Government
Office for Science

Update: Realising our ambition through science

Update on the 2019 Government Science Capability Review

March 2023

Contents

Foreword

I am pleased to have produced this update on the progress which has been made in government science capability since the 2019 Government Science Capability Review (SCR).[1]

Good use of science is essential to any government wanting to improve the lives of its nation's citizens and tackle global challenges. Robust science capability is needed to help the UK guard against major shocks and emergencies, drive economic growth and prosperity, and ensure the UK remains competitive in an increasingly challenging and dynamic world.

Since the publication of the SCR, the world has undergone substantial change which has reinforced the need for greater science capability in governments. The Covid-19 pandemic called for enormous input from scientific and research communities to inform the UK's policy response to the pandemic and to develop life-saving diagnostics, therapeutics and vaccines. The pandemic serves as an example of why the UK Government must continually improve its scientific capability and capacity to innovate in order to tackle the greatest social, economic and security challenges we face.

The SCR set out 15 recommendations to achieve this, including more effective use of research and development (R&D) capital by government departments, better utilisation of Public Laboratories, making greater use of departmental Chief Scientific Advisers and ensuring departments better utilise world-class science and scientists in the private and public sectors across the UK. This update details the progress that has been made against the 15 recommendations and identifies the main areas that the UK Government should now focus on to further develop its science capability.

Overall, there is no doubt that science capability in government has improved since the SCR was published in 2019. Many of the recommendations it set out have been accepted and implemented by government departments. The aim of this report is to take stock of what has been achieved and identify where further work is needed to deliver the level and nature of science capability needed in future by the government.

Professor Dame Angela McLean*, Government Chief Scientific Adviser*

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[1] Realising our ambition through science: A review of Government Science Capability, published November 2019. Available at: https://www.gov.uk/government/publications/government-science-capability-review

Executive summary

The Science Capability Review (SCR), published in 2019, was an assessment of the role of science capability in government decision-making. It made fifteen recommendations for enhancing the use of science to promote better policymaking. The critical importance of improved government science capability has been made clear by events since the SCR's publication, in particular the Covid-19 pandemic, as well as increasing global competitiveness and geopolitical instability.

Significant progress has been made since its publication. Five recommendations are now complete and embedded in government operations.

This update is a qualitative evaluation of the work already done to deliver the SCR recommendations. It identifies five key findings, which have informed four high-level priorities for improving science capability going forward.

Key findings

1. **Government needs to maintain a clear focus on science funding to meet its objectives.** Departments are strategically managing their R&D budgets and articulating their science needs, but more work is needed on monitoring and managing R&D expenditure.
2. **The SCR was used to improve science capability beyond the fifteen recommendations.** The SCR raised the profile of science in government and was used as a foundation to embed science, evidence, and research in departments. There is a desire to go beyond the fifteen recommendations to continue building on the aims of the SCR.
3. **Areas of Research Interest (ARIs) and science systems have been successfully embedded in departments.** ARIs and Science and Evidence Systems are now in place in most departments, providing a shared vision for the science community within a department and promoting greater collaboration and coordination.
4. **Challenges remain in funding and governance of Public Sector Research Establishments (PSREs).** Progress has been made towards better utilisation of government owned Public Laboratories and expanding eligibility for funding streams, but there are still challenges for those who cannot cross-subsidise grant funding. In addition, in many cases the science missions of Public Laboratories need to be better defined.
5. **People and skills are essential, but many challenges remain in recruitment and retention.** Although some improvements on people capability have been made, departments report challenges in attracting and retaining key science and engineering skills and experience.

Priorities for science capability going forward

1. **Continue to implement the SCR and use as the basis for further action.** Five recommendations are completed. Implementation of the remaining ten recommendations should continue and be used as the basis for further science capability work.

2. **Consider a more targeted approach to supporting diverse departmental science capability needs.** Departments' needs are varied so a tailored approach may be more effective than a 'one-size-fits-all' approach.
3. **Continue to prioritise people capability, particularly recruitment and retention.** Key areas of focus include developing a systematic approach to prioritising science and engineering skills, making STEM training available for all civil servants, and increasing movement of people between the civil service, academia, and industry.
4. **Ensure sufficient capacity, capability, and quality within Public Laboratories and ensure their missions align with government needs.** Key areas of focus include ensuring that government has long-term plans to support Public Laboratories to deliver departmental and cross-government objectives, through ensuring that Public Laboratories have well-defined missions that address national capability gaps.

Conclusion

The SCR has been effective in strengthening science capability in government and in demonstrating the importance of science in policymaking. There are still challenges remaining, and more work is needed to further improve science capability as demands on government evolve.

Introduction

The Science Capability Review (SCR) was a major initiative conducted by the Government Chief Scientific Adviser (GCSA) and HM Treasury (HMT) to assess the role of science capability in government decision-making. It was carried out by the Government Office for Science[2] (GOS) working closely with departments. There has been significant progress since the SCR was published in 2019 and this update assesses the progress made against the 15 recommendations in the SCR, taking into account the changing context within which the work is being delivered.

This update includes:

- Relevant background and context
- Five key findings
- Four priorities for government to further improve its science capability
- Progress made against each of the 15 recommendations in the SCR

To inform this update GOS conducted a qualitative evaluation of the recommendations which involved interviewing departments and recommendation owners. The results of this evaluation are reflected in the key findings and 4 priorities for the future.

Background and context

The SCR was based on extensive consultation with government departments, scientific organisations, and academic institutions. This consultation revealed challenges to the delivery of science advice and knowledge in a timely, robust, and easily accessible way, including:

- Inconsistent science leadership and coordination across government
- Underinvestment in and underutilisation of Public Laboratories
- Limited access by government to private sector innovation and collaboration
- Insufficient investment in science budgets, skills and administration
- Lack of transparency and accountability in science governance

In response to these challenges, the SCR made 15 recommendations on areas for improvement (listed at Annex A). GOS has been leading on oversight and implementation of the recommendations, working closely with government departments and partner organisations.

Robust science, technology and innovation capability is needed to help the UK guard against major shocks and emergencies, drive economic growth and prosperity, and ensure the UK remains competitive in an increasingly challenging and dynamic world. The urgent need for improved science capability across government has been made clear by events since the publication of the SCR in 2019. The Covid-19 pandemic shifted organisational and personal views on science. Responding to the pandemic required government to draw heavily on scientific

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[2] Government Office for Science. Information available at:
https://www.gov.uk/government/organisations/government-office-for-science

advice and capability from a range of sources. It highlighted the importance of scientific capability, innovating together with industry and building public trust through transparency.

The international context has also changed since 2019, with increasing international competitiveness and geopolitical uncertainty pointing to the need to have a strong UK science and engineering base.

