BIA submission: Delivering a UK science and technology strategy

March 2022

UK BioIndustry Association

Summary: harnessing the UK's life sciences strength towards a science superpower

The BioIndustry Association (BIA) welcomes this inquiry into the UK's research and innovation ecosystem and whether it can deliver the Government's ambition for the UK to be a 'science superpower'. A strong science and innovation ecosystem is vital to accelerating national economic development and maintaining the UK's position as a leading world economy which will lead to a thriving society. 'Health and life sciences' has rightly been identified as one of the four priority areas for UK science and technology by the National Science and Technology Council (NSTC), alongside a 'digital and data-driven economy'.[1]

This response focuses on health and life sciences as one of the priority areas for the UK's science and technology strategy, highlighting the following points:

- The UK's life sciences sector is among the most research, development and innovation (RDI) intensive sectors in the UK, consistently investing more into research and development (R&D) than any other sector.[2] It is not only a key player in the UK science and research landscape but also acts as a highly globalised sector operating beyond the confines of the UK and bringing in foreign direct investment. The life sciences sector is universally recognised as world-leading and delivers great benefits to the economy, the health of the nation, and is essential if the Government's ambition to make the UK a science superpower is to be achieved.
- A sustained sector-specific strategy has proved highly effective in building the successful life sciences sector the UK enjoys today. Ensuring the full implementation of the current Life Sciences Vision and its strategic, complementary and comprehensive link to other science and technology strategies across Departments and sectors is vital for a successful joined-up UK science and technology strategy.
- The UK is not reaching the full potential of its private investment in R&D. Private investment can be attracted by de-risking it through R&D grants and tax incentives, most importantly R&D tax credits.
- To become a science superpower requires: access to finance for innovative companies; an enabling policy environment; a supportive regulatory and legal framework; a collaborative ecosystem; forward thinking; global reach; a strong pipeline of research translation; and a thriving skills and talent base.
- Public funding plays a vital role in enabling researchers and companies in the wider RDI ecosystem to innovate, grow, and leverage private investment. To be effective, public funding streams need to be sector-specific; maintain a balance between responsive and challenge-led programmes; focus on grants not loans; be diverse; be unbureaucratic and informed by the needs of users.

[1] Gov.uk (2022), *The Office for Science and Technology Strategy*. Available here: https://www.gov.uk/government/groups/office-for-science-and-technology-strategy

[2] BIA (2021), *Becoming a life sciences superpower*. Available here: https://www.bioindustry.org/uploads/assets/fc087ec2-ac56-4a6e-b117aa5edc643543/Becoming-a-life-sciences-superpower-Report.pdf

What would it mean for the UK to be a 'science superpower?'

To be a science superpower would mean the UK is a leader in RDI with a strong capability to translate that activity into commercially valuable solutions, products and processes that benefit the UK's society and economy and have a strong base in international markets. A science superpower would have a tangible impact in the UK and abroad, creating jobs and ecosystems that positively impact economic productivity, the environment and quality of life.

SMEs are the backbone of this scientific power and their full potential as a driving force in this ambition should be recognised in any science and technology strategy. With their deep understanding of the application of innovation to biology, the life sciences industry is helping to address humanity's greatest challenges, ranging from improving patients' lives through new treatments and digital healthcare, to the development of environmentally sustainable technologies, such as biological fossil fuel substitutes and biodegradable bioplastics. Life sciences SMEs are the route through which the UK will realise the economic and social benefits of a strong RDI landscape and move towards becoming a science superpower. This is exemplified by the recent successes of companies such as Kymab, Oxford Nanopore, Immunocore, Arecor and GW Pharmaceuticals.[3]

What would a 'science superpower' look like?

A science superpower would have a strong RDI landscape at its core, with the ability to identify, grow and scale up ideas, people and businesses in the UK, while upholding strong international ties and collaborations. Advancements in science and technology would flourish without obstacles and with adequate intellectual property (IP) protection and regulatory oversight. It would be able to channel consistent, diverse and significant amounts of investment into emerging technologies, including high-risk research, as well as skills and talent, and have a clear route for translating research into products and processes which would have clear and direct benefits for people, societies and economies in the UK and abroad. Throughout the following sections, we present the supporting principles that need to be embedded in the UK to realise this ambition.

