

Response to the Government's R&D Roadmap Consultation

Submission from the National Centre for Universities and Business (NCUB),
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Introduction

The Government recognises that research and development (R&D) has a fundamental role to play in recovering from Covid-19, as well as shaping a greener, healthier and more resilient UK in the future. The R&D roadmap describes a once-in-a-generation opportunity to strengthen our global position in research and drive an innovative economy.

This paper represents NCUB's submission to the R&D roadmap consultation and should contribute, along with evidence and recommendations from NCUB's [R&D Taskforce](#), to the forthcoming Government R&D plan. NCUB's central response is that realising the important and bold ambitions of the R&D roadmap requires the Government to view business as an integral partner of the UK's research and innovation system. Business spend on R&D accounts for 54% of total UK R&D spend and realising the Government's target of spending 2.4% of GDP on R&D by 2027 would require businesses to spend £18 billion more on R&D annually. The forthcoming Government R&D plan must take full account of the range of factors that affect the operating environment of R&D performing industries (including large corporates and start-ups) and their contribution to the impact agenda. This includes human, physical and financial capital, regulation, fiscal policy, infrastructure and trade policy.

Driving forward the UK's strong position in research and innovation can only be facilitated through persistent efforts to improve the many ways in which the academic and business worlds bring benefit to one another. Against this background, the National Centre for Universities and Business (NCUB) was launched in April 2013, and works together with member universities and businesses to achieve growth and prosperity. Uniquely in the UK, the National Centre focuses exclusively on understanding and improving the relationship between businesses and universities.

Our responses to the questions below are informed by our unique member perspective, championing the role of university and business partnerships and acting as a trusted advisor to Government.

How can we best increase knowledge and understanding through research, including by achieving bigger breakthroughs?

Knowledge can emerge at different times in different places. Arguably, knowledge from basic research has never flowed so quickly and so freely across national borders. Various studies have demonstrated that R&D investment overseas can spill over domestically and impact productivity. The UK needs to be ready to seize opportunities presented by discoveries made anywhere in the world, as well as strengthening its own research production.

- **NCUB recommends** that this requires the continuation of flexible government support for world-class basic research in all disciplines. The flexibility offered by Quality Related (QR) Research Funding, and devolved equivalents, allows researchers from a wide range of backgrounds and with their own global academic networks to steer productive research agendas.

Research universities' primary goal is generating and disseminating knowledge. Investment in universities represents a long-term investment in the UK's research capabilities and will bring long-

term returns. Universities' critical contribution to the research and innovation system relies on a long-term and sustainable funding system.

- **NCUB recommends** that the principles of the UK's highly efficient Dual Support System should be maintained, but that the balance should be reviewed. Our university members report that growth in QR funding, and devolved equivalents, has not kept pace with growth in grant funding from all sources (that includes government grants, but also investment in university research by charities and business).
- **NCUB recommends** that the financial sustainability of universities as an integral part of the research system must be kept under careful review, particularly as the consequences of the Covid-19 pandemic become clearer. The scale and diversity of the university sector must be maintained to drive forward the ambitions of the roadmap and level up the economy.

NCUB members and others tell us that near-to-market 'technology-pull' is better funded within the research funding landscape than early-stage, high-risk, potentially high-impact venture capital. Limiting research funding to late stage research or research that is likely to achieve excellence with near-guaranteed outcomes can stifle curiosity and innovative thinking. There is a gap in the research and innovation funding landscape for researchers to access longer-term funding.

- **NCUB recommends** that the proposed UK ARPA may go some way in breaching this gap by providing research funding allocations (spanning at least 10 years) that give researchers the freedom and resources to unlock their ideas from concept stage through to commercialisation. The ARPA should be mission orientated and focussed on specific themes of strategic priority. Involving industry and academics in determining strategic priorities will be critical.

Being part of a global network of knowledge generation and exchange is critical in order to maintain and grow the UK's research strengths.

- **NCUB recommends** that the UK maintains close research relationships with other countries and welcomes the Government's commitment to seek association to European Framework Programmes, as well as its commitment to a replacement programme should association not be achieved. As the UK leaves the EU, there will be opportunities to strengthen the UK's strategic engagement with other major research nations too.

How can we maximise the economic, environmental and societal impact of research through effective application of new knowledge?

