UK Research and Development Roadmap – Yorkshire Universities response

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

What appear to be 'breakthroughs' are often the result of gradual, incremental efforts across teams, disciplines and institutions, backed by long-term financial support. Facilitating the sharing of ideas and expertise across a diverse set of organisations throughout the UK is therefore key.

'Moonshots' are a thread running through the roadmap. As with similar approaches such as challenge prizes, moonshots can mobilise different organisations around a single goal, provide excitement and public interest, and focus minds on solving a societal challenge. Major breakthroughs and successful moonshot projects thrive in a culture that accepts – and expects – a high failure rate. DARPA had a failure rate of 85%.[1] Policymakers will need to ensure this culture of experimentation and risk permeates universities and businesses rather than being confined to one-off funding programmes or a dedicated innovation agency such as the proposed APRA-style body. University researchers from across the UK (i.e. not just those from within the golden triangle) should be part of the group of experts determining which moonshots to pursue, and the system should be configured to encourage experimentation and discovery in areas adjacent to the central challenge; breakthroughs often occur seemingly by accident in unanticipated areas.

Innovation occurs at interfaces and boundaries, therefore facilitation mechanisms for inter / cross-disciplinary research is also vital. The roadmap acknowledges the contribution of the social sciences, the arts and the humanities, for example, to science and research. But the imagery throughout is of test tubes and AR headsets. It is vital that policymakers throughout Whitehall – and in the Devolved Authorities, Combined Authorities in England, and so on – understand the importance of the whole spectrum of academic research, consider STEAM and not just STEM, for increasing effective R&D. Without this understanding, breakthroughs are likely to be limited.

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

[1] *Financial Times:* 'Why moonshots elude the timid of heart': https://on.ft.com/2ErzugY

UK R&D policy needs to be designed alongside, and be closely aligned to, local economic development policy. The success of research and innovation in the UK is intrinsically linked to the levelling up agenda, and as such to discussions over devolution and 'place' (the focus given by Yorkshire Universities' members to both their civic role in local communities and to research and innovation is testament to this).

Looking forward, important questions remain as to how innovation will feature within the UK Shared Prosperity Fund (SPF), the post-Brexit successor to European Structural and Investment Funds (ESIF). ESIF has encouraged and enabled place-based investment in innovation, which has been important for regions such as Yorkshire.

We need to see increased levels of research and innovation investment and activity (including investment for IP exploitation and more venture capital funding which is concentrated in the south and the golden triangle) in the northern regions. The benefits are many: driving more and better jobs in the regions, creating and diffusing knowledge for new and existing businesses, attracting inward investment and talent, and more effective data, analysis and innovation to improve our public services. This means creating local and regional innovation ecosystems which link universities with prime industries and smaller businesses and with foundational sectors and services such as local government, health, transport or the police, as well as local communities. Supporting such ecosystems is an essential part of applying new knowledge and maximising societal benefits.

3. 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?

Incremental devolution in recent years has begun to provide local government, metro mayors and other institutions with new flexibilities to deliver services and investment that are designed to reflect local conditions and meet the specific needs of a locality or region. Effective devolution is essential for deepening and widening the impact of innovation in our economy. It means local areas and regions will have more freedom to engage with businesses and universities on the issues that matter the most to particular places, thereby having a chance to direct impact locally where it is most visible or where it most matters for citizens. It also means local stakeholders and citizens can be more closely involved with innovation processes, helping to embed and accelerate impact and create a demand-side pull for innovation, thereby increasing collaboration, openness and inclusion.

Secondly, strong links between 'frontier' firms and local SMEs through supply chains is critical for increasing demand for innovation, improving skills and diffusing the commercialisation of ideas and product and process innovation within and across a wide business base, and for encouraging business scale-ups.

Finally, the roadmap is right to draw inspiration from the response of businesses to COVID-19. The pandemic has shown the ingenuity, innovation and resourcefulness of local businesses who have entered the supply chain to fill gaps, and such firms should be encouraged and supported. More emphasis will likely be given to secure and deliver resilient supply chains within the UK and near neighbours post-COVID-19. This means strengthening industrial capacity and domestic manufacturing in the UK, ensuring the provision of critical goods and services across the country, and encouraging a culture of innovation and experimentation – with clear implications for spatially-aware policymaking and an opportunity for rebuilding local economies.

More essentially, the R&D Roadmap needs to be successful at speaking to those businesses (SMEs in particular) and public services that currently dismiss innovation as something not applicable to them. The language needs to be adapted to include, encourage and inspire those who think it is not for them and campaign to drive behavioural and culture change to want to and aspire to innovate.

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

Underpinning a post-COVID recovery there is an opportunity to recalibrate the education system to be fit for a new era. Such an education system would provide citizens with entrepreneurial and growth mindsets and encourage flexible, lifelong learning to help them keep up with the pace of change. Skills are a huge barrier to innovation adoption and diffusion; businesses need access to opportunities to upskill their employees. There is a strong link between skills and innovation that needs to be communicated clearly at national level, with innovation funding streams directly addressing skills issues.

