researchers, innovators and investors. The UK is a global innovation hub where ideas can turn into new global businesses. Underpinning this is our enabling regulatory environment, and our standards and Intellectual Property regimes that have global reach in setting international standards and norms.

The future is uncertain, and we do not know all the problems and challenges we will all face. But we do know we will face them best by facing them collaboratively, winning breakthroughs in science and innovation—drawing upon the very best of human intellect and ingenuity.

Chris Skidmore

Minister of State for Universities,
Science, Research and Innovation



Introduction

This strategy sets out how the UK will develop its international research and innovation partnerships to help achieve the targets in our modern Industrial Strategy.

We are a world-leading research nation, with a well-rounded, impactful and globally connected research base. With only 0.9 per cent of the world's population, and 4.1 per cent of researchers, we account for 10.7 per cent of citations and 15.2 per cent of the world's most highly cited articles. Over half our scientific papers have international co-authors, and 72 per cent of active researchers in the UK are internationally mobile¹. We produce and attract some of the most talented people in the world – since 2001 there have been 20 British Nobel Laureates².

We have built upon this excellent research base with a joined-up innovation ecosystem spanning world class talent, physical and digital infrastructure, and enabling financial and regulatory environment. This place's the UK in the top four of global innovation nations. Our vibrant start-ups are already attracting record levels of investment. In 2017 the UK brought in \$4bn or more than 2.5 per cent of global venture capital funding³. In 2018 UK based AI companies raised \$1.3bn⁴, almost as much as the rest of Europe put together. Building on this success, we are increasing investment in research and innovation to a historic high of 2.4 per cent of GDP by 2027, and to three per cent in the longer term.

In this strategy, we show how we will open all parts of our research and innovation system to international partnership with the best in the world in order to tackle global challenges and create growth. We are looking for impact in all areas of research and innovation. From fundamental scientific discoveries to the development of cutting-edge technologies; from innovating practical solutions to shared challenges and to strengthening global governance frameworks.

Through a series of key themes the strategy targets the UK's offer to distinct international audiences, other governments, research organisations, businesses and investors, and individual researchers and entrepreneurs.

Our seven themes are:

- ▶ **A global partner:** how we will build and promote partnerships and openness, guided by excellence and impact.
- ▶ **Bringing together talent:** how we will connect researchers and entrepreneurs, support their development and the translation of their ideas, and build global people networks.

- ▶ **A global hub for innovation:** how we will provide innovation hubs across the UK for global innovators, entrepreneurs and investors to connect and build industries of the future.
- ▶ **A package of incentives and financial support:** how the UK's package of incentives and financial support attracts innovative start-ups and scale-ups, and how that support will grow.
- ▶ **A global platform for the technologies of tomorrow:** how the strengths and global reach of our governance, intellectual property and standards frameworks can support the design of common, global regulatory approaches to bring forward emerging, transformative technologies.
- ▶ **A partner for a sustainable future:** how we will build and invest in collaborative partnerships to tackle the greatest global challenges.
- ▶ **An advocate for better research governance, ethics and impact:** how we will build through multilateral fora an international consensus on research governance, ethics and on Open Science to share knowledge and build trust.

Our engagement will be led by the Science and Innovation Network teams in our Embassies and High Commissions across the world. This engagement will include the UK's regions and Devolved Administrations and the wider science and innovation communities. Our implementation

will be guided by Professor Sir Adrian Smith's advice on the UK's future frameworks for international research and innovation collaboration, announced alongside this strategy. This advice will ensure our implementation aligns with this strategy's goal for the UK to be the partner of choice for international research and innovation for the long term. It will also support the aims of the Government's Industrial Strategy and in meeting our target of 2.4 per cent of GDP invested in R&D by 2027, and 3 per cent in the longer term.

UK Global Research and Innovation

6 per cent

of global research publications are produced by the UK⁵.

15 per cent

of the world's most highly cited articles come from the UK⁶.

£23.7bn

invested in R&I by UK businesses in 2017⁷.

Top four

in the **Global Innovation Index**⁸.

Three

universities ranked in the **top ten globally**⁹.

Top ten

in **World Bank** ease of doing business rankings¹⁰.

A global partner

A partner for open, excellent and entrepreneurial research and innovation.

We want to build and promote international partnerships and openness, guided by the research and innovation principles of excellence and impact. **The UK's offer is to other nations and their research and innovation communities.**

Our offer

Partnership: We want to build strategic government and institution-level agreements for deep and long-term research and innovation collaboration. We will also support universities and other research and innovation organisations to develop their own international partnerships and collaborations.

Openness: We will promote and facilitate wider access to the full research base, including our universities and our research infrastructure, to enhance excellent research and innovation collaboration to address shared challenges.

Excellence: We will build partnerships that recognise the importance of curiosity led and interdisciplinary research and knowledge exchange.

Our commitments

- ▶ We will seek out opportunities for bilateral collaboration to deliver shared objectives, guided by excellence and impact.
- ▶ One of our core objectives is to continue to collaborate with European partners on major science, research, and technology initiatives. We want to explore association to EU research and innovation programmes, including Horizon Europe and Euratom Research and Training, networks and infrastructure.
- ▶ The new strategic partnership approach with Africa announced by the Prime Minister in 2018 is underpinned by a coherent cross government science, technology and innovation approach. This will help to ensure that promising new innovations and technologies are better linked to entrepreneurs and policy makers on the ground, and that local companies with transformative innovations are given the tools they need to scale.
- ▶ We have introduced new research and innovation partnership funding, including the £110m Fund for International Collaboration.

- ▶ We are creating a long-term research and innovation infrastructure roadmap, incorporating leading UK and international facilities as a cornerstone, to develop an effective strategy for future requirements and investment priorities.
- ▶ We will use our extensive diplomatic networks, led by our Science and Innovation Network teams and including Her Majesty's Trade Commissioners, the Devolved Administrations, UK Research and Innovation, Newton and British Council offices to enhance international cooperation, build partnerships and deliver this strategy.
- ▶ We will work with our universities, research institutes, the academic and business communities to promote and facilitate international collaboration and use their networks and influence to build new partnerships that produce excellent research and innovation.