Government, funders and universities have developed and implemented a variety of policies to enhance the impact of research through initiatives like the Research Excellence Framework. The impact agenda has had a significant and positive effect on research, encouraging researchers to consider the economic, environmental and societal impact of their research from the outset. Importantly, it has recognised that research in all disciplines can lead to a range of positive impacts.

- **NCUB recommends** that effective collaboration between researchers, innovators and end users (in business, the third sector and Government) is critical to maximise the impact of research and appropriate its benefits. Collaboration should therefore be central to the Government's R&D plan. NCUB is leading a comprehensive study into the drivers of university-business collaboration to enhance evidence on university-business interaction specifically.

Commenting specifically on the impact and value that can be generated through collaboration with businesses as end users, NCUB observes that creating the innovative economy set out in the roadmap, and maximising the impact of the UK's world-class research base, requires a fundamental refocus of the UK's economy. In refocussing the economy towards more R&D intensive activity, businesses are not just beneficiaries of the research and innovation system, but they are an integral part of it in a way that is not fully explored in the roadmap to date. The roadmap speaks to the role of public R&D performers more than to the role of private R&D funders and performers.

- **NCUB recommends** that the forthcoming Government R&D plan takes full account of the range of factors that affect the operating environment of R&D performing industries (including large corporates and start-ups) and their contribution to the impact agenda. This includes human, physical and financial capital, regulation, fiscal policy, infrastructure and trade policy.
- A UKRI-sponsored NCUB taskforce of business and university leaders is developing more detailed recommendations in this area and will **publish a full report and recommendations in October**.

Maximising the impact of research and driving innovation relies on an effective flow of knowledge. Ultimately, this requires people to connect with each other through collaboration. Talented researchers and innovators need opportunities to migrate both geographically and between positions in academia, industry and government.

- **NCUB recommends** that the UK encourages the flow of researchers across national borders and sectors. NCUB is researching barriers to flows between academic, industry and government careers, and is well placed to advise the government as it develops policies on mobility.
- **NCUB recommends** that innovative practices to networking and collaboration through digital channels are further explored, encouraged and exploited. This includes further expansion of the role of digital brokerage tools, such as NCUB's innovative Konfer platform.

How can we encourage innovation and ensure it is used to greatest effect, not just in our cutting-edge industries, but right across the economy and throughout our public services?

The challenge in driving an innovative economy is twofold. First, refocusing the economy will require the UK to support, build and attract more businesses and organisations in sectors that typically perform more R&D. Second, it requires less R&D intensive businesses and organisations to adopt more innovative practices.

- **NCUB recommends** developing a time-limited, mission-orientated Government Department to review the full range of fiscal, regulatory and policy measures that could be implemented to realise the vision of an innovative economy. This recognises that translating the UK's strength in research into driving an innovative economy requires measures to be taken across most, if not all, areas of Government.
- **NCUB recommends** that schemes and initiatives are developed that support the diffusion and adoption of research and development through the supply and value chain of some of our world leading businesses. The catalytic effect of encouraging R&D could be transformational in developing more innovative, more productive and more resilient businesses across different sectors.

The UK has set an ambitious target to double, in nominal terms, R&D spend and has frontloaded increases in public funding to help leverage greater private investment. Business spending on R&D accounts for approximately 54% of current R&D spend. Achieving the Government's target would require an estimated increase of £18bn per year by 2027. The leverage rate of public R&D funding is shown to be greater in the long-term than the short-term.

- **NCUB recommends** that in addition to committing to greater research spend, the Government should also review and enhance specific funding streams and fiscal policies designed to stimulate business investment in R&D, partnerships and innovation. Lifting tax credits to 13% was a positive step, but this could go even further. To realise their full value, tax incentives must not penalise contracting research from universities.
- NCUB makes the following observations:
 - o The economic and social benefits of innovation often face a time lag, typically reflecting the prohibitive cost and risk associated with proof-of-concept research. Finding ways to help business overcome the so-called "Valley of Death" is fundamental to realising the ambitions of the roadmap.
 - o Historically, industries have been less inclined to invest in speculative R&D and innovation activity when facing uncertainty. Businesses may invest less in the years to come. NCUB is working with UKRI to develop ongoing evidence.