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

Continuity in the policy environment is essential to success in the long term. In the life sciences sector, this includes the continuing implementation of a coherent strategy. The success of the sector comes in part from the consistent support delivered by successive strategies published since the Strategy for UK Life Sciences in 2012 and most recently framed in the Life Sciences Vision. Private investment in the sector has increased by over 1000% since 2012[4]. Multi-year spending settlements for the relevant public authorities are also vital to maintain the UK's globally competitive science ecosystem. Continuity in public funding and policymaking creates confidence in companies which want to innovate and reassures private investors. Changes to the way the current system functions need to remain focused on outcomes and build in a greater capacity to innovate for all parties involved.

Ensuring the full implementation of the Life Sciences Vision and its strategic, complementary and comprehensive link to other science and technology strategies is vital to build on the successes created from

3 BIA (2022), *UK biotech financing in 2021.* Available here*:* https://www.bioindustry.org/policy/finance-tax-and-investment/finance-report-2021.html

4 BIA (2022), *UK biotech financing in 2021*. Available here: https://www.bioindustry.org/policy/finance-tax-and-investment/finance-report-2021.html

past strategies. Government support, both financial and strategic, not only helps innovative companies to create value for the economy but enables collaboration with other organisations in the UK and globally that is vital to fulfill the superpower ambition.

Existing science and technology policies need to link-up with government policies in other departments and sectors in order to lift up communities and the economy through the power of sciences and tech. This has been evident in the life sciences sector, whose applications to society's problems go beyond healthcare and encompass the bioeconomy and the UK's targets towards a greener economy. As the UK emerges from the pandemic with a renewed impetus for scientific progress, and with the life sciences sector vibrant and relatively well-financed, it is crucial for the UK to continue on its path of long-term, consistent and forward-thinking policy making and financing. Linking up existing policies and strategies is essential to this. At the moment, life sciences policy sits with the Department for Business, Energy and Industrial Strategy (BEIS) and the Department for Health and Social Care (DHSC). Due to the cross-cutting nature of science and technology, all relevant government departments need to be pulling in the same direction, including the Department for International Trade (DIT), the Department for Digital, Culture, Media & Sport (DCMS), the Department for Work and Pensions (DWP), the Cabinet Office and HM Treasury.

Are the four scientific and technological priorities identified by the National Science and Technology Council the right ones for the UK?

'Health and life sciences' has rightly been identified as one of the four priority areas for UK science and technology by the National Science and Technology Council (NSTC), alongside a 'digital and data-driven economy'. The two are highly complementary areas, with data, digital and AI and life sciences being strongly linked in addressing not only health but also environmental, sustainability and societal challenges.

The UK life sciences industry is a major scientific and RDI employer, with 268,000 people across the UK. There are 6,330 life sciences businesses, 85% of which are SMEs, and combined they generate a turnover of £88.9bn[5]. The sector's deep understanding of applying innovation to biology is helping to address humankind's greatest challenges. Most recently, life sciences SMEs played a crucial role in developing and manufacturing effective vaccines against COVID-19. This fast and robust response was only possible due to an existing networked community in and beyond the sector and the continuous investment into the life sciences ecosystem.

Only through the support of the UK's thriving life sciences sector will the UK become a science superpower. Besides improving health through genetic screening, faster and more accurate drug delivery, new treatments for previously untreatable diseases and earlier diagnosis of diseases, life sciences improve the world by lowering environmental pollution with bio-degradable plastics and plastic-digesting bacteria, reducing the reliance on fossil fuels through biologically-produced fuels, more efficient food production and novel high-performing materials for fashion, sports and construction industries.

What measures should determine whether the UK has become a 'science superpower'?