As part of the 2021 UK Government's Integrated Review (IR)[3], commitments were made to strengthen the UK's science and technology (S&T) capabilities to ensure strategic advantage for the UK and the opportunity to prepare for major risks. This was further emphasised in the 2023 Integrated Review Refresh[4]. The National Science and Technology Council (NSTC) chaired by the Prime Minister was established to drive forward this agenda, led by the new National Technology Adviser (NTA). The NSTC is also responsible for overseeing delivery of the UK Science & Technology Framework[5], published in 2023, which emphasises the importance of science capability through the Innovative Public Sector workstrand. The Science & Technology Framework will require significant cross government working including from GOS and from the Chief Scientific Advisers (CSAs).

In 2021, the Declaration on Government Reform[6] outlined an ambitious programme of reform to improve how government and the Civil Service operates. The Declaration draws on the themes of the SCR to put science and innovation at the heart of the vision for improvement. Most recently, the creation of a dedicated Department for Science, Innovation and Technology (DSIT) has signalled the government's further commitment to the better use of science and technology in the national interest.

These events are all likely to have accelerated improvements in science capability in government but further improvements in capability are needed for the UK to remain competitive in the global science and technology race.

Key findings

This section outlines the key findings from a qualitative evaluation of the SCR (methodology described in Annex B). These findings inform the high-level next steps for improving science capability across government set out in the next section.

We identified 5 key findings:

1. Government needs to maintain a clear focus on science funding to meet its objectives.
2. The SCR was used to improve science capability beyond the 15 recommendations.

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[3] Global Britain in a Competitive Age: The Integrated Review of Security, Defence, Development and Foreign Policy, published March 2021. Available at:https://www.gov.uk/government/publications/global-britain-in-a-competitive-age-the-integrated-review-of-security-defence-development-and-foreign-policy

[4] Integrated Review Refresh 2023: Responding to a more contested and volatile world, published March 2023. Available at: https://www.gov.uk/government/publications/integrated-review-refresh-2023-responding-to-a-more-contested-and-volatile-world

[5] The UK Science & Technology Framework published March 2023. Available at: https://www.gov.uk/government/publications/uk-science-and-technology-framework

[6] Declaration on Government Reform published June 2021. Available at: https://www.gov.uk/government/publications/declaration-on-government-reform

3. Areas of Research Interest (ARIs) and science systems have been successfully embedded in departments.
4. Challenges remain in funding and governance of Public Sector Research Establishments (PSREs).
5. People and skills are essential, but many challenges remain in recruitment and retention.

Of the 15 recommendations, 5 are now complete and fully embedded in government. The remaining ten recommendations are all in progress. Detailed progress updates for each recommendation can be found from page 12 and an overview is presented below in Table 1.

✓ COMPLETE			📊 IN PROGRESS			
1	**2**	**3**	**4**	**5**	**6/7***	**8**
Every department should define its science system	All departments should annually publish & refresh ARIs	Government should create a policy-focused Forum for Public Laboratories	Government should make greater use of Public Laboratories	UKRI should lead development of tailored forms of governance for research programmes	Government should explore venture capital and business development functions	Submissions to HMT as part of SR should include a Statement of R&D need and costs
✓	✓	✓	📊	✓	📊	✓
9/11*	**10 †**	**12**	**13**	**14**	**15**	
Improving transparency & implementing clear sign-off mechanisms for R&D expenditure	GSE should ensure the Civil Service has appropriate science skills	Ensure science specialists are well-equipped with access to the right tools, journals and data	GOS should develop best practice guidance for peer review and research integrity	A Centre of Excellence should be created to support departments	Government should establish shared governance models on R&D	
📊	📊	📊	📊	📊	📊	

Table 1 represents the status of the 15 recommendations previously established in the 2019 Science Capability Review (SCR). *Recommendations 6 & 7 and recommendations 9 & 11 have been combined and are being implemented as one. †Recommendation 10 is now linked to the Government Reform Agenda and the Government Science and Engineering Strategy. Abbreviations: ARI, Areas of Research Interest; GSE, Government Science and Engineering Profession; R&D, research and development; SR, Spending Review.

In implementing the SCR, departments have rightly prioritised the recommendations and approaches that would have the greatest impact on their own science capability and fit their varied needs and resources.

This report provides a snapshot of what has happened a few years into the delivery of an ambitious programme. Progress has been made but some recommendations will need more time to realise their full impact.

1) Government needs to maintain a clear focus on science funding

The SCR showed that for non-protected departments, there was a year-on-year decline in government expenditure on R&D. All departments have core R&D budgets and since 2017-18 there has been a switch to an upwards trend as shown in Figure 1. The official expenditure data for 2022 onwards is not yet available. In the 2021 Spending Review, and then reaffirmed in the

2022 Autumn Statement, government committed to a significant increase in R&D funding for all (protected and unprotected) departments to £20 billion by 2024-25.[7]

Our evaluation found that the recommendations helped departments to strategically manage their R&D budgets to achieve policy and operational aims. Developing science systems (recommendation 1) and submitting R&D statements as part of spending review bids (recommendation 8) helped some departments to better articulate their science needs. However, more work is needed to monitor (recommendation 9) and manage (recommendation 11) R&D expenditure. Appropriate accountability and clear roles for CSAs in R&D spending decisions (recommendation 11) remains a key priority.
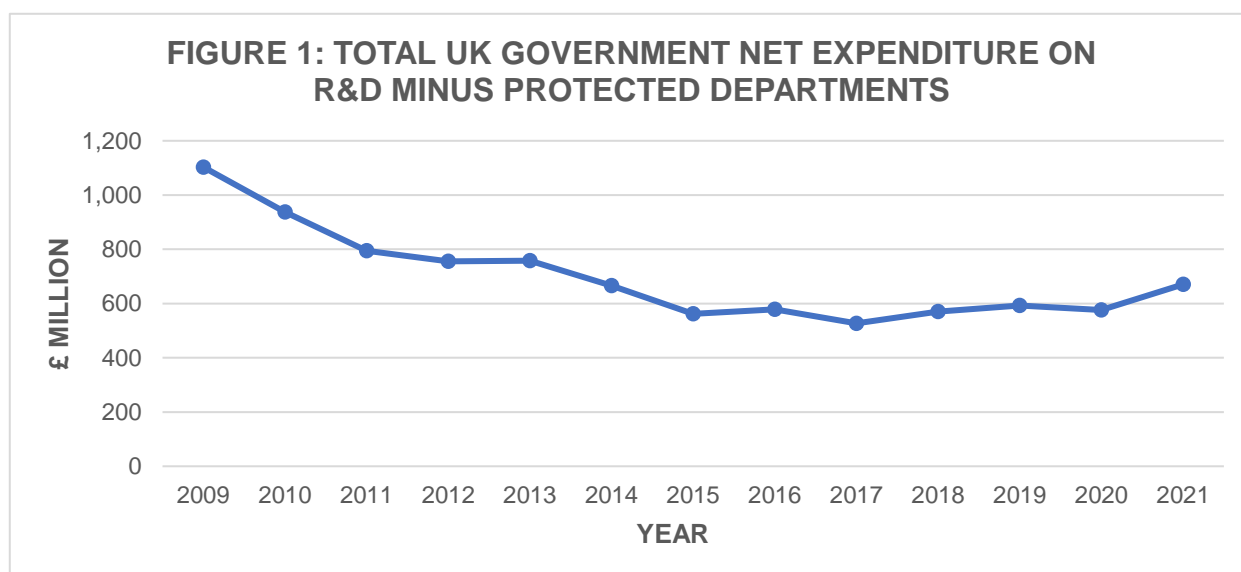
Figure 1. Trend in total government spend on R&D minus protected departments (DHSC, former BEIS, FCDO, former FCO, former DFID and MoD) across the time period 2009 – 2021. Total UK net government expenditure on R&D omits net expenditure of UK Research and Innovation, Research Councils, Higher Education Funding Councils and indicative UK contributions to EU R&D expenditure.

