



Prime Minister  
10 Downing Street  
London SW1A 2AA  
*Sent by email only*

14 June 2021

*Dear Prime Minister*

## **STRENGTHENING THE UK'S POSITION AS A GLOBAL SCIENCE AND TECHNOLOGY SUPERPOWER**

From King James's telescope to the Mars Rover Perseverance, British research and innovation has both supported our global influence and benefited from it. The breadth and depth of the UK's research capability, combined with our capacity for creativity and innovation, remain critical to achieving our strategic national goals and addressing global challenges.

We believe that keeping our place at the leading edge of science and technology and securing our status as a science and technology superpower by 2030 means:

- Sustainably increasing investment in science, engineering and technology by at least 50% to a scale commensurate with the size of our economy;
- Providing leadership and incentives to increase significantly the share of that investment from business and industry from 55% to 75% as seen in other successful economies;
- Making choices on where to focus resources informed by our present and potential competitive advantage with an explicit decision on how much risk should be borne by the government;
- Integrating research, innovation and growth investment by joining up all government research efforts, using government procurement as a catalyst, reinforcing research and innovation clusters and deploying growth investment nationwide;
- Strengthening our skills and expertise in research and innovation and attracting talented people into business and academia from around the world;
- Enhancing both domestic and international research and innovation partnerships to confront security threats and solve global challenges such as climate change and pandemics.

The ambition must be backed with **sustained action** to give it credibility. The attached report (Annex A) provides more detail and recommendations on how to achieve this. We will write separately with further advice on developing an innovation strategy to support this endeavour.

The choices that Government makes now about where to invest in research and innovation will steer the future of the UK. Success in maintaining and enhancing science and technology superpower status provides numerous benefits to the UK:

- driving prosperity, increasing employment, productivity, and tax returns right across the country;
- attracting the best talent from across the globe, fuelling foreign investment and driving innovation through the sharing of ideas;
- reinforcing our security, by providing the technologies and know-how to resist malicious threats and resolve conflicts;
- contributing to our soft power through influence, trust, and enduring international networks, which helps to promote an open, rules-based global system;
- supporting society's health and well-being, with research and innovation to tackle the major global challenges we face, driving improvements in health, environment, and culture, and answering eternal questions posed by human curiosity.

In communicating this ambition, with detail about where to focus action, Government sends a positive signal to innovators, investors, businesses, entrepreneurs, and academics. It provides business with clarity on where to invest time, money, and expertise in support of national goals and provides a rallying call to international partners and talent to join us in creating the future.

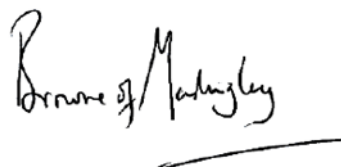
We would be delighted to discuss in more detail with you, or your Ministerial colleagues, how Government can strengthen the UK's position as a global science and technology superpower. We are grateful to Council members for developing this advice.

This letter is copied to the Chancellor of the Exchequer; the Secretary of State for Business, Energy and Industrial Strategy; the Secretary of State for Education; the Secretary of State for Housing, Communities and Local Government; the Chief Secretary to the Treasury; the Minister of State for Universities; the Parliamentary Under Secretary for Science, Research and Innovation; the Minister for Regional Growth and Local Government; the Cabinet Secretary and the Permanent Secretaries of HM Treasury, the Department for Business, Energy and Industrial Strategy, the Department for Education, and the Ministry of Housing, Communities and Local Government.

Yours sincerely,



**Sir Patrick Vallance**  
Co-Chair



**Lord Browne of Madingley**  
Co-Chair

## STRENGTHENING THE UK'S POSITION AS A GLOBAL SCIENCE AND TECHNOLOGY SUPERPOWER - Annex A

### Invest on a superpower scale

**Recommendation 1:** Invest in research and innovation (and the capabilities that support these activities) on a scale that matches the UK's ambition.

1. Commitment to increasing the total R&D investment is a clear indication that a country wants to be a science and technology superpower, and spending ambition is key to remaining relevant on the global stage. Achieving and maintaining global leadership in science and innovation requires sustained increases in investment. Current plans to increase R&D expenditure to 2.4% of GDP by 2027 would only bring us in line with the current OECD average<sup>1</sup> (and likely place us in the bottom half by 2030). Recognising the role played by the private sector, government should bring forward its 2.4% R&D investment target within this parliament, have a clear plan to reach 3%, and should aim for this rate to remain in the top quartile of the OECD.
2. The increase in R&D intensity can only be achieved through a combination of both public and private investment. **British businesses spend less on R&D compared to similar nations, with investments largely concentrated in just a few sectors**<sup>2</sup>. Two thirds of R&D spending will need to come from the private sector. A bolder, long-term target for overall R&D intensity (with a clear plan to achieve this) will be needed to give businesses confidence to make long-term plans and investments.