A UK science superpower would be identified by the following observable characteristics:

Collaborative. A UK science superpower has strong collaborative links within its own ecosystem of people, organisations and industry, across other sectors in the UK, and internationally. The more porosity exists in the ecosystem, the more knowledge and skills can be shared, realised and translated into products or processes that

[5] OLS (2021), *Bioscience and health technology sector statistics 2020*. Available here: https://www.gov.uk/government/statistics/bioscience-and-health-technology-sector-statistics-2020

benefit society and the economy as a whole. This includes sharing of knowledge, skills and information through established networks. Beyond simple monetary returns, the global nature of these type of programmes helps forge new collaborations, open new markets, and increase the diversity of prestigious funding and investment available.

Forward-thinking. A science superpower is supportive of and responsive to the dynamic and changing needs of its scientific organisations, including industry. Introducing the new Advanced Research and Invention Agency (ARIA) to the ecosystem, for example, could add a well-needed dimension to the UK's innovation capabilities by funding and scoping current and upcoming strategic high-risk, high-reward technologies, such as artificial intelligence and engineering biology. To be effective, it will be important to involve industry in every aspect of its design and delivery.

Global reach. A science superpower would be a leader through innovation not only in the UK but globally, solving global issues by driving forward solutions in green technology, genomics, novel medicines and therapies for patients, vaccine technology and development and manufacturing for complex biomolecules, and successfully, positively and supportively driving an international agenda that benefits people everywhere.

Access to finance. A clear measure of a science superpower is consistent access to funding and investment for UK science and technology, with more than 2.4% of GDP investment in R&D being achieved in the long term. This includes access to diverse finance for high-risk, high-reward projects and for all phases of RDI, from academic research through to all stages of its translation and commercialisation into products and processes that benefit people. Alongside government grants and private investment, a supportive tax system, including R&D tax credits, is crucial to this. Ensuring start-ups and scale-ups have access to finance at all stages of development is a fundamental pre-requisite for success of any science and technology strategy, as was recognised in the Life Sciences Vision.

Thriving talent & skills pipeline. Academia and other education providers in the UK need the right support to nurture talent and develop skills. The UK is renowned worldwide for its excellent science base and is home to some of the most prestigious universities in the world. This thriving science base is the foundation for the whole UK sciences ecosystem. To provide the right skills and talent to companies and the wider sciences ecosystem, education, training, reskilling and upskilling would be continuously supported and well-funded. In addition, knowledge exchange and collaboration across organisations and borders is fostered and a supportive immigration framework in place. Industry also has an important role to play in upskilling the workforce and the life sciences sector is committed to this.

Strong pipeline of research translation. Building on a science superpower's foundation of a strong research, development and innovation landscape is a deeply embedded successful mechanism to translate this research into products and processes of economic and societal value. This includes diverse and abundant public and private funding for start-ups and scale-ups at all stages of development on the one hand and growing the leadership and entrepreneurial skills needed to build on and progress bold ideas and companies on the other. Furthermore, for ideas to materialise and companies to progress, cross-sector mutual understanding needs to be broadened by increasing the overlap between teaching sciences and finance or business.

A supportive regulatory and legal environment. The UK maintains and builds on its robust and science-led regulatory regime. Its regulatory framework is agile and responsive, allowing innovation to flourish while maintaining the confidence of government, innovators and the public. However, science is global and regulation operates within that global context too. The UK needs strong regulators which not only lead the conversation nationally but also internationally. Similarly, strong intellectual property rights are vital for life sciences companies to be able to attract investment to innovate and grow.

An enabling policy environment. Research-performing, innovative companies in the UK life sciences sector are an important player in the UK's RDI ecosystem, paving the way towards making the UK a science superpower. For the UK to thrive, it is important for all stakeholders in the system, including the Government and industry, to work together and make sure systematic changes, public and private funding streams and the policy and regulatory environment are efficient and effective. A thriving RDI ecosystem will be vital to accelerate sustainable economic development and maintain the UK as a leading science-based economy.

