**Background**

The Government plans to make the UK a “science superpower”. It has committed to increasing investment in research and development to 2.4% of GDP by 2027, with a long-term target of 3%. This is in line with comparable OECD countries. The Government has said it will support this target by increasing public research and development funding from £9bn in 2017 to £22bn by 2026/7.[[1]](https://committees.parliament.uk/call-for-evidence/722/#_ftn1) In addition, a cabinet committee chaired by the Prime Minister, the National Science and Technology Council (NSTC), and the Office of Science and Technology Strategy have been established to promote an overall strategy for scientific and technological development in Government policy.

The NSTC has identified four priority areas for UK science and technology: “the sustainable environment, health and life sciences, national security, defence and space, and a digital and data-driven economy”.[[2]](https://committees.parliament.uk/call-for-evidence/722/#_ftn2)

There are ongoing reviews of various aspects of the science and technology system. These include a review of the functioning of UK Research and Innovation (UKRI), the second Sir Paul Nurse review of the UK research, development and innovation landscape, and a review of research bureaucracy. Many of these reviews are due to publish in the coming months; they should help answer the question as to whether the UK’s research, development and innovation institutions need reform to achieve the Government’s aims for UK science. The Committee will examine the findings of these reviews, and the broader issue of scientific skills and careers in the future.

**Purpose of the inquiry**

It is not clear what it would mean for the UK to be a “science superpower”, nor how an overall strategy for science and technology will be coordinated across Government and interact with the research and innovation delivery system. The UK has many respected academic institutions, but this is only part of what is needed for a high-skills, high-tech economy. It remains unclear which sectors the Government will focus on and invest in. It is not apparent how the vision of the UK as a science superpower will be integrated with other areas of national policy, or economic and industrial strategy. Nor is it clear how the Haldane principle, the idea “that decisions on individual research proposals are best taken following an evaluation of the quality and likely impact of the proposals (such as a peer review process)”, will be protected.[[3]](https://committees.parliament.uk/call-for-evidence/722/#_ftn3)

The Committee seeks to understand what the Government’s ambition for the UK to be a science superpower means in practice; what a viable strategy for the UK’s science and technology sectors would look like; how to ensure a strategy endures and is not overturned when governments change; what contribution state, private and international funding should make; whether science objectives could be better supported across Government policy; what the UK can learn from other countries; and how balancing ‘top-down’ messages about Government priorities with ‘bottom-up’ curiosity driven research will work in this new landscape with a stronger focus on a national science and innovation strategy.

**Questions**

The Committee is seeking evidence on the following questions (there is no requirement to answer all questions in your submission):

**1. What would it mean for the UK to be a “science superpower?”**

* What would a “science superpower” look like?

A science ‘superpower’ would be a country with global reach and international research collaborations. It would develop technologies that are sustainable and contribute to the wealth, health and sustainability of all the Earth’s inhabitants. This country would have the structures and resources in place to translate basic scientific observations into viable products and services.

A science superpower would also look outwards and would engage readily and confidently with a variety of national and international stakeholders such as industry, health services and academic institutes. It would recognise the complimentary skillsets in these sectors that, when combined, can provide answers to the big questions. In doing so, it would be an attractor of the very best scientific talent globally and retain domestic talent, and also be a global ‘partner of choice’ for collaboration, across governments, and in academia and industry.

A science superpower would also lead the world in the regulation of science and be at the forefront in its approach to fostering and supporting innovation. It would demonstrate the rapid adoption of scientific breakthroughs.

* Does the Government have a coherent strategy and sufficient existing policies to make the UK a “science superpower?”

To become a science superpower, the strategic elements that need to be looked at include:

1. **Transparency** – government strategy needs to be transparent. At the moment there are too many strategies that are linked and intertwined, leading to a lack of transparency and a lack of clarity on roles and responsibilities. A systemic overview of the various funding mechanisms and incentives is needed and could drive private investment in R&D and make it easier for late-stage R&D and innovation support to pull through opportunities.
2. **Commit to specific shorter and longer term funding** and avoid the trend-led finance and following what is new rather than what is developing. For instance, the government should identify core research themes to support, these include: genomics, innovative drug development, women’s health (WHS), AI. In addition to early stage research an increase in R&D funding of late-stage research and development is imperative.
3. **Remove barriers and make innovation everybody’s business** The contrast between say the MHRA and the NHS is stark. The MHRA has taken steps to encourage innovation. Innovations can be slow to be adopted within the NHS and many barriers are apparent.
4. **Use the strong ethos of public involvement to benefit innovation**. We have built strong links to the patient community for example in medical innovation, but UK can still do more. Look to countries like Denmark, with a strong history of public involvement to direct strategy on innovation.
5. **Level-up research**. Have a strategy that devolves funds to the regions. There is currently a lack of a “joined up” strategy between the devolved nations. There needs to be better planning for the UK as a whole.
6. **Open up to global innovation**. Make it easier for innovators and scientists from outside of the UK to research here.
7. **Leverage the NHS resources further**. For example, incorporate pharmacovigilance surveillance into routine NHS practice (rather than setting up completely new infrastructure for each new study/drug).
8. **Strategic direction** for innovation to be driven by central government steering committee, feeding into cabinet committees (policies should then be easier to align across government departments)
* What measures should determine whether the UK has become a “science superpower”?
1. Financial metrics such as contribution of scientific research/IP to GDP with demonstration of a similar contribution from all the devolved nations and increase significantly the share of investment from business and industry from as seen in other successful economies.
2. Success against the targets for R&D&I investment for both academia and industry.
3. Awarding of peer reviewed EU funding (assuming UK has access).
4. Number of UK patents secured/applied for.
5. Increase in population who are engaged in science careers directly and indirectly related to scientific activity.
6. Attracting talented people into business and academia from around the world
7. An increase in the diversity of those who are engaged in scientific careers.
8. Relative performance in the generation of publications from peer-reviewed journals with a high citation index.
* Are the Office for Science and Technology Strategy's four scientific and technological priorities the right ones for the UK?

Yes. It will be important to ensure that there are opportunities for collaboration etc. across priorities. Similarly, it will be necessary to take account of potential impact beyond one priority area, or indeed the area that may at first glance appear the most relevant, e.g. a cumulative impact may be greater than the impact of a project that solely addresses one priority.

* What could be done to ensure that the Government’s science and technology strategy is long-term and pursued across administrations? What have been the consequences of a frequently changing science policy?

Greater public involvement would ensure legitimacy and relevance of strategy and make it less likely that strategy needs to change. The frequent changes in strategy reduce adherence to strategy and leads to a loss of legitimacy and fragmentation. There needs to be a long-term plan with measurable milestones and deliverables, led by a Government-commissioned group, representing academia, public and third sector bodies and representatives from the commercial sector, all from across all 4 nations.

Science and Technology are fast-paced and rapidly evolve. It is always going to be difficult for policy to keep up with this. There is a need to ensure that the regions are not left behind and where there are strengths/opportunities under the priority areas these are focussed on and developed. A more localised knowledge would be required to ensure this is the case and perhaps also to be used in the determination of funding etc.

**2.** **Are the right structures in place in Government to implement a science and technology strategy?**

* How should Government coordinate science policy across different departments, with different strategic priorities such as levelling up? What role could the National Science and Technology Council play?

The National Science and Technology Council (NSTC) has been responsible for the legitimacy and relevance of investment – be it national or a part of the levelling up agenda. Research should be legitimate, in that it reaches the goals of the science superpower and is supported by the public and relevant, in that it is reliable and reproducible and adds value. The equity of investments across the different stakeholders should also be a role for the NSTC.

Similar to above, there needs to be a group/committee with adequate representation of the stakeholders from each region and balance of public/private, which works with different government departments to deliver a clearly defined strategy over at least a 10-year period.

* How should the National Science and Technology Council and the Office for Science and Technology Strategy interact with existing bodies like the UKRI Council and the Council for Science and Technology?

The NSTC should be responsible for governance processes and for capacity building. It is vital that these agencies are working in a coherent and collaborative way to ensure the optimised use of finite resources in support of R&D&I activity. There must be strategic backing of specific areas/sectors and such backing must include not only academia and industry, but more specifically ensure that there is a role for both the smaller companies (i.e. micro and SMEs) and for larger companies, who have a pivotal role to play in delivering impact but also in that all-important sharing of expertise and know-how with the smaller players. Unfortunately, this aspect has been overlooked all too often in the past, where a focus (rightly) on smaller companies has missed the tremendous benefits they can experience through collaborative efforts with the larger players.

* Are the right levers and mechanisms in place for the delivery of a science and technology strategy?

Some. We need more pull mechanisms – reducing the barriers to NHS adoption for example. Better pricing mechanisms and value demonstration from NICE for another. We also need to look at the push mechanisms – reforming UKTI grants to give them more legitimacy and relevance. Capacity building should be a part of the pull, as seen with recent RNA technology developments. It will be important to keep a dialogue with all relevant sectors and also the regions, as well as remaining flexible and agile to respond.

* Who should be accountable for the delivery of a science and technology strategy?

The NSTC, the PM and UKRI.

* What ministerial representation should science and technology have?

There is an existing Minister for Science, Research and Innovation, it would seem to be well aligned to their role. We would advocate that, if possible, the minister has education, ideally to PhD level, in a STEM subject or medicine.