**Recommendation 2:** Increase public sector R&D funding of late-stage research and development, and implementation, not at the expense of pure or early-stage research but in addition to it. This will be critical to stimulate private sector investment and to get the most out of our truly excellent science base.

3. Without competitive support for late-stage R&D, there is a risk that companies conduct basic and applied scientific research in the UK, but then go elsewhere to carry out product/process development R&D. Investing in late-stage R&D opens opportunities to translate UK scientific strengths into the technology leadership required to drive competitiveness and growth in important emerging S&T-based industries<sup>3</sup>. This should not be underestimated and will require a range of policy measures to ensure it is successful.
4. Government should also take a systemic overview of the various funding mechanisms and incentives that drive private investment in R&D, and which can be used to drive science and technology through to strategic advantage. Key support and delivery organisations such as UKRI Research Councils, Innovate UK and the British Business Bank, need to be well aligned so that late-stage R&D and innovation support can pull through opportunities on strategically important areas

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<sup>1</sup> OECD (2021), Gross domestic spending on R&D (indicator). doi: 10.1787/d8b068b4-en (Accessed on 11 June 2021)

<sup>2</sup> HM Government (2020), [UK Research and Development Roadmap](#)

<sup>3</sup> Innovating the Research & Innovation 'Toolkit' - Unlocking private sector investment in emerging tech R&D, Dr Eoin O'Sullivan, University of Cambridge, May 2021

and work closely with the private sector – both for established businesses as well as entrepreneurial start-ups.

5. Government could build on existing examples of industry and government coordination to support the development of expertise in strategic technologies, this could include the Advanced Propulsion Centre (APC) for low carbon technologies in the automotive sector, the Aerospace Technologies Institute (ATI) which creates and supports delivery of the technology strategy in the aerospace sector, and most recently the Vaccine taskforce which successfully brought together government, industry and academia behind a single mission to secure access to vaccines during the Covid-19 pandemic.
6. We offer further comments on incentivising business investment in our letter ‘Scaling the impact of Innovation in the UK’.

### Make informed decisions

**Recommendation 3:** Coordinate strategic direction for science and innovation through a central cabinet committee focussed on long term S&T advantage.

7. Public sector funding and support for research and innovation plays an important role alongside investment by businesses (from large to small), charities and the financial sector. However, policies and funding for R&D activity are distributed across government, making it easy for strategic UK needs to slip between the cracks. There needs to be better coordination across the whole of government and with various actors outside government. This does not just relate to funding, but also entails incentives (especially from HMT), procurement, communication, and advocacy (e.g., internationally by FCDO and DIT). A more coordinated approach, with long term goals will help to achieve greater impact.
8. In taking a whole of government approach to R&D it is essential to consider R&D spending (and priorities) in BEIS but also the S&T spending allocated to governmental departments including, but not limited to, defence, health, international development, and the intelligence community. The ability to coordinate across and focus government spend will also increase private sector confidence across a range of important sectors.

**Recommendation 4:** Improve Government’s ability to make informed choices and align policies across departments to achieve this.

9. To retain and enhance the UK’s science and technology superpower status government must get better at understanding the research and innovation landscape in the UK and internationally, and recognise Britain’s current and potential comparative advantage in that landscape. This will need to be specific to sector requirements<sup>4</sup> as well as specific technology areas.

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<sup>4</sup> For example, the annual report on UK Life Science competitiveness indicators look at UK science offer, infrastructure and skills for broad sector requirements.