Key facts

- ▶ Half of published UK research is the result of international collaboration¹².
- ▶ Since 2014, the UK Research Councils have funded 4,254 international research and innovation collaborations totalling £3.3bn¹³.
- ▶ The UK's Science and Innovation Network has over 100 officers spanning 47 countries.

World map of the UK's science and innovation network.



Source: Foreign and Commonwealth Office

Case studies

Partnership: We have signed far-reaching research and innovation bilaterals, including Canada, China, India, Israel, Japan, Singapore, South Korea, and the US, as well as 17 bilaterals under the £735m Newton Fund. We also support bilateral and multilateral co-operation with the EU member states.

Partnership: The UK and Singapore have partnered to build a satellite quantum key distribution test bed, under a £10m jointly funded research programme led by the Science & Technology Facilities Council and the Centre for Quantum Technologies (Singapore).

Openness: Our world leading research institutes, from the Alan Turing Institute for data science and artificial intelligence to the Francis Crick Institute for fundamental biology underlying health and disease – attract research talent from across the world and are deeply engaged in international partnerships.

- ▶ The **University of Exeter** and **Cefas Centre for Sustainable Aquaculture Futures** are bringing together world-leading scientists to address interdisciplinary challenges facing sustainable fishing internationally.

- ▶ **Queen's University** in Belfast is supporting international partnerships to accelerate the results of cyber and physical security research through to commercial application.


- ▶ The new £180m Oil and Gas Technology Centre in Aberdeen is already becoming a new global hub for oil and gas innovation, in partnership with the **University of Aberdeen** and **Robert Gordon University**.

- ▶ **Cardiff University's** Compound Semiconductor Centre will link industry and academics in a European hub to accelerate the commercialisation of materials and device research.

Excellence: The UK Nordic joint research programme on migration and integration is a world-first interdisciplinary partnership that researches the motivations, experiences and impact of migrants.

Excellence: The National Innovation Centre for Ageing and the National Innovation Centre for Data, located in Newcastle, provide a global hub to facilitate links between innovators, businesses and academia and to help deliver on the Grand Challenges.

The UK's research and innovation partnerships have global reach and impact



The **UK-Canada AI Innovation Challenge** is inspiring AI solutions in aerospace from companies in both countries.




13,000 delegates welcomed to the International Business Festival in Liverpool to see UK start-ups involved in the Grand Challenges.



Some of the UK's most innovative businesses met their US counterparts on board the **HMS Queen Elizabeth** in New York, for a trade mission on cyber security and AI.




\$500m invested by Japan's Softbank in Improbable, a London-based company crafting virtual worlds.



The **Newton Prize** is funding scientists in the UK and Chile to develop ways to strengthen energy infrastructure so that it can withstand extreme weather and natural disasters.



£32m invested in Technology Accelerators to build innovative business links between Africa and Britain.



Novo Nordisk is investing **£115m** in a new centre for development of medicines that will transform the lives of people with diabetes.




In May 2018, the UK signed **agreements for science and innovation with Israel**, for greater collaboration in shared priority areas including advanced materials and Ageing Society.




The UK is chairing the **EUREKA programme** for 2018/19. This intergovernmental network supports innovation-driven entrepreneurship in Europe.




£35m planned for investment in British AI start-ups by Japan's AI-focused Global Brain.




Chinese robotics company JEE Automation Equipment is investing **£6m** in the UK to establish an assembly and testing facility in Birmingham.



The second **UK-India Energy for Growth Dialogue** took place in September 2018.



\$72m co-invested with South Africa, through the UK's International Climate Finance, in our Clean Growth ambitions for battery storage



£10m invested by the UK and Singapore in a joint quantum space programme.

Bringing together the best talent from around the world

We want to connect researchers and entrepreneurs, support their development and the translation of their ideas, building the global people networks for the future.

The UK's offer is to researchers and innovators from around the world.

Our offer

Talent: We will provide opportunities for international researchers and research-leaders to join our vibrant, diverse and internationally connected research community to advance their knowledge and skills - from work in curiosity led research through to new technologies and services.

Impact: We will leverage the UK's research management excellence to help international researchers deliver highest quality research with impact. Researchers will benefit from the UK's academic freedom and opportunities for professional development. We will enable access to a network of incubators and accelerators that make the UK the best place for international researchers and tech entrepreneurs to develop their talents and turn their research into innovative businesses.

Mobility: We will encourage our best researchers at all career stages to boost their international connections.

Our commitments

▶ We are committed to funding research talent, including:

- £1.3bn to attract and retain world class talent, through UKRI's Future Leadership Fellowship and from the UK's National Academies to guarantee the UK's place at the forefront of discovery and innovation.
- A new AI skills and talent package supported by industry funding and up to £110m government investment including: up to 200 new AI Masters places at UK universities; new PhDs for 1,000 students at 16 dedicated UKRI AI Centres for Doctoral Training; up to five AI research Fellowships created in collaboration with The Alan Turing Institute.
- ▶ We are ensuring our visa arrangements support international researchers, innovators, their teams and their families.
- ▶ A suite of UK based Fellowships for promising global researchers, including Newton International Fellowships, Chevening and Commonwealth Fellowships.
- ▶ Commitments to build research capacity in partner countries and create a global network of promising early career researchers with links to the UK, including FLAIR Fellowships for African researchers.

Key facts

- ▶ In the top four of OECD countries in the international mobility of our scientific authors¹⁴.
- ▶ 30 per cent of our academic staff come from outside the UK¹⁵.
- ▶ Higher Education Innovation Funding will increase to £250m by 2020/21 for knowledge-based interactions between universities and the wider world.