Case Study 1 – Department for Transport (DfT) and R&D oversight

Since 2021, the DfT R&D Board has been chaired by the CSA with Chief Analyst as Deputy Chair. The board has members at director level from all Directorates with R&D spend, as well as finance and strategy teams.

An R&D dashboard enables the board to review and understand spend and prioritisation for R&D across the department, as well as supporting the development of DfT research priorities which are then used to communicate to external collaborators. It has also aligned its work with the annual Evidence and Review Summaries - a process led jointly by the Chief Analyst and CSA, to ensure that all R&D is reviewed and supported on an annual basis.

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[7] Government announces plans for largest ever R&D budget, published March 2022. Available at: https://www.gov.uk/government/news/government-announces-plans-for-largest-ever-rd-budget#:~:text=Driving%20forward%20the%20government's%20ambitions,in%20spending%20over%20the%20current

Members of the DfT Science Advisory Council have also provided independent advice and scrutiny for research scoping and commissioning.

2) The SCR was used to improve science capability beyond the fifteen recommendations

There is consensus that the SCR helped raise the profile of science in government. CSAs and science more generally are increasingly seen as central to the delivery of departmental objectives. Some departments have gone further than the recommendations of the SCR to strengthen the profile of the CSA and the use of science within their department. Interviewees during the evaluation also expressed a desire to continue building on the overall aims of the SCR and to further increase and embed science capability in their departments.

Case Study 2 – Foreign, Commonwealth and Development Office (FCDO) and the SCR

Following the establishment of FCDO in 2020, the department worked to embed science, research and evidence into their wide-ranging international and cross-government activities using the 2019 SCR as a foundation. With FCDO investments in Official Development Assistance (ODA) research and evidence, approximately 1000 professionally accredited advisers, and innovative, forward-thinking partnerships, FCDO are taking this opportunity to build structures and mechanisms within the department that ensure equitable access to rigorous evidence and research. This has included the delivery of:

- A FCDO Research Advisory Group of external academics with broad thematic and geographic expertise.
- A new internal Expertise, Science and Research Board aimed at ensuring research, scientific advice and expertise supports effective FCDO policy making on development and diplomatic priorities.
- New Centres of Expertise to provide advice and evidence on priority technologies and themes, as well as access to technical assistance and expertise to support FCDO colleagues and partners.
- Bringing research analysts under the leadership of the CSA and establishing a new CSA Science Cell to provide agile expertise.

FCDO is also refreshing its ARIs, as well as the development of its first departmental science plan and research principles. This will ensure science and evidence are embedded across the department and will form the foundation of their international diplomatic and development activities.

3) Areas of Research Interests (ARIs) and science systems have been successfully embedded in departments

Areas of Research Interests (ARIs) are documents where departments set out their long-term research and evidence objectives and where they want more collaboration with academia and industry. Since the SCR was published, all departments and applicable non-ministerial departments have published or refreshed their ARIs (Recommendation 2). An example is the recent publication of the Department of Health and Social Care's (DHSC) ARIs which the National Institute for Healthcare Research (NIHR) has used as the basis for a call for research applications.[8] GOS worked with ESRC (Economic and Social Research Council) to set up and fund an ARI fellowship scheme to bring academics into departments to support the development and use of ARIs.

During 2022, GOS focused on helping departments to write Science and Evidence Systems (SES) documents (recommendation 1). These internal documents provide a clear and accessible overview of a department's science structures and objectives and contribution to the department.

Having both ARIs and SES documents enables science and analytical leaders, including CSAs, to show the thread between science and policy implementation within a department. These build a shared vision for the science community within a department and promote greater collaboration and coordination across departments and with academia and the wider research community.

Case Study 3 – Department for Culture, Media and Sport (DCMS) Science and Evidence System

DCMS actively participated in cross-departmental workshops led by GOS to create the design principles for Science and Evidence Systems (SES). Following initial engagement, GOS and DCMS worked closely together to understand the needs of DCMS and incorporate them in the drafting of the SES guidance.

DCMS used the design principles to write their science plan, sharing it with GOS for further comments and suggestions. DCMS finalised their plan with approval from their Permanent Secretary and Executive Board.

In the evaluation interview for the SCR update, the DCMS CSA highlighted that the creation of a science system has allowed DCMS to fully articulate the value and benefit of science around the department by identifying what it is and is not doing. By embedding and sharing the document with policy teams, science and evidence are now supportive of policy making rather than being perceived as something which serves to challenge the policy. The relationship between policy and evidence is now clearer.

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[8] DHSC Areas of Research Interest (ARI), published January 2023. Available at:
https://www.nihr.ac.uk/documents/dhsc-areas-of-research-interest/32536

4) Challenges remain in funding and governance of Public Sector Research Establishments (PSREs)

Progress has been made towards better utilisation of government owned Public Laboratories, but challenges remain.

UKRI[9] made a big step forward in following the SCR recommendation and opening up competitive research funding streams to Public Laboratories after the 2020 Spending Review, and initiatives such as the Strategic Priorities Fund have had a positive impact. The impact of such funding streams should increase over time with greater exposure and familiarity.

However, early feedback from PSREs suggests the UKRI joint electronic submission system is viewed as complex. This may be a disincentive for the PSREs who have yet to apply for eligibility. However, work is ongoing in UKRI to replace this system and reduce the burden of finding, applying for and managing research funding. The current funding model for many PSREs means they struggle to cover the full costs on UKRI grants paid at 80% fEC (as required by fEC rules[10]). A solution should be found for those Public Laboratories that cannot cross-subsidise grant funding with other income sources.

The evaluation found that in many cases the science missions of Public Laboratories and how departments (or Arm's-length Bodies (ALBs) that manage Public Laboratories) support them needs to be better defined. Whilst there are some areas of good practice, it is not clear that all departments/ALBs have long-term plans for managing and exploiting the capabilities within Public Laboratories. There are significant people and infrastructure capacity constraints across parts of the Public Laboratory landscape both in terms of meeting the requirements of their departments and broader cross-government needs. The SCR recommendation on PSREs remain relevant and should be fully implemented.