10. Government inevitably needs to make choices as to where to focus national effort. The UK cannot be a leader in all domains, so it will be essential that Government makes informed decisions on which areas to focus our efforts, where to allocate resource, and how to collaborate nationally and internationally. Trade-offs will be required which necessitate consultation, transparency, and consideration of unintended consequences.
11. This focus is essential to strengthen the UK's status as a global leader, build on advantage in existing fields of expertise, capitalise on lucrative opportunities, and be an influential force in new transformative areas.
12. We welcome the proposal for a new Science and Technology Cabinet Committee to give Ministerial oversight and accountability for these choices. We offer the following principles to guide the Committee's decisions:
  - a. Establish clear **values** for how Government seeks to pursue the UK's national interests in sovereignty, security, and prosperity. These could include shaping the future international order based on values of democracy, a commitment to universal human rights, the rule of law, freedom of speech and faith, and equality (as set out in the Integrated Review<sup>5</sup>), against which we will prioritise development of strategic capability, research and innovation collaboration.
  - b. Government must clearly **communicate its long-term goals, including what it wants the innovation for**:
    - What are the economic, social and security challenges where Government seeks to convene expertise and promote innovation?
    - Which strategic technology areas will we seek to be 'world-leading' and where will we aim for the UK to be a 'fast follower or adopter'?
    - What are the large national programmes that will have long-term Government-backing in support of strategic areas of focus? Businesses need certainty of policy and incentives in order to support this.
    - Outside these areas, how will Government protect our curiosity-driven research base and provide mechanisms that allow the unexpected to emerge and be successful?
  - c. Enable system-wide engagement by bringing businesses, investors, entrepreneurs, academics, and communities on board. In most areas, it will be the private sector who deliver the investment in activity and capabilities needed to deliver the outcomes and goals Government has articulated.
  - d. We endorse the Own-Collaborate-Access framework as set out in the Integrated Review, and the use of insights and analysis to determine when each approach is needed:

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<sup>5</sup> HM Government (2021), [Global Britain in a Competitive Age: the Integrated Review of Security, Defence, Development and Foreign Policy](#)

- Government needs to be realistic in its assessment of relative strengths, and needs sophisticated, evidence-based, decision-making processes, including horizon scanning, to inform ambitions on **where we need to build sustainable capability for the future**.
  - Establish areas where UK has **unique strengths** as a research and innovation partner and thought leader, and more clearly promote these to international counterparts. To be effective and maximise benefits, decisions must consider natural, life and social sciences, technology, engineering, humanities, and arts.
  - For areas where we seek to collaborate, Government needs to support and scale effective strategic partnerships with allies and other international partners as appropriate to their particular capabilities and their role in our future.
  - For areas where we need to retain access, Government needs a strategy that goes beyond blocking of acquisitions in sensitive areas to positively encouraging the development of an appropriately protected supply chain in specific industry sectors. It will require a different approach to investment as a tool to secure access.
- e. Strong, skilled leadership will also be essential. Government's role will be to de-risk business investment in some areas and make bets on encouraging development of potentially important technologies in the face of uncertainty. The Cabinet Committee needs to be responsible for making decisions, balancing risks and opportunities across a portfolio of areas, with governance and support structures in place to inform these decisions and ensure coordinated action across the Government research and innovation spend. We welcome the Government Office for Science establishing a new Science, Technology and Innovation Insights Function to improve government scanning and analytical capabilities and provide insights on a broad spectrum of science and technology activities.

### A world-leading research and innovation system

**Recommendation 5:** To enhance the UK's status as a globally competitive destination for business R&D investment, Government should adopt a more business-friendly, "investment portfolio" approach to funding for development and implementation activities.

13. In areas of strategic importance, Government needs to effectively join up its R&D efforts across government departments and facilitate crowding in of private R&D investment. This should include:

- a. Innovation funding processes with much faster turnaround to match the speed and agility with which businesses make decisions, including Government procurement processes that build in scope for innovation from small and large companies.

- b. A greater acceptance of risk so that high-risk, high-reward opportunities can be taken in the knowledge that some projects in the portfolio will fail, with failure being part of the learning process.
- c. The flexibility to make larger, longer-term investments where that is needed, including for applied research projects.
- d. Empowering programme leaders so that they "own" the portfolios, are responsible for meeting their objectives and can take funding decisions quickly.

14. This should be supported by a targeted international research and innovation strategy underpinned by clear, flexible, well-structured mechanisms to encourage, explore, support collaboration at a scale that matches our ambition, and secure foreign direct investment (FDI) to build UK capability.

**Recommendation 6:** Government should support important UK research and innovation clusters to develop their international profile and encourage national and regional connections as a gateway to wider UK expertise.

15. World class research and innovation clusters emerge over many years, through a combination of factors and conditions. These centres can generate global recognition in their area of strength. Although highly concentrated and specialised places, research-driven clusters can supercharge innovation and generate ideas that can be developed, scaled up, and manufactured in supply chains that reach across the country.

16. We offer further detail in our advice 'Levelling Up: Promoting Local Impact from Investment in Research and Innovation'.