Case studies

Talent: Dr Karla Miller came from Stanford to the UK through EPSRC/ Royal Academy of Engineering, and Wellcome Trust Fellowships to develop new diffusion imaging techniques for MRI that allow us to map connections between different parts of the brain.

Impact: SetSquared is a world-leading shared business incubator and enterprise partnership in five premium UK universities: Bath, Bristol, Exeter, Southampton and Surrey. SetSquared member companies raised £292m of funding in 2018.

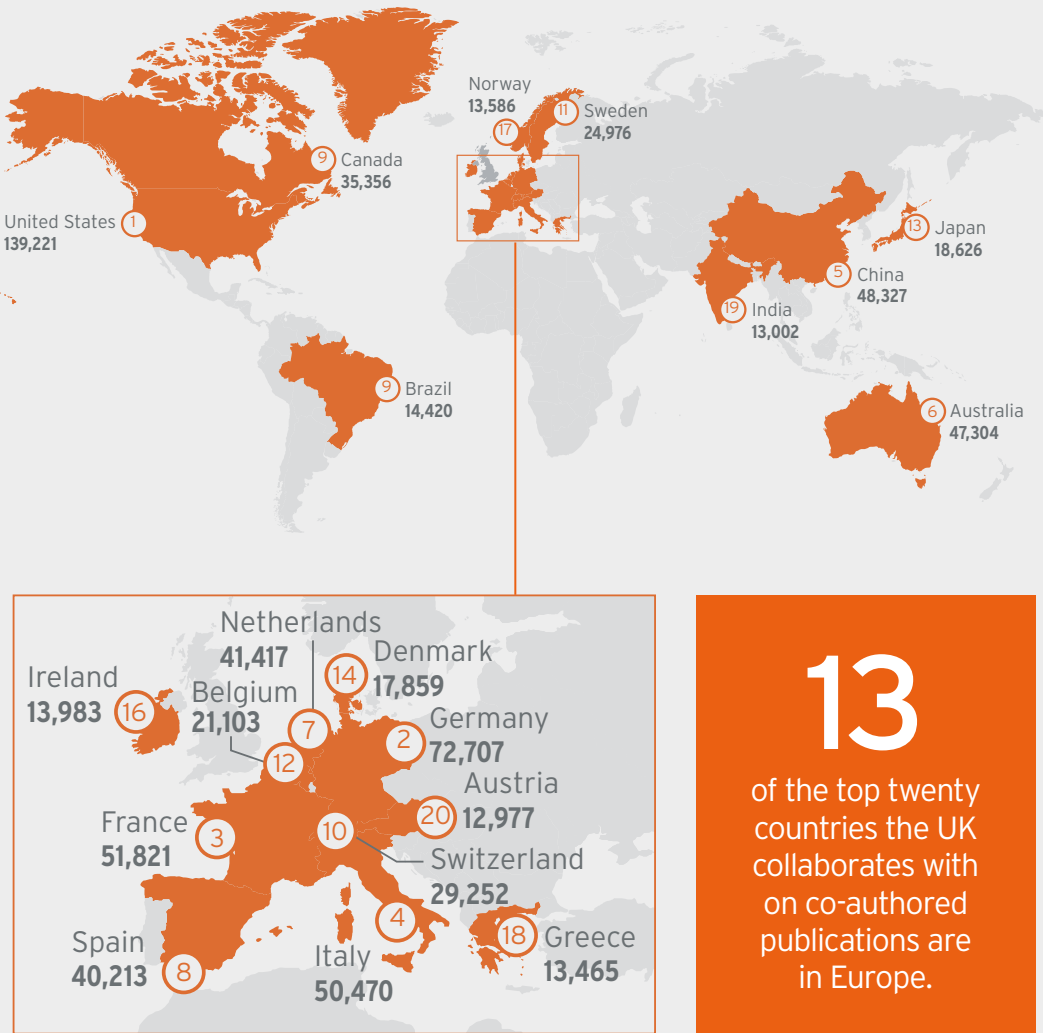
Impact: KETS Quantum Security, a University of Bristol start-up company, is developing a range of future-proof, cost-effective technologies for quantum-secured communications that have the power to improve the secure transmission of information such as banking details and medical records.

Mobility: The UK Atomic Energy Agency and the Princeton Plasma Physics Laboratory have set up a joint exchange programme which brings some of the best UK researchers to Princeton to work on new fusion technology.

- ▶ Our Knowledge Exchange Framework will support closer working between industry and academia promoting a culture of continuous improvement in knowledge exchange.
- ▶ Regional DFID technology acceleration platforms working with Innovate UK Knowledge Transfer Network to ensure linkages between networks of UK and African entrepreneurs and the private sector.
- ▶ The £900m UK Research Partnership Investment Fund is supporting new research centres and facilities via strategic partnerships between universities, businesses and charities, and will secure double that amount from private co-investment.

The UK's top collaborative partners

Countries with highest numbers of co-authored publications with the UK between 2013 and 2017, top twenty.



13
of the top twenty countries the UK collaborates with on co-authored publications are in Europe.

Source: SciVal c/o Universities UK

A global hub for innovation

We will provide innovation hubs across the UK for global innovators, entrepreneurs and investors to connect and build industries of the future.

The UK's offer is to international innovators, entrepreneurs and investors.

Our offer

A system geared to innovation: We will give international businesses investing in the UK access to the partners, talent, infrastructure and finance to boost their innovation performance and impact.

Entrepreneurial ecosystems:

Businesses and investors coming to the UK will benefit from the UK's vibrant start up ecosystem. In addition to this, our international tech hubs open up the best UK businesses to partners and investors in global entrepreneurship hotspots.

Turning innovative ideas into the businesses of the future:

We will provide opportunities for global business and investors to get in at the 'ground floor' of new industries, participate in horizon scanning and build partnerships with the UK's world class research base and tech SMEs, including in future sectors.