Most significantly, the measures used to identify whether the UK has become a science superpower would be based on outcomes, that is, real and tangible benefits for people's quality of life. This can be clearly identified in the life sciences sector, where medicines and therapies are directly improving people's lives.

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?

The strength and breadth of the life sciences sector is to a large degree the result of many years of cross-party government support and would not have been achieved without a sustained strategy pursued by successive governments. To continue this success and expand it to incorporate the wider science and technology landscape, this needs to continue and be embedded across government departments by linking up their existing strategies and aligning towards the same goals.

In the life sciences sector, ensuring the long-term implementation of a coherent and joined-up strategy can be further supported by continuing to work collaboratively with industry and other key stakeholders in the sector through forums such as the Life Sciences Council. Working with industry and other stakeholders is key to creating consistency while remaining agile to the changing needs of rapidly evolving innovative science and technology.

Is the UK realising the potential of its research investment?

The UK is not realising the full potential of its research investment. While the Government's target for total R&D investment in the UK to reach 2.4% of GDP by 2027 and the increase of public investment into R&D to reach £22 billion a year by 2026/27 is a positive step, this needs to materialise in increased business investment and access to adequate finance across all stages of R&D.

The UK life sciences and biotech sector reached new heights in 2021, securing £4.5 billion in public and private financings, £1.7 billon more than in 2020. There has been a step-change in investment levels in recent years, with 2021 seeing record sums of capital deployed. However, much of this capital is sourced from overseas, particularly the US. While this investment is welcome, it means the sector is missing out on a valuable source of additional investment (the City of London) to super-charge its growth and companies will naturally gravitate towards the US to access capital. The end result will be lower levels of commercialisation in the UK – i.e., a lower economic return on public R&D investment.

To increase private investment that allows companies to scale-up here, the UK needs to pool the funds of institutional investors to generate globally competitive scale, encourage institutional investors to invest into long-term value-generating asset and improve the transparency of performance data and company analysis in the life sciences and other science and technology sectors that lack sufficient access to UK private finance.

Ensuring there is a viable home market for companies is also key to maintaining their presence in the UK and supporting their scale-up here. An NHS that is open to innovation is therefore key for the healthcare industry, as well as government procurement across many other areas – from genomic sequencing for biosecurity to environmental technologies. Government procurement must be open to home-grown innovators, who can sometimes be overlooked in favour of overseas multi-nationals. The Government and the life sciences and other sectors need to work collaboratively to develop a holistic approach to innovation and funding policy that takes into account the role of the wider business environment in raising R&D investment in order to capture the full economic, environmental and social benefits for the UK.

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

Grant applications are often lengthy and time-consuming processes that SMEs have limited time and resources to navigate, and with a high risk of failure. This means thar the effort required by SMEs to write grant applications regularly outweighs the benefits of securing them. In addition, the subsequent audit and oversight requirements following a successful application are equally time-consuming and resource intensive. While audits and other measures are in place for good reason, it is important to remove or streamline those bureaucratic processes that discourage accessing funding and resources for R&D.

Some processes in academic-industry collaborations can hinder collaborative R&D. In some cases, universities and technology transfer offices work to different and often extensive timelines which cannot always accommodate for faster-paced industry projects and needs.

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

UK life sciences are a clear economic and scientific strength in the UK. While public funding is vital, not least to leverage private investment, on its own it cannot lead the UK to be a science superpower. The whole ecosystem needs to be strategically aligned. The UK life sciences sector's COVID-19 pandemic response exemplified how effectively the UK can deliver ground-breaking science with positive impacts around the world. Added to the points mentioned above, there are a few key areas of UK scientific and economic strength that need further strategic support.

The Biomedical Catalyst (BMC) is a key source of early-stage funding for UK bioscience companies. The BMC has been highly successful, generating £4.72 in public and business value for every £1 invested by government[6]. Though healthcare focused, it is broad enough to support a wide range of innovations in the pipeline. However, while the BMC competition identifies a large number of fundable projects, most of them (though scoring highly in their application) cannot be supported with funding due to limited budgets. It is important for the BMC to continue and be expanded in the long-term.