### Cultivate expertise

**Recommendation 7:** Strengthen the governance of the UK skills system to enhance skills and training in strategically important areas.

17. Being a science and technology superpower will generate new, valuable, and rewarding jobs and opportunities across the UK. Despite uncertainties regarding the exact needs of the future workforce, researchers agree that the future UK economy will need more skilled workers.<sup>6</sup>

18. To realise these benefits Government must facilitate a constant supply of highly diverse, skilled individuals to match the current and future demands needed to achieve national ambitions. Focus should be placed on attracting and inspiring a much more diverse range of individuals from many different backgrounds across the entire UK. There is a role for higher levels of inclusion in education, training and upskilling across engineering, sustainability, digital and data skills, language skills, leadership, and entrepreneurship.

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<sup>6</sup> The British Academy (2020), [Qualified for the Future: Quantifying demand for arts humanities social science skills, Higher technical education: the current system and the case for change \(Department for Education, 2019\); Employer Skills Survey 2019 \(Department for Education, 2020\)](#).

19. A trained workforce is essential and developing a skilled workforce of qualified scientists, engineers, and research professionals is a long-term endeavour. Domestically, it starts with education in schools and needs a strong focus in university and private sector training in STEM subjects. SHAPE subjects provide ideal contexts in which digital and data skills can be developed. The skills and knowledge also learned in those disciplines are essential to develop and scale innovation into the economy and translate the benefits to society.
20. Government should identify a clear owner for skills who should work across departments to determine the skills needed to undertake research and innovation required to meet the UK's science and technology superpower goals. To help inform and implement decisions of the Science and Technology Cabinet Committee, **we recommend Government establish a co-ordinating committee with the remit to identify skills needs in areas identified as strategic priorities and convene industry and education sector representatives to work together on solutions.**
21. Consideration should be given to the ability of industry and educational institutions to provide the necessary training to meet these needs. This should account for the entire supply chain and skills based in those selected strategic activities, finding solutions to gaps where they exist. A skills lead should also play a role in promoting the exciting and rewarding STEM and SHAPE careers to engage diverse audiences. Government may need to intervene to ensure the current and future workforce have access to courses in strategically important areas, where these are central to future UK growth and prosperity. For example, we previously advised on the importance of developing a more flexible system across HE and FE that support a diversity of learners.<sup>7</sup>
22. Being open to talent from across the world is also fundamental to the science superpower ambition. Evidence shows immigrants are often among the most productive innovators and entrepreneurs and vital to the international competitiveness of high-growth businesses in the UK.<sup>8</sup> Some 49% of the UK's fastest growing businesses, and nine of the UK's 14 unicorns having at least one foreign-born co-founder. Immigrant-founded start-ups also attract substantial investment; immigrant co-founded start-ups in the Top 100 have raised a combined £3.7bn in investment alone.
23. The UK will need to attract and enable people from overseas to work in the UK, or work with us, from the creative genius or aspiring entrepreneur, to high quality technicians and early career researchers. Government should keep under review the wide range of levers that incentivise investment and attract world class scientists, engineers, researchers, and entrepreneurs to base themselves in the UK (funding, infrastructure, procurement, skills, standards, regulation, and taxation).

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<sup>7</sup> <https://www.gov.uk/government/publications/implementing-the-2019-review-of-post-18-education-and-funding>

<sup>8</sup> The Entrepreneurs Network (2019) 'Job Creators: The Immigrant Founders of Britain's Fastest Growing Businesses'



24. Government should also review and develop mechanisms to promote human mobility, which is of crucial importance not only for attracting talent to the UK, but also for promoting the exchange of ideas, international experience, and networks for UK researchers.
25. We welcome the Office for Talent and Global Talent Visa, but the cost of the current system for applicants and institutions and the administrative processes for managing security concerns can present unintended barriers to collaborations or flows of talent.

### Strengthen our partnerships

**Recommendation 8:** Promote and sustain international research and development partnerships, with partners that have complementary strengths in strategically important areas.