Focus on Grand Challenges: We want to attract businesses to the UK who can join us in finding solutions to four societal Grand Challenges - Artificial Intelligence and Data, Clean Growth, the Future of Mobility and Ageing Society.

We will build international research and innovation alliances to solve these challenges for all.

An Innovation nation: Our research and innovation centres of excellence are widely distributed across the UK, and we can assure investors in technology and innovation that they will be at the heart of new local growth and productivity strategies.

Giving our best businesses global reach: We will encourage our most promising SMEs to develop international research and innovation partnerships – connecting our best to the best in the world to lead the industries of the future.

Our commitments

- ▶ In the UK's Industrial Strategy we have set out the goal of making the UK the most innovative country in the world by 2030.
- ▶ We have established hubs of tech innovation throughout the UK that are world-leading.
- ▶ We are establishing a global network of 'Tech Hubs' to share expertise and best practice for digital tech, supporting local entrepreneurs, start-ups and established tech companies through training and mentoring.

- ▶ We are working towards a global digital marketplace supporting greater transparency in public procurement - focussed largely on digital, data and technology suppliers and open to large companies and SMEs.
- ▶ We have an extensive Catapult network giving business access to world class research, general-purpose technologies and investment opportunities to boost their productivity and growth and extend their international reach.
- ▶ We are extending Innovate UK's Global Expert Missions and Business Innovation programmes, helping to map and connect the public sector and innovation stakeholders to ensure international collaboration can accelerate innovation and commercialisation.
- ▶ Through the UK Chairmanship of and participation in EUREKA we are working with members to develop a global framework for business-led R&D and innovation collaboration, and have committed a further £20m to support international collaboration through EUREKA.

Key facts

- ▶ Innovative UK SMEs lead the way in the OECD for collaborating with higher education or research institutions¹⁶.
- ▶ The proportion of UK SMEs which engage in international collaboration for innovation is the 2nd highest in OECD¹⁷.
- ▶ Long-term funding of almost £1bn to the Catapult networks supporting work in high-tech labs, cutting-edge factories and advanced training centres¹⁸.

Total R&D investment by region in 2017 across the UK¹⁹

South East	£6730m	South West	£2334m
East of England	£5938m	East Midlands	£1938m
London	£5548m	Yorkshire & the Humber	£1641m
North East & North West	£3747m	Wales	£742m
West Midlands	£2965m	Northern Ireland	£694m
Scotland	£2529m		

Case studies

A system geared to innovation:

Beyond Limits, an autonomous systems spin out of NASA, has chosen the UK as its base for global expansion based on the deep pool of AI and data science talent, and opportunity for research collaborations.

Entrepreneurial Ecosystems:

Since its launch in 2011, the UK Israel Tech Hub has facilitated 175 innovation partnerships and generated deals valued at £85m.

Turning innovative ideas into the businesses of the future:

The industry-led Sector Deal for Artificial Intelligence in April 2018 outlined a £1bn package of support for the sector and led to the creation of an Office of AI, to manage AI policy, and the Centre for Data Ethics and Innovation.

Focus on Grand Challenges:

The Faraday Institution, as part of the £246m Faraday Battery Challenge, endeavours to make the UK a hub for the research, development, manufacture and production of new electrical storage technologies, to help solve the Future Mobility Grand Challenge.

An Innovation Nation: In 2018, 1000 AR and VR companies around the UK generated £650m, accounting for 9 per cent of global market share of this growing industry. Regional hubs reflected established strengths of each locale: gaming in Brighton, healthcare in Cambridge, manufacturing in Gateshead, and engineering in Bristol.

Giving our best businesses global reach: Immunocore, a UK based biotech unicorn was supported in a EUREKA project with a French SME to develop new products— as a result of which, it received £327m in follow-on funding.

The UK's 25 Science and Innovation Audits demonstrate the breadth of strengths that exist across the UK

- 1 Edinburgh and South East Scotland City Region**
Digital technology and data-driven innovation
- 2 Sheffield City Region and Lancashire**
High value manufacturing
- 3 Greater Manchester and East Cheshire**
Health innovation and advanced Materials
- 4 Midlands Engine**
Medical technologies, energy and next generation transport.
- 5 South West England and South East Wales**
Advanced engineering and digital Innovation
- 6 Enabling Technologies in Scotland's Central Belt**
High value manufacturing
- 7 Bioeconomy of the North of England**
Agri-tech and industrial biotechnology
- 8 East of England**
Life sciences and agri-tech
- 9 Innovation South**
Digital enabling technologies
- 10 Leeds City Region**
Medical technology
- 11 Liverpool City Region+**
Infection; materials chemistry; and high performance computing
- 12 OffShore Renewable Energy**
Offshore energy and sustainable ocean technologies
- 13 Oxfordshire Transformative Technologies**
Quantum computers; autonomous vehicles; digital health; and space and satellites
- 14 Cyber Resilience Alliance**
Cybersecurity
- 15 Maximising the Marine Economy of the Highlands & Islands**
Aquaculture, wave and tidal energy and marine biotechnology
- 16 North West Nuclear Arc Consortium**
New nuclear technology
- 17 North West Coastal Arc Eco-Innovation Partnership**
Low carbon energy and eco-innovation
- 18 Northern Powerhouse Chemicals and Processing Science**
Chemicals
- 19 Northern Powerhouse in Health Research**
Medical
- 20 The South Wales Crucible**
Steel innovation; smart manufacturing; health informatics; and agri-tech
- 21 Upstream Space**
Space infrastructure and technology
- 22 Precision Medicine Innovation in Scotland**
Precision medicine
- 23 Applied Digital Technologies**
Digital capability
- 24 Sustainable Airports**
- 25 The Knowledge Quarter**
Biomedical; heritage; digital publishing; and data science

Science and Innovation Audits help local organisations map their research and innovation strengths, and identify areas of potential global competitive advantage.



Incentives and financial support

The UK offers a package of incentives and financial support to seed and grow the innovative businesses of the future, and that support is growing.