5) People and skills are essential, but challenges remain

Improvements on people capability include increasing the membership of the Government Science and Engineering (GSE) profession[11] by 51% between April 2021 and November 2022 and a renewed focus on Science and Engineering Fast Streamers (SEFS) with a target of a 10% year-on-year increase (against the baseline of 2020 entrants) for new entrant SEFS, which was met for the 2023 cohort. This is fully aligned with the Declaration of Government Reform. It is also encouraging that there will now be a target of 50% STEM (science, technology, engineering and mathematics) graduate entrants across all fast stream schemes.

Despite significant improvements, all departments reported challenges around attracting and retaining key science and engineering skills and experience. This is a particular issue for Public Laboratories who have a highly specialised and technical workforce. Speed of recruitment into

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[9] UK Research and Innovation (UKRI). Available at: https://www.ukri.org/
[10] Principles of full economic costing (fEC) published August 2021. Available at: https://www.ukri.org/councils/epsrc/guidance-for-applicants/costs-you-can-apply-for/principles-of-full-economic-costing-fec/
[11] https://www.gov.uk/government/collections/civil-service-statistics

government has also been raised as a significant challenge. This is mirrored in wider professional networks for STEM workforce such as the Government Analysis Function.

Priorities for science capability going forward

Based on the findings in this update, we have identified four high-level priorities for increasing science capability in the future.
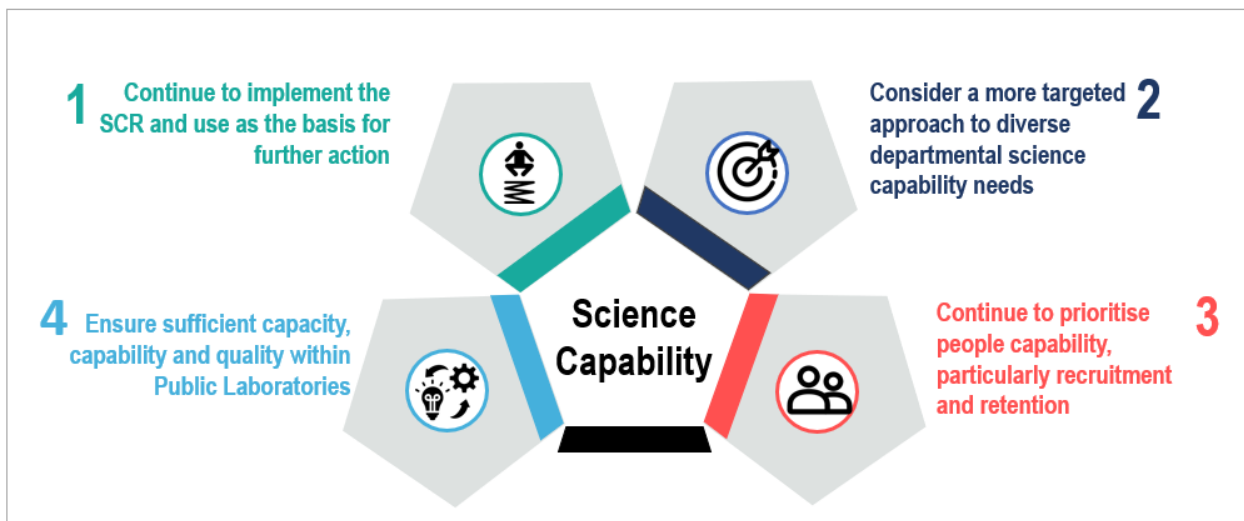
1. **Continue to implement the SCR and use as the basis for further action**

   - While progress been made, all recommendations of the SCR should continue to be implemented and it remains a relevant and useful document. Regular monitoring of progress should be continued alongside support to departments to deliver and embed the recommendations.

   - GOS, departments, and the GCSA, along with the newly formed DSIT, should continue to use the SCR as the basis for further science capability work, building on the aspirations and recommendations of the SCR.

2. **Consider a more targeted approach to supporting diverse departmental science capability needs**

   - A theme emerged in the evaluation that a 'one-size-fits-all' approach did not reflect the variable needs of departments. GOS should work with departments to help develop effective tailored approaches to meet departmental needs.

3. **Continue to prioritise people capability, particularly recruitment and retention**

   - The GSE Profession is addressing difficulties in attraction, recruitment and retention of scientists and engineers. However, a more systematic approach is needed to prioritise science and engineering skills, recognising that delegated pay has resulted in different pay levels across departments. The approach should also provide greater clarity on funding options to offer a long-term, cross-profession and cross-government solution. Speed of recruitment is also important if the civil

service is to compete with industry in attracting skilled staff. This is particularly challenging for very specialised disciplines (e.g. cyber and data science).

- STEM training should be available for all civil servants, particularly policy professionals. All civil servants need a greater awareness of the importance of the use of science in informing policy decisions. Data visualisation tools have proven useful and should be used more widely.

- Government should seek to increase the movement of people between the civil service and academia, industry and the wider public sector by relaunching, integrating and expanding the STEM Futures Programme.

- GSE and the Government Analysis Function should continue to work together to support capability building given their shared ambition to build expertise across government. This includes continuing to champion research excellence and transparency.

4. **Ensure sufficient capacity, capability, and quality within Public Laboratories**

- There are still barriers to PSREs working across government and making the most of their significant capability, including people, infrastructure and funding. There is still a need for clarity around the definition of PSREs.

- There should be a continued focus on ensuring there is sufficient capacity and capability within the overall government laboratory landscape to deliver government's strategic, operational, and statutory needs. This should be achieved by:

  o Individual departments, including those that do not directly sponsor Public Laboratories, identifying and understanding their own capacity and capability requirements and having long-term plans to support laboratories in delivering against clear departmental objectives.

  o GOS and the GCSA working with departments to ensure there is a cross-government view of the S&T capabilities needed by the UK from its public laboratories.

  o As set out in the recommendations of the recently published Review of Research, Development and Innovation Organisation Landscape[12], the government should ensure missions of public laboratories are well-defined, processes are in place for ensuring delivery of high-quality science for government, businesses and the wider landscape, and long-term plans are in place for investing in key national capability gaps.

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[12] The Review of the Research, Development and Innovation Organisational Landscape (RDI Landscape Review), led by Sir Paul Nurse, was published on 6 March 2023: https://www.gov.uk/government/publications/research-development-and-innovation-organisational-landscape-an-independent-review

Progress updates for the SCR recommendations

The SCR made 15 recommendations. Five are now complete (recommendations 1, 2, 4, 5 and 8) and the remaining are in progress and at different levels of implementation.

Recommendation 1

Every department should have a clearly defined science system. A central role here is leadership in the articulation of the entire range of a department's science needs in a single document which is endorsed by the department's Executive Committee.

Status: Completed

As of March 2023, 10 departments have agreed their Science and Evidence System (SES) documents. A further 5 departments have drafted them and are awaiting final internal clearance and Executive Committee endorsement.