**3.** **Does the introduction of a science and technology strategy challenge the Haldane principle and UKRI’s commitment to fund outstanding research?**

* Should the Government take further steps to preserve and enhance the Haldane principle?

Yes. Current practices on funding research has already departed significantly from the Haldane principle. A new process of peer review should be investigated rather than the current one. It is important that high quality research is funded, however more input in the review process from industry may improve the chances for economically meaningful research to be funded. The principle of external review, examining impact and quality, has to be maintained but viewed being mindful of the stage across that spectrum. It is not going to be reasonable to compare a project that is at TRL 2 with one at TRL 6 for example, so there will have to different opportunities and criteria for each.

* How should the Government balance support for bottom up, curiosity-driven research with support for research focused on its strategic priorities?

By evaluating legitimacy, relevance and capacity building potential. There should be a fixed proportion of the funding budget for “blue sky” research as this may ultimately feed into the strategic priorities.

**4.** **Is the UK realising the potential of its research investment?**

* Do bureaucratic processes hinder research and development in the UK? Are there examples of where these could be removed without compromising oversight?

Yes. The cumbersome NHS adoption of new technology is a prime example. UK granting bodies often require an excess of paperwork, much of which contributes little to the review process. ‘Bureaucratic processes’ the world over, not solely in the UK, will on occasion hinder research and development. For academic groups this is perhaps less of an issue, due to most (if not all) having dedicated teams allocated to funding administration roles, however it does lead to significant over-head levels that see funds being redirected from being allocated to directly support the project itself. If ways were able to be identified to reduce this burden on academia, then it would not be unreasonable to reduce the overhead being assigned, leading to a higher percentage of the support being directly invested into the relevant activity. For industry this burden is also there and can often lead to smaller partners simply not seeking support. For larger partners there is also a need for time to be allocated by HR, Finance, Purchasing etc. teams, but yet this is not supported in the same way through overheads to industry as for academia.

* Could the bureaucracy reducing principles of the Advanced Research and Invention Agency be extended to other public sector research establishments?

Yes. DARPA and BARDA are good models, as they bridge the early stage funding gap when the amounts needed are small and short to medium term. The shortage of early technology funds leads to innovators asking for unrealistic amounts of funding to try and reach the thresholds of investors. The investors on the other hand see the risk. This situation is not helped by current UKTI advice.

* How can the Government better incentivise and support interdisciplinary research and innovation?

We believe that research and innovation is everybody’s issue and duty. This is part of an educational process. The creation of ‘IP safe spaces’ where discussions can be had without threatening IP and sharing possible would also help. In particular, with regards to healthcare, we would encourage additional funding to allow healthcare workers to take time out of NHS roles to support translational research. Challenges in Life and Health sciences could be set in collaboration with healthcare workers and patients who may recognise opportunities to improve UK healthcare that could be commercialised internationally.

Where industry and academia collaborate, there is a need to ensure that industry is being given a meaningful percentage level of support but also a ‘fair’ reflection of IP. There is a challenge for many industry partners in collaborating with academia in sometimes unrealistic IP demands, which leads to stifled impacts and demotivated industrial partners. Given that the UK government is fully funding the academic partners it is not acceptable that an academic partner expects to wholly own any novel IP that is co-developed.

* Does the Government’s strategic direction and the current allocation of research funding align with the UK’s scientific and economic strengths?

Not well. There is variation between the devolved nations on research funding allocation which results in the underperformance of some regions. This is self-perpetuating as these regions become less competitive for future grants. There need to be an ambition to grow all the regions.

5. **How should state funding for research and development be allocated between different organisations, who should make that decision and by what criteria?**

* Should Government departments commission and fund more research and development directly?

Yes. The funding should be 100% where possible. There is a mismatch currently, where companies/innovators are left to raise significant amounts of money, but at levels outside of the normal funding route, too small for venture capital, to large for Family offices. Perhaps the idea of an innovation bank to provide short term cast secured against IP. The increased use of SBRI mechanisms would also be a welcome addition. However, it is important to continue to route support through the existing sources. It will reduce confusion over where to seek out such opportunities. It will also reduce any further administrative challenges for applicants who attempt to navigate across multiple funding sources.

* What role should public sector research establishments play?

Public sector establishments have a key role to play in providing both expertise and access to equipment that is otherwise beyond the reach of private companies. In addition, there is a need to facilitate the dissemination of relevant regulations or related requirements in a specific sector. They also need to be sufficiently connected to government to be able to act as a conduit in both directions for the flow of information as required.

* What role should universities play?