The UK's offer is to entrepreneurs, innovative businesses and investors.

Our offer

Long-term commitment: Our commitment to raise our R&D intensity to 2.4 per cent of GDP by 2027, and to 3 per cent in the longer term, gives global business assurances that the UK government is taking a long-term approach to boosting innovation and productivity.

Attracting investment: The UK is the best place in Europe for angel and venture capital investment, and our regulatory incentives for investors are second to none. To boost scale-up, this is complemented by government initiatives to promote patient capital.

Legal and financial framework: Our world-class regulatory environment is geared to help innovative companies, including through tax incentives for research and development, smart procurement initiatives, and Patent Box tax relief.

Breadth of support: The UK Government has a suite of funding opportunities with international reach, to support all stages of innovation, from basic research to demonstration and commercialisation.

Our commitments

- ▶ A £20bn, 10-year Patient Capital Action Plan, including £2.5bn for British Patient Capital to drive £7.5bn of investment into innovative high-growth potential SMEs.
- ▶ The upper limits on the Enterprise Investment Schemes and Venture Capital Trust investment reliefs were doubled from April 2018 for knowledge-intensive companies.
- ▶ British Business Bank's Enterprise Capital Funds programme invests in emerging fund managers to build talent as well as funding opportunities.
- ▶ We will work with businesses, our leading universities, research institutes and UK Research & Innovation to make the UK an even more attractive location for R&D activity. The UK has some of the best research facilities and talent in the world and boasts a number of leading sectors, universities and research strengths, which play a pivotal role in private sector R&D investment and attracting opportunities.

Case studies

Long-term commitment: In 2017 Amazon doubled the size of their R&D centre in London to 900 employees and expanded their R&D facilities in Cambridge to focus on devices including the Amazon Echo and Alexa.

Attracting investment: The UK accounted for 32 per cent of European venture capital deals announced between 2013 and 2018, and 36 per cent of total deal value.

Attracting investment: Energise Africa offers the UK public an opportunity to invest in solar companies that install life-changing solar systems in homes in sub-Saharan Africa. Over £7.5m has

been raised reaching over 300,000 people with access to clean energy, boosted by match funding provided by UKAid, through our International Climate Finance, and Virgin Unite.

Legal and financial framework: A total of £3.5bn in R&D tax credits were claimed in 2016-17 stimulating between £5bn and £8.2bn additional R&D investment into the economy.

Breadth of support: Improbable, the virtual reality spin out from Cambridge University, secured UK government support including a £876k Innovate UK grant, on its way to a record investment of £391m from SoftBank in 2017.

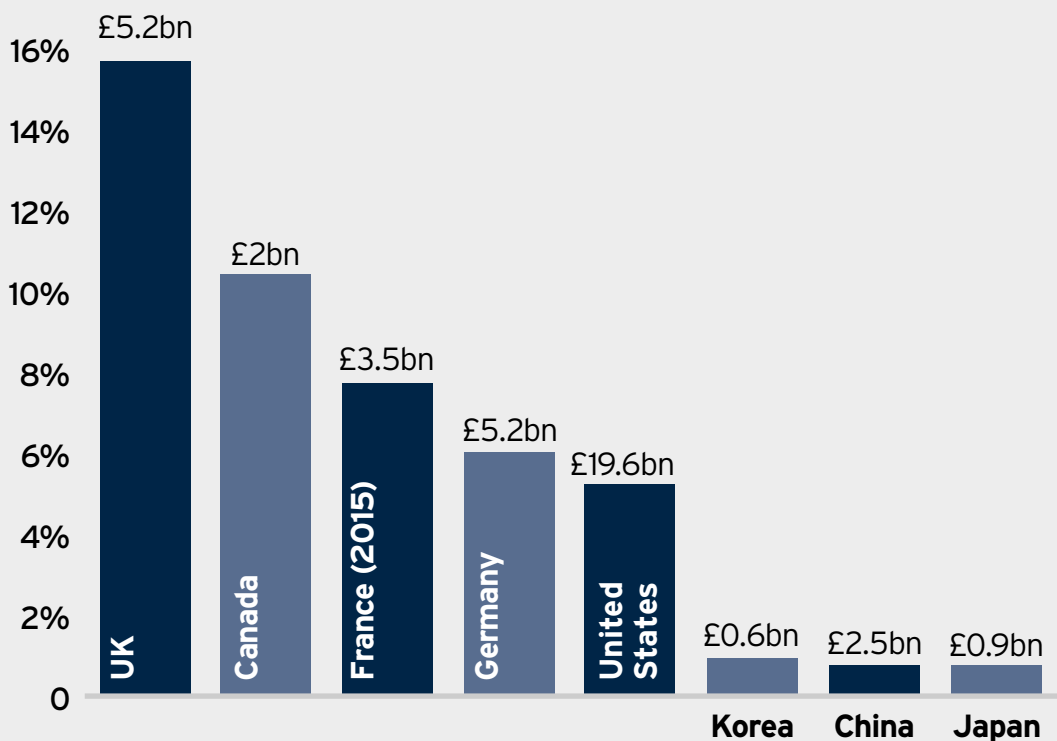
- ▶ Global Entrepreneur Programme helps overseas entrepreneurs and early stage technology businesses that want to relocate to the UK.
- ▶ R&D Tax Credit relief for SMEs and R&D Expenditure Credit for larger companies supports innovative science and technology projects. Alongside 100 per cent in-year capital allowances for R&D equipment expenditure.



Key facts

- ▶ Local Industrial Strategies are opening opportunities for international engagement and collaboration to help build R&D and innovation strengths.
- ▶ Global Entrepreneur Programme has raised over £1bn in private investment for companies.
- ▶ The UK has one of the lowest corporation tax rates in the G20 and R&D reliefs that support companies working on innovative projects in science and technology²⁰.