Before the SCR some departments already had products describing the way they delivered science. However, since the SCR, design principles were co-created with departments and GOS to jointly agree a vision and common components for a SES.

GOS is now developing an interactive map of the government's science system. This will enable officials and external partners in academia and industry to understand and make use of the relationships that exist across the system and help identify areas that need strengthening.

Recommendation 2

All departments should publish, and refresh annually, Areas of Research Interest documents with a view to encouraging extra-mural activity and collaborations and the commissioning of key R&D. They should be co-developed by Chief Scientific Advisers, Analysts, and Heads of Policy Profession in departments, putting scientific thinking at the centre of departmental processes, including policy and operations. The Government Office of Science, with CSAs, should make the documents consistent and ensure they provide potential collaborators with the key information (including the availability of data) that they need to engage effectively with the relevant research questions.

Status: Completed

All Departments that would benefit from engagement with academia and industry have now published Areas of Research Interest (ARIs), and in many cases have received positive feedback from external partners.

ARIs are public documents designed to facilitate engagement from academia and industry. GOS has supported the development of ARIs by providing guidance[13] and hosting working groups for officials.

ARIs are now consistently produced by collecting input across a whole department and can be used to inform funders' priorities. For example, the National Institute for Health and Care Research (NIHR) website now specifically states it is interested in receiving funding applications in response to the ARIs identified by DHSC[14].

Analysis of ARIs can be used to identify cross-cutting themes of interest. The Rebuilding a Resilient Britain (RRB) programme[15] used ARIs to inform evidence mobilisation and synthesis. This work then informed the British Academy's report[16] on understanding long-term societal impacts of Covid-19 and was used by the International Public Policy Observatory (IPPO) and the Economics Observatory (ECO) to inform the topics for their programmes of work.

Recommendation 3

The government should create a policy-focused Forum for Public Laboratories, to raise their profile within government and to create greater knowledge exchange about their role amongst policymakers. The Government Office for Science should lead on this, working closely with department sponsors. An early task for the forum will be to advise on the development of a framework for evaluating their performance and value.

Status: Completed

Two forums have been created:

1. The National Laboratory Alliance (NLA): a group of 10 Public Laboratories with a remit to provide scientific and technical advice in times of crises to government. The aim of this group is to increase effectiveness by sharing knowledge, co-developing capability, and working together to provide mutual support.

2. A PSRE Policy Forum: a wider group bringing together senior scientists across Public Laboratories to discuss current and emerging policy issues. Aims of the group include creating opportunities to advise on government science policy and raise awareness of Public Laboratory capabilities.

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[13] Writing and using Areas of Research Interest, published January 2022. Available at: https://www.gov.uk/government/publications/writing-and-using-areas-of-research-interest/writing-and-using-areas-of-research-interest
[14] DHSC ARIs can be found here: https://www.gov.uk/government/publications/department-of-health-areas-of-research-interest/department-of-health-areas-of-research-interest
[15] Rebuilding a resilient Britain, published February 2021. Available at: https://www.gov.uk/government/collections/rebuilding-a-resilient-britain
[16] The COVID Decade Understanding the long-term societal impacts of COVID-19, published March 2021. Available at: https://www.thebritishacademy.ac.uk/publications/covid-decade-understanding-the-long-term-societal-impacts-of-covid-19/

In 2022, GOS published the PSRE Value Framework[17] as a tool to support departments in assessing the performance and value of PSREs. This was done as part of the wider Cabinet Office Public Body Review Programme which is ongoing.

Recommendation 4

The government should make greater use of Public Laboratories as leaders in directed R&D programmes, and in supporting innovation through intermediate technology readiness levels. Government should give greater support to them in this role. This should include:

a) Departments ensuring that they have adequate long-term funding for the pursuit of their core missions for government.

b) Research funders opening up excellence-based competitions to Public Laboratories, where they might compete with universities and other research institutes.

c) The creation of a specific fund geared to the work of Public Laboratories, for which they can compete for funds for innovation activities to be conducted in partnership with business.

d) Clear processes for the protection and maintenance of intellectual property generated. The Department for Business, Energy & Industrial Strategy (BEIS)[18] as part of its 2.4% roadmap should address the role of Public Laboratories across government in supporting and enabling research and development in the private sector, and the accountability to deliver this should rest in the department in change of that sector.

Status: Ongoing

Progress has been made on part (a), (b) and part (d) of this recommendation.

This recommendation is still relevant despite the ONS's latest revisions to the statistics on UK business expenditure on R&D.

The most recent Spending Review settlement provided funding assurance for Public Laboratories to 2024/25, with high R&D funding in several areas.

Laboratories are now eligible to apply for UKRI grant funding. However, because research council grants cover 80% of full economic costs (as required by fEC[19] rules), some Public Laboratories feel less able to participate as they do not generate or retain income to address the remaining cost.

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[17] Public Sector Research Establishment Value Framework published January 2022. Available at: https://www.gov.uk/government/publications/public-sector-research-establishment-value-framework
[18] BEIS was replaced by the Department for Energy Security and Net Zero, the Department for Science, Innovation and Technology, and the Department for Business and Trade in February 2023.
[19] Principles of full economic costing (fEC) published August 2021. Available at: https://www.ukri.org/councils/epsrc/guidance-for-applicants/costs-you-can-apply-for/principles-of-full-economic-costing-fec/

The establishment of the Government Office for Technology Transfer (GOTT)[20] has also contributed to progress towards part (d) of this recommendation. GOTT supports the government to manage and commercialise its knowledge assets including from PSREs[21].

However, there is still a need for more long-term planning in the investment of the capabilities, infrastructure, and assets within Public Laboratories, with high variability across departments. This issue prompted the drafting by GOS of departmental leadership principles for managing PSREs that support departments to help them ensure high-quality Public Laboratory capability. A key next step will be working with departments, especially those that require support to strengthen their systems, to deliver on these principles.

Recommendation 5

UKRI should lead development of tailored forms of governance for research programmes relating to government strategic priorities taken forward under the Strategic Priorities Fund and related areas.

Status: Completed

The Strategic Priorities Fund (SPF)[22] aims to strengthen the UK's research capacity as a world leader in research and innovation and address gaps in the UK research funding system. Each bid was assessed against 3 objectives including one on 'Government Priorities: to ensure UKRI's investment links up effectively with cross-departmental research and innovation priorities and opportunities'.

UKRI progressed this recommendation in collaboration with GOS as part of the set-up phase of the fund. A governance framework for joint programmes with UKRI was produced and distributed across the 34 programmes of the SPF and stakeholders, building on previous experience from within the research councils. This provided a common understanding across UKRI and departments on how best government officials (e.g. CSAs) could be integrated into the governance structures of the SPF programmes to advise on, shape, and ultimately maximise the benefits that could arise from future research and innovation.