26. The UK's status as a science superpower, and our ability to translate this into prosperity and benefits for society, is reinforced by our global standing and relationships with other countries. International collaboration on research and technology is a long-term investment on two dimensions, the research and innovation activity, and the relationships required to enable and sustain it. In order to be effective in promoting strategic research and innovation collaborations, policies and activity needs to be aligned across government. The approach to governance needs to ensure this.
27. Partnerships in research and development have contributed to the UK's soft power and long-standing ties to other countries. The vibrancy of our research across all the disciplines also adds to the attraction of UK as a partner. For example, research partnerships can offer a unique platform to maintain relationships with countries that might otherwise be difficult to engage.
28. Trusted, enduring and appropriately scaled relationships will be essential in supporting collaboration in strategic areas. Decision-making around the use of the 'Own-Collaborate-Access' framework can be informed by these ongoing relationships. This is of particular importance in maintaining influence and ability to collaborate in areas of defence and security, where principles of proportionality and reciprocity should inform our relationships with allies.
29. Government should monitor the regions of major growth in the world and should use funding to facilitate research and innovation collaborations with advanced and growing economies. This can be used to achieve a new growth model for the UK, with particular focus needed on countries such as India and China where we should seek mutually beneficial, sustainable business and academic relationships where appropriate. The UK's strategy should include building relationships with smaller nations that have complementary strengths and are open to mutually beneficial innovation partnerships, for example: Norway, Singapore, and Israel. Government

should identify a list of strategically important areas where we seek collaboration and partnership to enable FCDO, UKRI, the British Council, and other partners to identify how engagement with specific countries could help to achieve national goals.

30. Existing mechanisms for international collaborations with different partners should be reviewed to ensure they are globally competitive. This would include framework agreements and institutional support for flexibility, as well as strengthening mechanisms for collaboration and partnerships in strategically important areas. There is currently a lack of funding mechanisms that allow for international collaboration with allies, particularly on security matters. We recommend Government creates a new funding mechanism that supports research and innovation partnerships, particularly for applied physical and social science and technology in strategically important applications of technology. This could promote partnerships on security applications with NATO or 5 Eyes allies as well as providing opportunities to build wider applications as highlighted in the Integrated Review.
31. There is potential to significantly increase the scale and scope of existing mechanisms such as the UKRI Fund for International Collaboration to specifically include support for strategic research and innovation activities. Future arrangements should balance top-down mechanisms for country to country and funding agency to funding agency collaborations, alongside bottom-up and multilateral collaborations in key challenge areas. This will help to counter the impact of reductions to ODA funding that will negatively impact valuable research capability. It is also important to emphasise the role of ODA Global Challenge Research Funding in ensuring strategic international relationships and enhancing our credibility within the global community.
32. UK participation in large-scale international research projects helps to conduct science with infrastructure that is beyond the means of any individual country. Large-scale collaborations have been responsible for fundamental breakthroughs and for a host of beneficial technological innovations. Through participation in these initiatives, we share expertise and provide a stimulating environment for the next generation of scientists and engineers.
33. Many of the greatest challenges facing humanity, like climate change, global health security, and digital privacy and responsibility, transcend national boundaries and require collective action to address them. Scientific collaborations across disciplines and countries, like the assessment reports to which hundreds of scientists contribute to under the auspices of the Intergovernmental Panel on Climate Change, are central to understanding these challenges and devising solutions. The UK should continue and strengthen its role in these scientific initiatives to solve shared challenges and should also have ambition to be a host nation.

**Recommendation 9:** Lead the global conversation in areas that promote our values and harness our expertise.

34. The pursuit of science and innovation depends on standards of integrity that are backed up by open and reproducible evidence. These enlightenment values have served science and society well, though they have endured renewed challenge in recent years. The UK should continue to promote the open flow of scientific information, including through open-access publications and expectations for access to publicly funded scientific data.
35. Government should continue to share its experience of using science and technology to inform public policy across many areas of government, for example via the Chief Scientific Advisors, whilst learning from good practices around the world. Government should actively support British scientists, engineers, researchers, and other innovators in taking up advisory and technical roles in international institutions and other national governments.
36. The UK should be ready to lead ethical debates, for example regarding human reproduction technologies. The UK should engage with international partners to explore the deep implications of data science and digital technologies, and develop approaches and standards that are consistent with our values.
37. Being at the frontier of a discipline enables a country to play a role in setting technical standards and shaping international regulations. The UK can use its industry leadership and globally trusted regulatory institutions in areas such as healthcare, aerospace and satellite applications to participate in the development of international regulations and set standards that define the global markets in which we want to lead and promote global security. The UK should also set a clear pro-innovation intellectual property arrangement, with necessary safeguards for collaboration, but avoiding measures that are overreaching or punitive. In developing standards and regulations, the UK should seek to embed its trusted and respected values with the intention that they be adopted internationally.

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