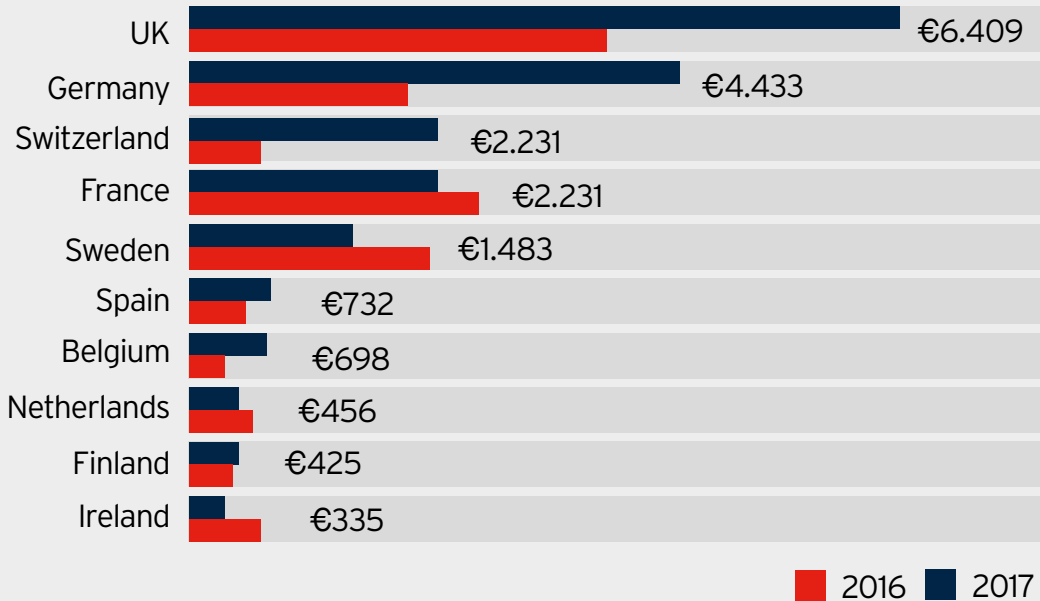
Percentage of gross R&D expenditure financed from abroad for selected economies (2016)



Source: OECD MSTI database. Note: UK percentage of GERD financed from abroad comes from ONS GERD statistics

Chart of European Venture Capital Raised per Country

Amount raised per country, in millions



Source: © 2017 Sirris - Omar Mohout



A global platform for the technologies of tomorrow

The strengths and global reach of the UK's governance, intellectual property and standards frameworks can support the design of common, global regulatory approaches to support emerging, transformative technologies.

The UK's offer is to investors and innovative businesses, great and small.

Our offer

Governance frameworks: Our technology ethics and governance frameworks are smart, future facing, and designed to accelerate innovation. Through our Industrial Strategy we are building a system that is fit for purpose for new technologies, and want to be a global leader in facilitating the industries of the future.

Innovation infrastructure: British Standards Institution, National Physical Laboratory, The UK Accreditation Service and The Office of Product Safety and Standards - our globally-recognised measurement, standards and regulatory bodies lead the way in designing enabling frameworks for emerging and future technologies.

Intellectual property: The UK has one of the best Intellectual Property environments in the world; one which promotes innovation, enforces rights effectively, and reaches into key global markets to encourage investment and collaboration.

Global influence: The UK has a strong voice in developing international governance partnerships and global frameworks to accelerate innovation, boost trade, and helping developing countries open up.

Our commitments

- ▶ We are bringing forward plans to transform the UK's regulatory system to enable innovation, and seize the opportunities from the Fourth Industrial Revolution, including through a Regulators' Pioneer Fund to support regulator-led initiatives.
- ▶ We will work with other countries to develop a balanced and fit for purpose international intellectual property framework that maximises the benefits of innovation and creativity.
- ▶ We are establishing a new partnership with the World Economic Forum Centre for the Fourth Industrial Revolution to develop regulation which benefits business and consumers around the world.

- ▶ We will promote better governance frameworks around the globe through the FCO's network of overseas posts, and BSI's leadership role in European and international standards.
- ▶ We will provide a safe and secure environment for research and innovation through physical and cyber protection.

Key facts

- ▶ In February 2019, the independent US Chambers of Commerce Global IP Index ranked the UK 2nd out of 50 countries for its IP environment²¹.
- ▶ BSI Group has 90 offices worldwide and serves 86,000 clients in 193 countries.
- ▶ Seven of the 10 most widely used ISO standards originated from the UK.

Case studies

Governance frameworks: The UK's Centre for Data Ethics and Innovation is giving us a leadership position in the global debate about how data and AI can and should be used.

Innovation infrastructure: The connected and autonomous vehicles standards programme - a partnership between BSI, the Centre for Connected and Autonomous Vehicles, Innovate UK, Department of Transport and Meridian- sets out to draw up the standards that will underpin our future mobility.

Intellectual property: IPO has developed international model agreements for collaborative research projects, developing versions for China, India and Korea.

Global influence: The world's first ISO standard on graphene was led by NPL and will accelerate the commercialisation of this 2D material.

The international reach of the UK's quality infrastructure and intellectual property

British Standards Institution

The British Standards Institution (BSI) develops consensus standards that are used across the world, enabling innovation, accelerating economic performance, facilitating governance and stimulating trade. In its role as the UK's National Standards Body, BSI represents UK interests across the international standards organisations ISO, IEC, CEN, CENELEC and ETSI, providing the infrastructure for innovators, industry experts, government bodies, researchers and consumers to collaborate effectively and help deliver globally relevant standards. BSI's experience spans across sectors including aerospace, automotive, built environment, energy and healthcare. Our future standards programme is helping improve the performance, quality and safety of products, services and systems in new and emerging fields such as advanced materials, the circular economy, connected and autonomous vehicles, digital health, digital manufacturing, offsite construction and sustainable finance. BSI develops strategic programmes and partnerships with leading standards organisations including AAMI, IEEE and W3C in areas of mutual interest.