The SPF programme is being evaluated over the period 2020-2025. Initial high-level findings from the forthcoming Interim Impact Evaluation of the SPF against the government's priorities shows:

- There are government departments as formal partners in 30 of the 34 SPF programmes, while 25 departments and agencies are involved in programme advisory boards.

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[20] Government Office for Technology Transfer. Available at:
https://www.gov.uk/government/organisations/government-office-for-technology-transfer
[21] Apply for the Knowledge Asset Grant Fund 2022, published July 2022. Available at:
https://www.gov.uk/government/publications/apply-for-the-knowledge-asset-grant-fund-2022
[22] UK Research and Innovation, Strategic Priorities Fund. Available at: https://www.ukri.org/what-we-offer/our-main-funds/strategic-priorities-fund/

- SPF helped to establish a novel centralised process for engagement between Councils and government departments to identify and prioritise relevant programme ideas.

- 91% of programmes are addressing government priorities and policy needs.

- Three quarters of SPF programme leads agreed that the SPF experience had increased awareness of national research efforts and state of the art evidence amongst government departments, while even more (92%) believed that UKRI had increased their awareness of government R&I priorities as a result of the SPF.

Recommendations 6 and 7

Recommendation 6 - *The GOS should work with the UK Government Investments and the British Business Bank to explore the use of government venture capital and business development models in innovation, and to provide expert resource to support departments in developing these.*

Recommendation 7 - *The Government Office for Science should develop proposals for the implementation of business development functions, including experience from similar approaches taken from defence and security to identify wider applicability. This will ensure that the landscape of small and large company activities is well understood, we have good links with those companies and their backers and are able to exercise a range of business partnerships effectively. This work should then be taken forward within the centre of excellence (see recommendation 13 below).*

Status: Ongoing

Recommendations 6 and 7 are being delivered together as they share a common aim of improving government ability to access and drive innovation in partnership.

The importance of these recommendations has been highlighted through the success of the Vaccine Taskforce in leveraging public-private partnerships to drive rapid innovation. The Declaration on Government Reform[4] committed government to championing innovation, science, and technology to improve public services and to building the internal capability and external networks required to deliver this.

The below prerequisites have been identified as essential in delivering these recommendations in departments:

- Leadership within departments in identifying well-defined innovation challenges.

- Requisite skills for identifying where technology in commercial R&D ecosystems has or may have a government application and the skills to execute a range of partnerships effectively with innovative businesses. The key to this is moving toward a collaborative private sector engagement approach rather than purely transactional.

- Portfolio-based, at-risk investment mindset with a recognition that not all partnerships will yield successful results, and many will fail.

- Milestone-based approach to investment that links R&D and innovation funding to procurement where work is required to fund technology modification or development to meet government needs.

- Collaboration with venture capital and private sector investors to both support in identification of new opportunities and ensure long-term commercial viability of potential partner companies.

The project is now moving to implementation with a key first step being for GOS to work with government departments to set out their innovation challenges and to continue to develop the external networks required to deliver these challenges effectively.

Recommendations 8, 9 and 11

Recommendation 8

Submissions by departments to the Treasury ahead of Spending Reviews (SR) should incorporate a statement of research, development need and costed plans for meeting those needs (including an assessment of the percentage of overall departmental expenditure they aim to spend, in absolute terms, on science) and how this compares with international benchmarks for R&D spend in their policy areas. Departments should include a clear statement of where particular R&D work streams fit within the spectrum from basic to applied R&D. In support of the government's objective to spend 2.4% of GDP on R&D, departments should also set out plans for stimulating wider economic investment in R&D in industries of relevance to their policy portfolios. Consistent with existing practice, consultation with the Government Chief Scientific Adviser (GCSA) and HM Treasury should take place if there are significant deviations from planned expenditure.

Status: Completed

Recommendation 9

The Government Chief Scientific Adviser should work with HM Treasury and the Office for National Statistics (ONS) to ensure that government expenditure on research and development is transparently reflected in public expenditure statistics so that in the future there will be comprehensive data on which to assess spending on science within government.

Status: Ongoing

Recommendation 11

All departments should have a clear sign-off mechanism for science expenditure, involving joint accountability for the Director of Finance and Chief Scientific Adviser, in reporting to the departmental Executive Committee and to Ministers.

Status: Ongoing

Recommendations 8, 9 and 11 are being delivered together as they share aims of improving R&D expenditure data, its governance, publication, and subsequent use to inform better policy and fiscal decisions. Ultimately this should support departments in attaining solid evidence bases of R&D expenditure, provide a good oversight of the departmental R&D portfolio, and empower accountable leadership to inform strategic investment.

The most recent Spending Review led to increased funding for science capability in many areas of government. Capital Departmental Expenditure Limits (CDEL) on R&D (excluding former BEIS given its role in funding Core Research, Innovate UK and EU Association Programmes) increased from £3.5bn allocated in 2021-22 to £5.8bn allocated in 2024-25, or 66%.[23]

Engagement across government identified issues regarding R&D expenditure data and governance and the barriers and challenges faced by departments. These include lack of availability and transparency of information presented, limited use of data for decision- and policy-making purposes, and highly variable expenditure governance processes with the role of the CSAs sometimes unclear. GOS worked with the Office for National Statistics (ONS) and HMT to create recommendations and lessons learnt to help departments resolve these issues.

This work has identified a potential need to make changes to the ONS's future Government Expenditure on R&D (GovERD) survey to increase transparency of R&D expenditure and allow for greater accountability of spending choices.

As part of the last two Spending Reviews, GOS trialled the use of R&D statements with departments, encouraging them to complete an R&D Statement following their SR submissions. These proved helpful in providing a holistic view of R&D expenditure across government to support the GCSA's advice to HMT. Further consideration should be given to the structure and need for R&D statements in the future.

Recommendation 10

The Government Science and Engineering (GSE) Profession Board should work with the Analysis Function Board to ensure that the civil service as a whole has the scientific skills it needs and the mechanisms to deploy them effectively through the wider civil service functional agenda being led by the Cabinet Office. Plans should be developed to remedy any shortages (working with UKRI and the Department for Education where appropriate), reporting early in 2020.

Status: Ongoing

In May 2020, the GSE Profession was reinstated as its own profession, independent of the Analysis Function. This provided a clear identity for its members and allowed for a refreshed approach on how scientific skills can be used in the civil service. The 2022 GSE Profession

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[23] Autumn Budget And Spending Review 2021, published October 2021. Available at:
https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/1043689/Budget_AB2021_Web_Accessible.pdf

Strategy[24] set out 6 strands of activity to increase science and engineering skills in government: expertise, interchange, inclusivity, learning and development, talent, and leadership.

In 2021, a GSE career framework[25], a skills assessment tool and a professional recognition offer were launched. These support members to identify skills needed and achieve professional recognition with 9 science and engineering institutions.

Membership of the GSE Profession increased by 51% between April 2021 and November 2022. In May 2022, a GSE conference was attended by 370 people in person and 1011 virtually helping to build greater connections between scientists and other government professional networks.