Encouraging innovation across industry, not just in traditional R&D intensive sectors, means harnessing ideas in innovative start-ups where access to finance is often a barrier to further innovation. The Rees report provided advice on University-Investor links, concluding that access to funding for spinouts can suffer when constrained by accounting and tax rules. Similarly, a lot of regulation that applies to large companies ends up also applying to the start-ups that they invest in. These issues restrict Corporate Venture investment and discourage start-ups from working with Corporate Venture arms.

- **NCUB recommends** making tax incentive schemes start-up-friendly by limiting regulation and bureaucracy for venture capitalists and providing support to start-ups on how they can access and benefit from investment.

How can we attract, retain and develop talented and diverse people to R&D roles? How can we make R&D for everyone?

Excellent research and an innovative economy relies on a diverse researcher and innovator workforce and good employment conditions to attract talent, generate new ideas, improve the wellbeing of researchers and drive research excellence. The UK's researchers and innovators work in universities and research centres, but also in businesses across the UK. Much less is known about the private sector workforce driving much of the UK's research and innovation activity.

- **NCUB recommends** that the R&D plan consider both the academic and the private sector R&D workforce, identifying where there may be shared challenges related to diversity, career pathways and culture.
- **NCUB recommends** that the Concordat to Support the Career Development of Researchers provides a strong framework to addressing issues related to researcher career progression and culture. Many of the principles could and should be extended to the private sector, as well as embedded within universities and public research institutes.

The availability of a skilled workforce is a major factor influencing business investment in R&D. Research from the Royal Academy of Engineering has found that investors felt that the quality of the UK's R&D workforce is high but the quantity was a challenge. Covid-19 has presented challenges for academic researchers, with some university academics furloughed and university recruitment of early-career researchers significantly reduced. To achieve the goals of the roadmap there must be a clear strategic direction from government, in collaboration with universities and business, in identifying and delivering future talent needs.

- **NCUB recommends** ensuring that the Office for Talent has adequate resources and develops a single government approach to the UK's "talent offer" as well as co-ordinating effectively with business and universities.
- **NCUB recommends** BEIS and HMT works with universities and industry to identify bold measures to help those recently completing postgraduate research degrees and PhDs at this unprecedented time into meaningful employment. This is critical to avoid losing a generation of researchers.

Diversity of the research and innovation workforce remains a significant challenge, despite positive initiatives like Athena Swan and The Race Equality Charter processes. Change has been too slow. The UK's ability to maximise research impact and drive innovation relies on bringing people together with a diverse range of experiences, perspectives and ideas.

- **NCUB recommends** expanding on the success of Future Leaders Fellowships (FLF) so there are fellowships specifically for UK citizens with protected characteristics and from disadvantaged backgrounds.

It is welcome that the roadmap recognised that technicians are vital to R&D. There have been long-standing skill shortages in these roles and as well as ensuring more UK citizens enter these roles, it is important to attract international talent.

- **NCUB recommends** adding STEM technician roles (all job titles listed under the 2010 SOC minor group 311 Science, Engineering and Production Technicians) to the updated Shortage Occupation List. According to the Home Office's immigration rules, these are all roles at RQF 3 and the majority have a salary rate less than the threshold under the new points based immigration system.

How should we ensure that R&D plays its fullest role in levelling up all over the UK?

NCUB agrees that there is a need to "do more to enable places all over the UK to thrive and fulfil their potential in R&D." Often the tendency is to interpret 'levelling up' in a geographical sense but by levelling up through R&D, there are in turn benefits in the context of social mobility, wellbeing, healthcare, employment and other opportunities that have cross cutting benefits.

- **NCUB recommends** maintaining the current funding mechanism for awarding funding on the basis of research excellence wherever it exists, building on existing programmes like the Strength in Places Fund (SIPF). The SIPF allocates funding driven by business need that can be met by existing local area research strengths and capacity, taking into account the ability of an area to absorb public funding.

As well targeting funding at existing strengths and excellence, initiatives are needed to consider how areas can build their R&D capacity and create an environment for future excellence. Universities and businesses play a critical role in identifying and responding to local strengths, weaknesses and opportunities in terms of science and innovation in their areas. Initiatives like the trailblazer local Industrial Strategies (LIS) allow universities and businesses to enhance understanding of regional strengths, as well as shape proposals to create, seize and promote opportunities in the future.