The universities are often the foundation of many blue-sky research projects. More emphasis needs to be placed on educating academics about business. Universities need to be central if the UK is to be a ‘scientific superpower’. There is, however, a clear need to redefine how and what any government funding leads to or is focussed on. Issues such as IP generation and ownership need to be addressed at the funder level, to ensure that there are safeguards for the industry partners who would seek to commercialise and exploit the opportunities. Developments and progress cannot be hindered by the demands of sometimes unrealistic university departments.

* How should state funding be used to leverage private sector funding?

The current contribution system of 50-70% funding is not working. It leaves attempts to raise funds limited as the sums left are not attractive to funders. Funds instead should be 100% where possible and focused on early-stage development. A joint funded and managed innovation bank might help. Smaller shorter-term investments might help attract industry and might attract private sector investment.

Consideration should also be given to later stage investment, as funding early stages only risks talent and products exiting the UK to the US at that stage, as currently frequently happens.

The principle of additionality should be maintained, where state funding is being used to de-risk private sector investments, encourage projects to be of more significant scale and scope and to ensure that they are timely and not delayed at the cost of losing out to competitors. To achieve this, the support rates need to be at the maximum allowed levels, not working on a basis of reduction, so that senior management from industrial partners can be fully incentivised to take on important R&D&I rather than perhaps seeking out ‘safer’ investment plans with short term benefits.

**6.** **What more should be done to encourage private-sector investment in research and development in the UK?**

* What policies could incentivise private sector research spending in the UK? Are there international examples the UK could learn from?

The UK needs to be associated with Horizon Europe. To be outside of this would be a calamity for the UK in its efforts to be a ‘science superpower’. Attempting to achieve this alone and without recognising the need to attract the brightest and best researchers globally would be a mistake. A continued effort to review and update policies such as the R&D tax credit system and the patent box are welcome. Benchmarking against other countries and remaining flexible and nimble enough to respond and introduce best practises will be important. More SBRI engagements are also to be welcomed, given the incentive of a first customer for the research output and a pre-clarified ‘need’.

* What more could be done to incentivise collaborations between academics and industry? Are there barriers preventing this collaboration that could be removed?

Simplifying and unifying the technology transfer system. Standardising University ownership. The contracts over ownership and technology transfer can take months – by which time the advantage is lost. Perhaps build these issues into academic contracts so there are clear and not variable expectations. Clear and simple national guidelines on IP ownership that prevent the need for lengthy negotiations and create more realistic expectations from both partners. Requiring some strands of university support to have an industry partner, even if this is just in-kind support, could be encouraged, to ensure that there is a clear focus on what the commercial potential would be from a piece of research.

* What can be learnt from local innovation ecosystems, such as the Cambridge Science Park?

Local ecosystems are very valuable and encourage not only direct science but building of supporting organisations such as One Nucleus, which educate and encourage collaboration. The mix and collaboration of VC, angel and state funding in Cambridge is also useful. The ecosystem also allows the mix of companies and independents to thrive both in government funded and private sectors and the scientific culture pervades into many social activities. Science in the ecosystem is a 24/7 activity including interactions into book clubs, charity events and sports as well! This happens in the US Cambridge too and is a great place to foster scientific growth.

* What stage of the pipeline, from innovation to industry, is presenting the most significant problems for commercialising discoveries in the UK?

Early stage development – like the prototype stage, this is where BARDA and DARPA are most effective. Also the sums of money needed are such that the banks and VC are not interested but it is too large for family offices. Once research enters the pre-commercialisation/proto-type phase there are also often very few opportunities for further funding. This is where value needs to be added to attract private funds such as Venture capital.

* What contribution should public procurement make to achieving the aims of the science and technology strategy?

Public procurement (through the example of the SBRI projects) is an ideal vehicle for delivering on the aims of the science and technology strategy. It will however require a speed of movement, a flexibility and approach that is not always the case in government and so will require the support of the likes of Innovate UK for delivery.

**7.** **How well does the UK collaborate on research with international partners and what can it learn from other countries?**

* In which areas of science and technology is collaboration, or negotiating access to existing projects, more appropriate than competition or seeking comparative advantage?

UK collaborates extremely well and essentially in pharma and VCs. They cannot operate except internationally but NHS and NIHR tend to be much more insular and thus sometimes put investment off coming to the UK from pharma. Most global R&D companies have their research heads based in other countries not the UK. This should be redressed as UK late-stage research is seen by much of pharma as secondary and we need an edge now we are no longer part of EMA. This has to be founded on becoming a lot more engaged at key influencer level globally in academic societies and with pharma.

Certainly in global health challenges (such as the Covid-19 pandemic) where speed to a product is essential. Also in rare/orphan diseases where the global market may be more attractive to industrial partners than a single region.