Alongside the broad support offered by the BMC, strategic investments are needed in important areas of UK innovative strength, including cell and gene therapies, genomics, engineering biology and data and AI. These need dedicated funding to continue to tackle health and environmental challenges. Life sciences companies increasingly rely on enabling technologies such as engineering biology and data and AI. As recognised in the

[6] Innovate UK (2019) *Biomedical catalyst impact evaluation*. Available here: https://www.gov.uk/government/publications/biomedical-catalyst-impact-evaluation

Innovation Strategy, these enabling technologies, when accelerated, are able to support companies in multiple sectors, thus building a strong foundation for the wider science and technology ecosystem to flourish.

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

State funding for R&D should be allocated to encourage collaboration between different organisations on the one hand and target emerging technologies such as AI and engineering biology on the other. A diverse ecosystem is vital to support R&D and build a powerful science and technology force in the UK, so that any public funding should be distributed fairly and include a wide range of organisations, people and R&D activities.

Public funding plays a key role in enabling researchers and companies in the wider RDI ecosystem to innovate, grow, and leverage private investment. The BIA has consulted its membership of life science companies to analyse what does and does not work in research and innovation funding systems.[7] To ensure public funding streams remain attuned to industry needs, leverage private investment most efficiently, make the most effective use of taxpayers' money and remain effective in the long term, they need to:

- be sector-specific to provide long-term consistency and assurance to researchers and investors. The renewal and expansion of the publicly funded Biomedical Catalyst[8] enabling breakthrough scientific research to materialise is a positive example that can be applied to other sectors and academia.
- maintain a balance between responsive and challenge-led programmes to allow all types of innovation to thrive
- focus on grants, which are better suited to supporting risky early-stage RDI, not loans
- be diverse to support the varied needs of life science SMEs
- be unbureaucratic and informed by the needs of users (those performing RDI).

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

Public funding should be used to demonstrate confidence in UK science and technology, thereby encouraging private sector funding into certain scientific innovations, R&D and more. State or public funding can be used to leverage private sector funding and investment in the following ways: (1) Tax incentives, including R&D tax credits, which offer broad support for innovation while requiring low levels of bureaucracy (2) Grants that de-risk private investment with non-dilutive finance and provide confidence through peer review. Linking these programmes more closely with venture capital further helps to leverage private investment.

Public funding streams are complemented by other policy levers that the Government and UKRI have at their disposal to steer the UK's RDI landscape and maintain its global competitiveness and collaborative nature. Like the dual-support system in university funding, there is great complementarity in these support mechanisms. These include a supportive tax system, with R&D tax credits that are internationally competitive to attract investment into the UK, tax-advantaged employee share options that allow SMEs to offer competitive renumeration packages; and venture capital incentives that encourage private investment into early-stage companies.

[7] BIA (2020), *Life Sciences: Catalysing investment and growth*. Available here: https://www.bioindustry.org/uploads/assets/uploaded/b19779d4-470c-4787-83c1e20b4ffdec60.pdf
[8] BIA (2021), *Biomedical Catalyst*. Available here: https://www.bioindustry.org/policy/finance-tax-and-investment/biomedical-catalyst.html

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

Besides the points mentioned above, the sector needs to be promoted more effectively, be given credibility in the eyes of investors and through the authority of government. The funds of institutional investors need to be pooled to generate globally competitive scale and drive collective action through a government-led scheme that would provide confidence through approved VC funds. Further, UK institutional investors need to be encouraged to invest in long-term value-generating assets through continued changes to rules and regulations. Lastly, the transparency of performance data and company analysis needs to be improved so that investors have a better understanding of the opportunities the sector presents.

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

Innovative companies in the life sciences sector need sufficient investment to conduct R&D, for pre-revenue companies this will primarily come from equity investors (i.e., venture capitalists and to a lesser extent the public markets). The more access to capital these companies have, the more they can spend on research. Institutional investors such as pension funds are an untapped investment source in the UK that can be leveraged to support the sector's R&D spend.