The GSE Profession has increased the Science and Engineering Fast Streamers (SEFS) scheme seven-fold over a seven-year period with 122 participants in 2022 compared to 18 in 2015.[26] The 2022 pool of SEFS show the highest levels of diversity compared to previous years (23.1% ethnic minority participants compared to 4.2% in 2021; 10.2% from a lower socio-economic background compared to 5.1% in 2021).

A 10% year-on-year increase to the number of SEFS entering the scheme each year has been set, to maximise science and engineering skills, which was met for the 2023 cohort. A 50% target for STEM graduates has also been set for the 2023 intake for all fast stream schemes and subsequent intakes. These targets aim to increase graduate level STEM skills across senior policy and operational roles and not just in specialist roles.

The GSE Profession has contributed to the Declaration on Government Reform action to increase high demand science skills in government more generally through developing a science and engineering 101 learning package which will be available to all civil servants. In 2022, a joint plan was agreed with the Analysis Function and Policy Profession to increase science skills capability across government. Further modules planned for delivery during 2023 on accessing, understanding and communicating science and engineering advice will be hosted through the Government Skills and Curriculum Unit.

In September 2022 the GSE Profession took ownership of a STEM Futures Programme aimed at increasing interchange with industry, academia, and wider public sector as part of this skills agenda.

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[24] Government Science & Engineering (GSE) Profession Talent Strategy 2021 – 2023, published August 2022. Available at: https://www.gov.uk/government/publications/government-science-engineering-gse-profession-talent-strategy-2021-2023#:~:text=Corporate%20report-,Government%20Science%20%26%20Engineering%20(GSE)%20Profession%20Talent%20Strategy%202021%20%E2%80%93,as%20well%20as%20future%20commitments
[25] Government science and engineering: career framework, published May 2020. Available at: https://www.gov.uk/government/publications/government-science-and-engineering-career-framework
[26] Civil Service Fast Stream, Science & Engineering Scheme. Available at: https://www.faststream.gov.uk/science-engineering/index.html

Recommendation 12

CSAs should work to ensure (and have support from their departments in doing so) that science specialists have access to the tools, research journals and data that are essential to understanding, evaluating, and undertaking excellent research.

Status: Ongoing

GOS initially scoped this recommendation to understand the type of tools, data, standards and journal access departments already have and what they still need. The CSA offices that were interviewed highlighted journal access and citation tools as an area that could be improved. Departments confirmed that tools (such as digital and coding tools) and data needed for scientists are mostly being provided by the departments themselves or by the ONS and Government Digital Service.

GOS engaged across government to understand how journal access is provided across government currently. While access remains inconsistent, broader open access proposals (e.g. Plan S[27]) are expected to resolve these issues over the next few years.

Lessons from this work will be shared with departments to support them in optimising their access to journals. GOS will continue to investigate how CSAs and their officials can be assisted in the delivery of this recommendation.

Recommendation 13

The Government Office for Science should work with UKRI to develop guidance for government departments on best practice for a) improving peer review and research integrity and b) benchmarking of quality and outcomes.

Status: Ongoing

Improving peer review and research integrity

GOS has improved government access to good quality evidence with initiatives such as the ARI Guidance[28] and the updated Code of Practice for Science Advisory Councils and Committees (CoPSAC) which sets out extensive guidance for establishing and operating scientific advisory committees (SACs).[29]

Departmental CSAs and Analysis Function Heads of Profession agreed to implement the principles of the Concordat to Support Research Integrity.[30] GOS produced guidance on how to

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[27] https://www.coalition-s.org/

[28] Writing and using Areas of Research Interest, published January 2022. Available at: https://www.gov.uk/government/publications/writing-and-using-areas-of-research-interest/writing-and-using-areas-of-research-interest

[29] Scientific advisory committees: code of practice, published November 2011. Available at: https://www.gov.uk/government/publications/scientific-advisory-committees-code-of-practice

[30] The Concordat to Support Research Integrity. Available at: https://ukrio.org/our-work/the-concordat-to-support-research-integrity/

implement the principles in a government context. [31] The guidance seeks to support departments to adopt the principles of the concordat and help to safeguard public trust and confidence in research. Departments are publishing their first annual statements, for the financial year 2022-23, on how they have implemented these principles.

Improving transparency and best practice across government features in the updates to the Government Social Research Publication Protocol[32] and the CoPSAC.

GOS is currently considering further aspects of this recommendation around improving peer review and benchmarking quality and outcomes.

Recommendation 14

A centre of excellence should be created to support those departments with smaller science and evidence budgets in areas of basic capability that underpin the conduct of an effective research programme, such as data quality and integrity, research procurement, research governance, best practice in the use of grants and contracts, and the use of financial instruments and business development approaches in the development of R&D programmes.

Status: Ongoing

GOS engaged with departments to better understand how a centre of excellence should operate and what it should focus on. The result was a proposal for a Science Capability Hub to support the sharing of best practices and guidance to all departments and a pilot was launched in January 2022.

The pilot is focusing on research governance and improving data quality and integrity through supporting departments with the implementation of the Concordat to Support Research Integrity. Through the pilot the Hub has managed a series of working groups to discuss key themes and jointly resolve issues. It has also tested out different methods of delivering best practice. The Hub will be evaluated in 2023 to identify the most effective actions taken and inform next steps.

Recommendation 15

For important cross-government areas of science, shared governance models consistent with the recommendations of the National Audit Office (NAO) report on cross-government research and development should be established to improve coordination and to maximise funding opportunities, including opportunities to link up internationally. To support this, the Government Digital Service should work on a platform to allow important R&D projects to be logged within a single database.

Status: Ongoing

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[31] Guidance to implement the Concordat to Support Research Integrity within government, published February 2022. Available at: https://www.gov.uk/government/publications/implementing-the-concordat-to-support-research-integrity-within-government

[32] Government Social Research: Publication protocol, published June 2015. Available at: https://www.gov.uk/government/publications/government-social-research-publication-protocols

In 2022 a scoping exercise was conducted to understand the latest landscape of cross-government R&D coordination and what had changed since the SCR and the 2017 NAO report[33]. A list of R&D coordination mechanisms was compiled which showed there had been significant progress made since 2017, and a consultation carried out with a range of stakeholders including secretariats of existing shared governance mechanisms and strategy-setting bodies/teams, CSA offices, Office for Science and Technology Strategy and UKRI.

With regards to a single database, there was universal consensus across all stakeholders that there was not a sufficiently clear use case to justify the investment required.

Conclusion

The SCR has been effective in promoting science within government and encouraging departments to think strategically about their science capability needs through its 15 recommendations. Five of the 15 recommendations have been completed since 2019 and all others are currently in progress. The recommendations have also helped departments clarify their long-term scientific and evidence objectives which are integral to building a shared vision for the science community within a department.

In terms of funding, the government's commitment to investing in R&D has been demonstrated in recent Spending Reviews and budgets. However, some departments still face challenges in funding and this will need to be addressed in future Spending Review assessments.