The Intellectual Property Office (IPO)

The IPO is working with other countries to develop a balanced and fit for purpose international intellectual property framework that maximises the benefits of innovation and creativity for the UK economy and society. A network of IP attachés cover key territories, including SE Asia, China, India and South America. Wider support is provided via collaboration with international IP organisations, such as the World Intellectual Property Organisation and direct engagement with host British High Commissions and Embassies.

National Physical Laboratory

Worldwide metrology – the science of measurement – at the highest level operates through a well-established network of National Metrology Institutes and Designated Institutes. As the UK National Metrology Institute, NPL represents the UK on a number of international committees, networks and organisations both at a strategic and technical level. This includes involvement in many international collaborations in the development of standards and regulations in current and emerging areas of technology.



The United Kingdom Accreditation Service

The United Kingdom Accreditation Service is the UK's sole National Accreditation Body. UKAS accreditation assures the competence, impartiality and integrity of testing, calibration, inspection and certification bodies. This reduces the need for suppliers to be assessed by each of their customers. UKAS is a world-leading innovator in accreditation services. Its development projects range from physiological diagnostic services to nuclear new build, energy management, retail banking products and data protection. UKAS is highly active and influential internationally, holding positions on the executives of both the International Laboratory Accreditation Cooperation and the International Accreditation Forum. UKAS' involvement in international groups provides for mutual recognition, further reducing the need for multiple supplier assessments and as a consequence helping reduce barriers to trade.

The Office of Product Safety and Standards (OPSS)

The OPSS brings together technical expertise and practical experience to ensure that regulation is effectively delivered in ways that reduce burdens on business, save public money and protect citizens and communities. Science and Innovation are at the core of its two main areas of focus; consumer product safety and legal metrology. Through its externally commissioned Strategic Research Programme and in-house technical experts, the OPSS ensures that product safety policy and enforcement decisions are based on the latest high-quality scientific evidence. For legal metrology, it provides the infrastructure necessary to make markets function more effectively, underpinning trade measurement and providing confidence in the market. OPSS also offers a range of certification services that enable businesses to export their products globally. It is an active and influential member of a number of European and wider international fora for legal metrology and product safety, including the European Commission, the International Organization of Legal Metrology, the OECD and the World Bank.

A partner for a sustainable future

The UK will build and invest in collaborative partnerships to tackle the greatest global challenges.

The UK's offer is to a broad range of international partners: from governments, academia, the private sector and civil society.

Our offer

International collaboration:

We want to tackle the greatest challenges of the world including our four Grand Challenges by building well-funded collaborative partnerships with other nations.

Sustainable development goals (SDGs):

We will strengthen collaborations with others to deliver the SDGs through first class research and innovation, building capacity, saving lives and promoting stability and growth.

Climate change, energy security and environmental sustainability:

We will build research and innovation alliances to address climate change, to accelerate sustainable energy research and innovation and to boost environmentally sustainable growth.

Health: We will work with others to promote excellence in international research and open collaboration on healthcare and One Health in the developed and developing world - human, plant, animal and environmental health - including in AMR, dementia and diabetes. The AI and Data Grand Challenge is using these technologies

to transform the early diagnosis, treatment and prevention of disease.

Our commitments

- ▶ The Industrial Strategy Challenge Fund is tackling the biggest challenges that society and industries face today and is powered by multi-disciplinary research and collaboration between academics and business.
- ▶ The UK's commitment in law of 0.7 per cent of our Gross National Income to Official Development Assistance includes delivering mission-driven, high quality research and innovation to save and transform lives around the world.
- ▶ We have invested across government in targeted programmes for international research and innovation for sustainability and the Sustainable Development Goals.
- ▶ We are committed to bring a whole of government approach to maximise the impact of international collaborative programmes. The Strategic Coherence for ODA-funded Research Board aligns the UK's main funding departments and is underpinned by a broader advisory council.

Key facts

- ▶ Allocating £200m to 12 interdisciplinary research hubs to tackle global challenges²².
- ▶ Supported 47m people to cope with the effects of climate change and provided 17m people with improved access to clean energy²³.
- ▶ Invested £1.2bn in the Global Fund to fight AIDS, TB and Malaria, and UK Aid is expanding access to life-saving HIV treatment²⁴.

Case studies

International collaboration: The UK Space Agency's Global Challenges Research Fund investment in International Partnership Programme is delivering sustainable development benefits to emerging and developing economies around the world using satellite data applications.

Climate change: The Met Office-led 'Weather and Climate Science for Service Partnership Programme' develops a global network of scientific partnerships to strengthen the resilience of vulnerable communities to weather and climate variability.

Sustainable development goals (SDGs): The UK's Department for International Development's innovative research partnership with M-KOPA Solar kick-started a transformative new market for solar lighting and energy in East Africa using mobile phone technology. M-KOPA is powering half a million homes, has connected over 3 million people to affordable solar power, and has created 2,500 jobs in East Africa.

Health: UK investment in the rapid development of an effective Ebola vaccine means that the world is in a stronger position to tackle Ebola.

The UK's global research and development funds for sustainable development

Newton Fund: Through the £735m Fund, we collaborate with 17 active Newton Partner countries. They are: Brazil, Chile, China, Colombia, Egypt, India, Indonesia, Jordan, Kenya, Malaysia, Mexico, Peru, Philippines, South Africa and wider Africa, Thailand, Turkey, Vietnam. The Programme supports bilateral and regional research and innovation partnerships agreed at intergovernmental level. We jointly fund programmes dedicated to global development. This has transformed our relationships and helped us jointly accelerate the impact of our work.

UK Vaccines Network: The Network brings together industry, academia and relevant funding bodies to make targeted investments in specific vaccines and vaccine technology for infectious diseases with the potential to cause an epidemic. The Government has committed to invest £120m between 2016-2021 in line with the expert advice provided by the UK Vaccines Network. Projects supported range from work on Zika virus vaccines to work to increase the speed of vaccine manufacturing.