The Tibi scheme in France, launched in 2019, is a positive example of how to improve the flow of institutional investment into life sciences. The scheme has been successful in pooling institutional investors' funds (£3bn invested into funds to date out of a total commitment to invest £5bn) at pace and into technology-focused and life sciences funds. Its success is in part due to strong political and government buy-in. Switzerland's pension reform is a good example of supporting institutional investment into higher risk/illiquid asset classes. The Swiss pension reform, allowing 5% of a pension's assets to be invested directly into venture capital, will enable greater levels of institutional funding into illiquid assets. It is an example of how the UK can potentially act in a swift manner and implement a regulatory change which could be beneficial for life sciences. Sweden has performed a similar regulatory reform, allowing 40% of a pension's assets to be invested into illiquid asset classes (compared to 5% previously), thereby increasing institutional funding into those assets.

These country-specific changes to unlocking institutional investment through reform and strong backing from government are key to ensuring that innovative SMEs have the ability to grow, scale up and remain in the UK, benefitting people and the domestic economy.

In addition, strong intellectual property protections for innovative life sciences companies are necessary for companies to be able to access private investment.

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

The most significant problems for commercialising discoveries in UK life sciences are found in the early-stage translation of ideas from academia into industry on the one hand, and scaling-up and growing innovative companies in the UK through access to scale-up UK finance, on the other. The former is linked to resource constraints in both academia and industry, especially SMEs; lengthy bureaucratic processes; and difficulties around ownership of intellectual property. The latter is linked to limited availability of UK-based scale-up finance, including venture capital and institutional investment for life sciences companies.

Some of the barriers to academia/industry collaborations are caused by disagreements over IP; lengthy, time-consuming bureaucratic processes involved in collaborating; difficulties in identifying the right partners; inflexibility of academic partners; and lack of resources, which acts as a significant inhibitor especially for SMEs[9].

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

The research-intensive life sciences sector is global in its nature, as exemplified by the COVID-19 pandemic response. Association with international programmes such as Horizon Europe are an important part in keeping up international collaborations. There is room to grow when it comes to the extent of the UK's international collaboration on research, especially since leaving the EU. Long-term international funding programmes can help leverage skills and capabilities, develop international relationships and attracts inward investment.

Life sciences is a global industry with high levels of collaboration. The majority of UK R&D conducted by innovative life sciences SMEs takes place in the UK. However, some activity must be conducted overseas with international partners for legitimate and unavoidable reasons such as access to the right patient groups for clinical trials. The complexity of regulated medical R&D in life sciences means they must access specialist skills (researchers and doctors) and facilities that may not be present in the UK at all or in sufficient numbers. Unlike other countries, the relatively small size of the UK and almost infinite scope of medical science means the UK will never be 'self-sufficient' in this regard and is unable to onshore this R&D activity fully. It is vital for the continued growth and competitiveness of the UK's life sciences community that these companies continue to be able to claim for overseas R&D through the tax reliefs regime, and to be able to work with the best and most innovative companies around the world.

About the BIA

The BioIndustry Association (BIA) is the trade association for innovative life sciences in the UK. Our goal is to secure the UK's position as a global hub and as the best location for innovative research and commercialisation, enabling our world-leading research base to deliver healthcare solutions that can truly make a difference to people's lives. Our members include start-ups, biotechnology and innovative life science companies; pharmaceutical and technological companies; universities, research centres and accelerators; and a wide range of life science service providers. The BIA's members are at the forefront of innovative scientific developments targeting areas of unmet medical need. This innovation leads to better outcomes for patients, to the development of the knowledge-based economy and to economic growth. Many of our members are small, pre-revenue companies operating at the translation interface between academia and commercialisation.

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[9] NCUB and CBR (2022), *The changing state of business-university interactions in the UK*. Available here: https://www.ncub.co.uk/wp-content/uploads/2021/07/5334_NCUB_Changing_State_of_Business-University_Interactions-FINAL.pdf