The evaluation of the SCR highlighted that progress has been made towards the ambition of better utilising PSREs, but areas of challenge remain. The focus on sharing science and evidence priorities, via ARIs and SES documents, is promoting greater collaboration and coordination across departments, which will support continued progress in improving science capability. Science skills within the Civil Service have also improved however there is still much to do in many areas and challenges remain regarding attraction and retention.

In conclusion, the SCR has helped strengthen science capability in government and demonstrate the importance of science in policymaking. This has been reinforced by the creation of the new Department for Science, Innovation and Technology which will focus on positioning the UK at the forefront of global scientific and technological advancement. An update should be renewed before 2029 as appropriate. More work is needed to see through the remaining SCR recommendations as demands on government evolve.

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[33] Cross-government funding of research and development published November 2017. Available at: https://www.nao.org.uk/insights/cross-government-funding-of-research-and-development/

Annex A – the 15 SCR recommendations

Recommendation 1

Every department should have a clearly defined science system. A central role here is leadership in the articulation of the entire range of a department's science needs in a single document which is endorsed by the department's Executive Committee.

Recommendation 2

All departments should publish, and refresh annually, Areas of Research Interest documents with a view to encouraging extra-mural activity and collaborations and the commissioning of key R&D. They should be co-developed by Chief Scientific Advisers, Analysts, and Heads of Policy Profession in departments, putting scientific thinking at the centre of departmental processes, including policy and operations. The Government Office of Science, with CSAs, should make the documents consistent and ensure they provide potential collaborators with the key information (including the availability of data) that they need to engage effectively with the relevant research questions.

Recommendation 3

The government should create a policy-focused Forum for Public Laboratories, to raise their profile within government and to create greater knowledge exchange about their role amongst policymakers. The Government Office for Science should lead on this, working closely with department sponsors. An early task for the forum will be to advise on the development of a framework for evaluating their performance and value.

Recommendation 4

The government should make greater use of Public Laboratories as leaders in directed R&D programmes, and in supporting innovation through intermediate technology readiness levels. Government should give greater support to them in this role. This should include: a) departments ensuring that they have adequate long-term funding for the pursuit of their core missions for government; b) research funders opening up excellence-based competitions to Public Laboratories, where they might compete with universities and other research institutes, c) the creation of a specific fund geared to the work of Public Laboratories, for which they can compete for funds for innovation activities to be conducted in partnership with business, and d) clear processes for the protection and maintenance of intellectual property generated. The Department for Business, Energy & Industrial Strategy (BEIS) as part of its 2.4% roadmap should address the role of Public Laboratories across government in supporting and enabling research and development in the private sector, and the accountability to deliver this should rest in the department in change of that sector.

Recommendation 5

UKRI should lead development of tailored forms of governance for research programmes relating to government strategic priorities taken forward under the Strategic Priorities Fund and related areas.

Recommendation 6

The Government Office for Science should work with the UK Government Investments and the British Business Bank to explore the use of government venture capital and business development models in innovation, and to provide expert resource to support departments in developing these.

Recommendation 7

The Government Office for Science should develop proposals for the implementation of business development functions, including experience from similar approaches taken from defence and security, to identify wider applicability. This will ensure that the landscape of small and large company activities is well understood, and we have good links with those companies and their backers and are able to exercise a range of business partnerships effectively. This work should then be taken forward within the centre of excellence (see recommendation 13 below).

Recommendation 8

Submissions by departments to the Treasury ahead of Spending Reviews should incorporate a statement of research and development need and costed plans for meeting those needs (including an assessment of the percentage of overall departmental expenditure they aim to spend, in absolute terms, on science) and how this compares with international benchmarks for R&D spend in their policy areas. departments should include a clear statement of where particular R&D work streams fit within the spectrum from basic to applied R&D. In support of the government's objective to spend 2.4% of GDP on R&D, departments should also set out plans for stimulating wider economic investment in R&D in industries of relevance to their policy portfolios. Consistent with existing practice, consultation with the Government Chief Scientific Adviser (GCSA) and HM Treasury should take place if there are significant deviations from planned expenditure.

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Recommendation 10

The Government Science and Engineering (GSE) Profession Board should work with the Analysis Function Board to ensure that the civil service as a whole has the scientific skills it needs and the mechanisms to deploy them effectively through the wider civil service functional

agenda being led by the Cabinet Office. Plans should be developed to remedy any shortages (working with UKRI and the Department for Education where appropriate), reporting early in 2020.

Recommendation 11

All departments should have a clear sign-off mechanism for science expenditure, involving joint accountability for the Director of Finance and Chief Scientific Adviser, in reporting to the departmental Executive Committee and to Ministers.

Recommendation 12

CSAs should work to ensure (and have support from their departments in doing so) that science specialists have access to the tools, research journals and data that are essential to understanding, evaluating and undertaking excellent research.

Recommendation 13

The Government Office for Science should work with UKRI to develop guidance for government departments on best practice for a) improving peer review and research integrity and b) benchmarking of quality and outcomes.

Recommendation 14

A centre of excellence should be created to support those departments with smaller science and evidence budgets in areas of basic capability that underpin the conduct of an effective research programme, such as data quality and integrity, research procurement, research governance, best practice in the use of grant and contract, and the use of financial instruments and business development approaches in the development of R&D programmes.

Recommendation 15

For important cross-government areas of science, shared governance models consistent with the recommendations of the National Audit Office (NAO) report on cross-government research and development should be established to improve coordination and to maximise funding opportunities, including opportunities to link up internationally. To support this, the Government Digital Service should work on a platform to allow important R&D projects to be logged within a single database.

Annex B – evaluation method

1. Familiarisation & Data Collection – to begin the team conducted a thorough overview of all the data we collected through semi-structured and tailored interviews with questions designed in conjunction with analytical colleagues. This involved taking detailed notes, summarising these and looking through the data to get familiar with it.

2. Coding - next, we coded the data. This involved focusing on phrases and sentences – and coming up with shorthand labels or 'codes' to describe their content. The team went through the transcript of every interview and highlighted everything that jumped out as relevant or potentially interesting. As well as highlighting all the phrases and sentences that matched these codes, the team kept adding codes as we went through the text. Next the team grouped the data as identified by the code which helped classify the main points and common meanings that recurred throughout the data.

3. Theme generation – we looked over the codes we created, identified patterns among them, and started coming up with key themes. This involved combining several codes into overarching themes.

4. Review – we reviewed the themes to make sure that they were useful and accurate representations of the data. Here, we returned to the original dataset and compared our themes against it.

5. Definition – now we had our final themes we defined them, formulating exactly what we meant by each theme and figured out how it helped us understand the data and the impact of the SCR. The themes are not equal, but all offer interesting interpretations of the SCR.

6. Writeup – finally we wrote up our analysis of the data. Here we went back to our original question, aims, and approach and have summarised the key outcomes.