- **NCUB recommends** building on initiatives like the trailblazer local industrial strategies (LIS) as a positive example of how local authorities can bring local leaders together to help build capacity and identify excellence. NCUB supports the need for LIS' to be built upon a strong understanding of the local economy, its key sectors, and what the opportunities are to drive productivity growth. Businesses can provide a direct understanding of the challenges their areas are facing in a way standard datasets do not.

Research from the NCUB Smart Specialisation Hub suggested there is a need to use evidence more strategically to identify where to invest limited resources to achieve local economic growth. This data can support strategic discussions at a local level between and within local Government, universities and business.

- **NCUB recommends** promoting the use of transparent and reliable data to drive growth and target policy initiatives.

EU structural and regional development funds have played an important part in supporting some research and innovation activities that are not covered by other UK funding streams.

- **NCUB recommends** that the Smith-Reid recommendation to integrate the forthcoming Shared Prosperity Fund (SPF) with the Innovate UK agenda is taken forward to take advantage of Innovate UK's potential to guide and shape the SPF in partnership with DHCLG and local Government. This needs to be part of a phased and gradual approach to the change to SPF.

How should we strengthen our research infrastructure and institutions in support of our vision?

NCUB welcomes the vision articulated within the Roadmap of world-class UK research and dynamic innovation as part of an interconnected system. With this in mind, NCUB's response considers infrastructure in its broadest sense, with an eye to all of the components that lead to a successful innovative economy. The Roadmap highlighted that the UK will build upon the recommendations in the UKRI Infrastructure [Opportunity report](#) to provide a long-term, flexible pipeline of research and innovation infrastructure investment priorities for the next 10 to 20 years. NCUB believes the following recommendations are the most important to take forward:

- **NCUB recommends** that attracting and retaining human capital across all parts of the UK will be critical to building up R&D capacity and levelling up across the country. To develop the researchers, innovators, engineers, technical professionals and other specialist roles needed to build, maintain and use our infrastructure, we need a strong and interconnected talent pipeline across all sectors and career stages, and we must offer effective career support. Of immediate importance is the provision of technical professionals with digital, data science and AI skills as outlined in the Industrial Strategy. In these areas, demand already exceeds supply and shortages will become more acute.

- **NCUB recommends** including e-infrastructure as an essential and pervasive requirement in the R&D roadmap developed at the same pace of growth in demand and rapid development in technology in both business and academia.
- **NCUB recommends** maintaining and investing in physical infrastructure to protect the valuable assets that the research ecosystem relies on. In the context of Covid and the ensuing recovery period, the UK will need to protect its assets while businesses and universities find their way back to prosperity. NCUB welcomes the £300 million in funding to upgrade scientific infrastructure as a positive step in recognising the importance of ongoing capital investment.
- **NCUB recommends** that as the UK expands its research and innovation infrastructure toward the 2.4% target, but we must ensure appropriate tensioning between development and investment in new capability on the one hand, and the requirement to maintain, develop and decommission existing infrastructures on the other.
- **NCUB recommends** exploring what interim support can be offered to businesses to help protect their investments and ensure investing in R&D in the UK remains attractive. This could include extending programmes such as the Future Fund, tax incentive schemes or specific interventions aimed at bridging the funding and support gap for early stage research, where venture capital is at the highest risk of cuts from corporate investors.
- **NCUB recommends** policy makers consider the long term impact of the recession in traditional R&D industries sectors and their role in the entire R&D ecosystem. Certain sectors have been disproportionately impacted by Covid-19 including many traditional sectors associated with a high concentration of R&D investment, including aerospace, automotive and manufacturing. Stabilising the current ecosystem may involve industry-specific interventions aimed at ensuring the whole ecosystem does not collapse.

How should we most effectively and safely collaborate with partners and networks around the globe?

International collaboration is deeply embedded in the research and innovation community across the UK and it is fundamental to high quality research and business innovation. Against the backdrop of Brexit, the proposals contained within the Roadmap have the huge potential to reduce regional disparities in wealth and opportunity and to work towards a new global positioning for the UK.