Department for International Development research investment: The Department for International Development invests in broad spectrum, high return, mission-driven research and innovation. It targets investments in science, social science and technology to find new solutions to complex development challenges facing the world's poorest people in often the most fragile countries, and to generate global public goods that deliver impact at scale. It spends 3 per cent of its annual budget (c£400m) to support DFID, other UK government departments, national governments and the international development community to make rigorous evidence based decisions to achieve the Global Goals and ensure a safer, healthier, more prosperous world. On its science and research agenda, DFID works in partnership with developing countries, universities, innovators, the private sector, and major philanthropic research funders.

Fleming Fund: £265m to support low and middle-income countries generate, share and use data to tackle antimicrobial resistance.

Global Challenges Research

Fund: The fund is investing £1.5bn in mobilising the UK's research base to address the trickiest global development challenges. The Fund is helping forge strong and enduring partnerships between researchers, policy makers and practitioners in the UK and developing countries.

NIHR Global Health Research

Programme: The National Institute for Health Research is allocating £429.5m to support high-quality applied health research for the direct and primary benefit of people in low and middle-income countries using Official Development Assistance.

Global AMR Innovation Fund:

The £50m One Health fund invests in high quality, early-stage research to stimulate innovation in neglected and underfunded areas of AMR research and development to tackle the threat of AMR, and promote the welfare of people in low and middle income countries.

The UK's International Climate Finance and Prosperity Fund have related objectives on supporting the Sustainable Development Goals through the provision of Official Development Assistance, but are not research and development funds.

International Climate Finance:

Through UK investment of £5.8bn we support clean growth in developing countries by supporting the deployment of technologies at scale, providing clean energy to those who need it and helping to avoid the impacts of climate change on the poorest. We have supported 47 million people to cope with the effects of climate change and provided 17 million people with improved access to clean energy.

Prosperity Fund: The Fund will invest £1.2bn over six years across a portfolio of strategic projects addressing barriers to growth. It aims to improve the global business environment, strengthening institutions, and encouraging private investment.



An advocate for better research governance, ethics and impact

The UK will build through multilateral fora an international consensus on global governance, ethics and on Open Science to share knowledge and build trust.

The UK's offer is to the worldwide science, research and innovation communities.

Our offer

Improving governance: We will work with other nations to improve the governance of the global research community, and to ensure that global governance is informed by the best research and evidence.

Strengthening quality and building trust: We will reach out to other nations to help build international consensus on research ethics, standards and integrity, for equitable research partnerships and to build public trust in science and technology.

Securing impact: We are committed to playing a strong role in the global research architecture, and ensuring that the research carried out within global organisations has the greatest possible impact for the benefit of humanity.

Open science: We support the ambition of the Open Science movement to make research transparent and ensure research methods, findings and data are accessible to all.

Our commitments

- ▶ The UK will play a full and active role in the global governance of scientific research and innovation organisations through critical global fora - they include:
 - Belmont Forum brings together funding organisations, science councils and regional consortia representing over 50 countries. It supports interdisciplinary, user-inspired research to address global environmental change.
 - CGIAR is the world's largest global agricultural innovation network spanning 15 research centres, 70 countries and partnerships of governments, academia, business and NGOs.
 - The Commonwealth Science Advisers Network established a knowledge exchange network on global challenges, supporting data sharing and science expertise and strengthening links between available evidence and policy.

- Networks, communities and fora across Europe which strengthen science and innovation governance. These include EUREKA, COST (European Cooperation in Science and Technology), Humanities in the European Research Area, and Science Europe.
- G7 and G20 have established collective cross-cutting work on global challenges including oceans, clean energy and antimicrobial drugs.
- The Global Research Council's work to bring the heads of science and engineering funding agencies together, promoting data sharing and research integrity.
- The Intergovernmental Panel on Climate Change and the World Meteorological Organisation are working to accelerate action to mitigate the impacts of climate change. This includes support for data distribution and governance reforms.
- Mission Innovation is the leading international public sector initiative to accelerate clean energy innovation and deliver widely affordable and reliable clean energy solutions for all. Membership includes 23 countries and the European Commission.
- The OECD Global Science Forum's focus is on complex, interrelated science policy issues, and is engaged in the promotion of Open Science and the coordination of international research data networks.
- The United Nations Development Programme's activities across a range of developmental challenges, and has established an open data platform to ensure global access to project data
- World Intellectual Property Organisation's aim is to lead the development of a balanced and effective international intellectual property system that enables innovation and creativity, underpinned by knowledge-sharing IP infrastructure.
- The World Health Organisation became a member of the International Aid Transparency Initiative to support the effectiveness of its work on global health and well-being.

Case studies

Improving governance: We are a founding member of Digital 9 - the collaborative network of the world's leading digital governments with a common goal of harnessing digital technology to improve citizens' lives, through nine core principles.

Strengthening quality and building trust: The UK will be co-chair of the Belmont Forum for the next three years. Our focus will include research excellence and impact, whilst ensuring global capacity building and fair data principles remain part of the Forum's overall work.

Securing impact: As the Chair and Head of the Secretariat of Mission Innovation, the UK is working with other members, representing over 80 per cent of public clean energy innovation investment, to reinvigorate and accelerate the global clean energy revolution.

Open science: UKRI is collaborating internationally to achieve immediate open access to research papers as a member of the Plan S partnership, and supporting the Declaration of Research Assessment to improve research evaluation.

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Image references

Foreword

LIGO mirror suspension fabrication
Credit: University of Glasgow

Square Kilometre Array
Credit: SKA Organisation

RSS David Attenborough
Credit: Rolls Royce

Nitrogen Field Lab
Credit: Mark Sutton

Global research and development funds for sustainable development

Water hub in Africa
Credit: David Walker

Poultry trader
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Liver sensor in lab
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