Specifically, the roadmap acknowledges that most doctoral candidates exit academia once they have completed their training. HEPI report that 67% of PhD students want a career in academic research but only 30% stay in academia three years on.[2] Transitioning between sectors needs to be a seamless process, facilitating the sharing of knowledge and expertise and building new connections. Forging new career paths across sectors – whether that is industry, local government, the NHS or universities – should be encouraged. Jointly-funded posts, secondments or exchanges between sectors can help this process, and deepen collaboration. Such initiatives can be highly effective, particularly if they have a clearly defined mandate across both institutions.

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

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[2] https://www.hepi.ac.uk/2020/07/16/new-report-shows-67-of-phd-students-want-a-career-in-academic-research-but-only-30-stay-in-academia-three-years-on/.

The roadmap states the Government will take greater account of place-based outcomes in how we make decisions on R&D in the UK. This is welcome and overdue. There is a spatial imbalance in R&D and innovation spending in the UK, with London, South East and East of England dominating investment, while Yorkshire and other north of England regions receive much lower levels of funding. This imbalance drives serious regional challenges for the economy. Recent research published by Nesta argues that some parts of the UK – including Yorkshire and the Humber – have missed out on £4 billion of public R&D funding each year, plus a further £8 billion of private sector investment.[3] Some of these regions never fully recovered from the 2008 Great Recession, and COVID-19 threatens to deepen these divisions.

The Government's target – set before the pandemic – called for the UK to increase investment in R&D to 2.4% of GDP by 2027, and by 3% in the future. The importance of this target is now greater than before. To meet it means empowering those regions with the lowest R&D intensity – such as Yorkshire – and recognising and supporting the vital role of universities and other partners in these regions. To rebalance the UK economy, research and innovation should be more sensitive to local and regional context, conditions, capabilities and strategies.

The roadmap proposes finding new ways to track the development of R&D capacity across the UK to improve our understanding of how funding systems across the UK are supporting levelling up. Effective data is vital for monitoring the effectiveness of place-based innovation policies, and the work of the now-defunct Smart Specialisation Advisory Hub may provide a basis for future efforts in this area.

The Government should lead by example by increasing the regional presence of national R&D funders. The example of Channel 4 relocating to Leeds, and the positive impact on supply chains and jobs, has shown the benefit of this approach for the creative industries.

Finally, the Government needs to ensure the forthcoming UK R&D Place Strategy has teeth. If the strategy is not taken seriously, and not used as the basis for rethinking our approach to regional economic development and national innovation policy, R&D is unlikely to play a significant role in levelling up the UK.

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

The case for greater priority to be given to strategic R&D and innovation investments in places outside London and the South East requires UKRI, when considering the balance of funding and priorities across the research and innovation system, to ensure diverse public and stakeholder engagement. Science should not be seen as

[3] https://www.nesta.org.uk/report/the-missing-4-billion/.

an elite exercise.[4] Here, there are valuable lessons to be drawn from the 'Leading Places' programme and the Urban Living Partnerships project, which at the outset hardwired business, civic and local community partnerships with the scientific community into action-orientated research seeking to address economic and social opportunities and challenges.[5] Using public engagement to co-produce and co-deliver research with the local knowledge base is essential if the extra public investment that is planned is to secure long-term, broad support.[6]

There is also a strong case for a greater proportion of national innovation funding to be deployed through more local input to decision-making. This would support emerging clusters, facilitate a more systemic view of local innovation ecosystems, and encourage the lifelong development of technical and higher-level skills. Greater involvement of regional stakeholders in developing calls with UKRI, NIHR and others would be welcome, as would greater weight being placed on the support and engagement of regional stakeholders in decision-making in relation to strategic innovation investments.

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

The funding for international scientific partnerships and collaboration mentioned in the roadmap is welcome. Government should ensure meaningful involvement in the next EU Framework Programmes so that important collaborations and relationships built up during the previous ones can be maintained. Government should also protect funds such as the Global Challenges Research Fund (GCRF), which bring together teams from several countries, led by a UK university, to help tackle global challenges. The disruption from COVID-19, the economic recession and the merger of DFID and the FCO are all potential threats to the GCRF, which brings considerable benefit to the UK as well as overseas partners and needs to be protected.

8. **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?**

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[4] UKRI's citizen science collaboration grants are a positive step in this direction, but will require more funding to scale up: https://www.ukri.org/funding/funding-opportunities/involving-citizens-in-research-to-address-societal-challenges.
[5] https://www.local.gov.uk/topics/devolution/leading-places; https://yorkshireuniversities.ac.uk/2020/05/20/learning-lessons-from-the-urban-living-partnership-programme/.
[6] https://www.ukri.org/files/legacy/scisoc/concordatforengagingthepublicwithresearch-pdf/

The roadmap suggests that local leaders should to be empowered to co-create effective innovation approaches for their local economies, building on their unique local strengths and assets. This is the right approach. Local leaders often have strong relationships with local universities, and have worked closely together to develop local economic strategies – which will inform effective innovation projects at local level. Yorkshire Universities would be delighted to share in more detail how we have worked with local leaders and university staff to map innovation strengths and shape local industrial strategies.

Equality and diversity considerations are also important. Places in the North of England are diverse in terms of health, wealth, culture, race, class and geography. Concentrating innovation capacity within a certain part of the country restricts the range of perspectives and viewpoints that can be brought to bear on economic, social and environmental challenges.

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