- **NCUB recommends** establishing an international version of the highly successful UK Research Partnership Investment Fund. The scheme's unique feature is the doublematch funding required from non-public investors. To date, UKRPIF projects have secured commitments of over £2 billion of co-investment from industry partners, charitable organisations and philanthropic donors. NCUB supports the Smith-Reid recommendation to run similar competitions with sizeable rewards for the universities or research institutes that attract large amounts of foreign direct investment in R&D to the UK.

The Government's International Education Strategy published in 2019 demonstrated the important role that education related exports make to our economy generating almost £20 billion in 2016. The critical part that our globally renowned research system plays in bringing value to these global relationships also needs to be exploited and enhanced.

- **NCUB recommends** ministerial trade envoys consider how they can market and connect our globally renowned HE sector as well as innovation-active startups and businesses

concurrently, in order to secure global business investment so that it forms part of our newly independent trade policy considerations.

Internationalisation has brought significant economic and social benefits to the UK and transformed universities (and businesses) into global players in a competitive market. However, an increase in rare, but significant-impact risks and threats is an area that the UK cannot ignore. The threats to universities are not limited to the theft of intellectual property and data, or the security of university campuses. There are also threats to the values that have underpinned the success of the higher education sector: academic freedom, freedom of speech and institutional autonomy. The UK's universities have always been a crucible for debate, covering both domestic and international issues – many of which have been or continue to be contentious. It is critically important that they continue to play this role, providing the space for such debates to take place.

- **NCUB recommends** that Government guidelines for both businesses and universities working internationally must be clear and regularly reviewed. UK businesses and universities need to have the confidence to be able to pursue sustainable, secure international partnerships.

Developing a clear, collaborative and constructive approach towards protecting R&I growth, research security, institutional autonomy and academic freedom, intellectual property and cybersecurity and UK campuses will be essential.

- **NCUB recommends** developing a clear strategy to security, in consultation with private and public sector interests, in order to secure buy-in and ensuring the strategy works for all parties involved.

How can we harness excitement about this vision, listen to a wider range of voices to ensure R&D is delivering for society, and inspire a whole new generation of scientists, researchers, technicians, engineers, and innovators?

As the UK Government commits to investing £22 billion in public funding by 2024, it is with the expectation that an additional £44 billion will need to come from businesses in leveraged investment to reach the 2.4% target by 2027. Driving forward the UK's strong position in research and innovation can only be facilitated through persistent efforts to improve the many ways in which the academic and business worlds bring benefit to one another. NCUB believes it is only through listening to all the diverse interests of our existing R&D system that we can fully realise the benefits to become a world-class R&I leader.

- *Locally and regionally:* **NCUB recommends** engaging with existing local enterprise partnerships, as well as programmes like MIT REAP, to bring together local decision makers, universities and businesses. This will help drive forward the R&D Roadmap, encouraging each local area to demonstrate, build on and articulate their specific strengths. Key to this process will be to ensure universities are central to local engagement strategies. Their role as large employers of highly skilled research and talent positions them well to promote and facilitate new policies and opportunities. Throughout the Covid19 crisis, universities have demonstrated an ability as well as a commitment to supporting their local areas, and ensuring local businesses can not only survive but also thrive during the recovery period.

- *Nationally:* **NCUB recommends** adopting an ambitious mission-based policy to drive innovation in technologies that are important to the UK. NCUB business members have told us that a government-backed strategy can help to unite and inspire businesses, researchers, innovators, government and the public behind a common goal, to which businesses will respond and invest. Harnessing that enthusiasm and diversity of ideas and expertise with a clear agenda can propel the UK forward.
- *Internationally:* The Roadmap is explicit about the role that international researchers play in building and maintaining a successful R&D ecosystem. Thinking globally, there may be an opportunity for policy makers to orientate the same 'welcoming' approach aimed at international students to similarly attract international investors and innovators into the UK. NCUB is undertaking a study to understand how we can continue to ensure the UK remains an attractive place to come and do research. Underlying this, we need to understand how and to whom do we target and communicate tax credits? Are these sufficient? NCUB research has found that although our UK universities attract substantial business investment in their research and have a worldwide reputation, the UK is not equally as positive about promoting its strengths in this area.
- **NCUB recommends** exploring the role of Government in promoting the strengths of our HE sector in attracting R&D investment (see question 5 regarding trade envoys).