Government Office for Science – the next 5 years

Contents

This note from the Government Chief Scientific Adviser outlines the scope of his work and of the Government Office for Science. It describes how they will work across government and with many external partners to help to deliver the key priorities of the government.

Introduction

Efficient and effective government needs all of the sciences: the natural and physical sciences, mathematics, engineering, technology, social science and the humanities. The Government Chief Scientific Adviser and the Government Office for Science, work closely with Departmental Chief Scientific Advisers to deliver the science advice, evidence and implementation that government needs to govern the country. We do this mainly by working as a 'transmission mechanism' between expert scientific communities working in academia, industry and government, and government policy makers.

We work at the centre of government as a single team with the Cabinet Office on Horizon Scanning for government, taking advantage of the very best insights from academia and industry in the UK and around the world. In concert with Cabinet Office we facilitate cross-departmental policy discussions where science is an important part of the policy mix and with the new Implementation Taskforces where we can help. We catalyse the uptake and embedding of new technologies, including data science, across the Civil Service to increase its efficiency and effectiveness. With the Treasury we work to ensure that the UK benefits fully from its investment in science and innovation.

Drawing on access to the best science and scientists, we work with the Knowledge and Innovation group in BIS, the Research Councils, other government departments, the Prime Minister's Council for Science and Technology and the scientific community at large to develop strategic priorities for the research base, so that the UK gets the most out of its research assets and knowledge infrastructure.

Our work is focused on the priorities of government and this plan for science in government for the next 5 years is aligned with these priorities. The plan is organised around 4 themes, though individual projects frequently contribute to more than one of these.

1. Supporting national growth and increasing the UK's productivity

The goal is to link excellent science, innovation and industrial enterprise.

Emerging technologies

We will help to ensure that the UK gets the best possible benefit from emerging technologies such as distributed ledgers (blockchain), the Internet of Things, autonomous systems, satellites and drones, while ensuring they are safe and secure. New forensic technologies mean new ways of providing assurance on identification and provenance, and we will explore how these can be used to design out crime while creating new markets. Working with the research base and Innovate UK we will catalyse the translation of science for application, for example, developing demonstrator programmes.

Infrastructure, efficiency and effectiveness

We will work with Infrastructure UK to apply science to ensure that national infrastructure is fit for purpose, resilient and future proof. The best scientific input will help to ensure that standards, smart regulation and deregulation catalyse growth and do not inhibit it. We will work with BIS and Treasury to ensure that publicly-funded science and innovation spend is applied efficiently and effectively and that the UK continues to deliver world-leading research.

Jobs and skills

Central to raising productivity is the need for businesses to be able to access the right skills at the right time and place. Through the Council for Science and Technology we will continue to provide advice on: strengthening STEM (Science, Technology, Engineering and Maths) education in schools; delivering the technical work force, enhancing the links between Higher Education, schools and the workplace; and increasing entrepreneurial training, lifelong learning and development.

An important goal is to recruit and retain the next generation of top class researchers and scientists by ensuring that the UK is the best place to do science.

Communication and public engagement

We will ensure that key evidence is effectively communicated and work with departments to promote sophisticated public engagement where science and technology are likely to be controversial. Robust decisions require clear communication and the scientific endeavour itself depends on transparency – as does public trust in science. The corollary of this is to help to ensure that the scientific enterprise itself maintains the highest standards of trustworthiness.

International

Science diplomacy plays an important role as part of the UK's influencing capability. Working with FCO and the Science and Innovation Network we will catalyse and promote science investment and international growth opportunities.

2. Supporting regional growth

Mapping the landscape of science and innovation

We will help map strengths in all the sciences across the UK, in partnership with city regions and with all of the major government funders of research and innovation. This will inform the development of plans that build on existing strengths and excellence in different places. With others and as requested, we will broker and catalyse regional science and innovation activity.

Cities

Through Foresight, we will continue our working with cities to ensure that the decisions they take today are robust for the future. Working with Cabinet Office we will encourage government departments and cities to act as partners to deliver shared objectives wherever possible.

3. Using technology to develop modern and cheaper public services

Health and care system

We are a partner with the Department of Health, the Office for Life Sciences and the NHS to develop the Testbed and other programmes. These will catalyse the use of science and technology to transform and deliver higher quality, more efficient and more accountable care.

Ageing

We will improve the evidence base on the implications of the changing structure of the demography of the UK. This will enable government to develop policies that anticipate and respond to the needs of a population with increasing life expectancy. With Cabinet Office, we will work with departments to develop cross cutting policy proposals that are appropriately informed by evidence from across all disciplines.

Efficient and effective Whitehall

Working with CSAs across Whitehall, we will ensure that expert customers exist for all of the sources and uses of science inside government. We will pay particular attention to the major science infrastructures funded by government, such as the public sector research establishments (Met Office, National Physical Laboratory, Defence Science and Technology Laboratory, Ordnance Survey and others).

The Government Office for Science is part of a Data Science Partnership with the Government Digital Service, Cabinet Office and the Office for National Statistics to encourage and facilitate the use across government of data science and other emerging technologies to deliver more efficient and effective services. This is part of the work on embedding digital and other technologies in government to improve productivity, policy making and delivery of public services.

A strong Government Science and Engineering network that works closely with the policy profession is essential to enable science to provide effective inputs to policy making. We are leading a renewed and refreshed Science and Engineering Fast Stream that will help to provide the expertise and diversity of education and skills essential for a 21st century Civil Service.

Supporting departmental research and development needs

We will continue to provide oversight of research and development capacity within individual government departments, and review these as appropriate, drawing on the models of completed reviews of animal and plant health (with DEFRA) and of MoD's science and technology capability.

We will continue to work closely with the Chief Scientific Advisers in departments and the Devolved Administrations.

4. Preventing or addressing crises and mapping national security risks

The prevention and management of crises and disasters require excellent scientific input. Science is needed at all stages of risk management - to avoid, mitigate, prepare for, manage and rebuild after the event. The UK has a world leading system of risk identification and preparedness, but there is much further to go. We will work with departments to ensure the National Risk Assessment and departmental risk registers draw on the best possible science, engineering, technology and social science.

Infectious diseases

Building on recent work on human, animal and plant health we will continue to work with departments and researchers to help the UK to anticipate and manage infectious diseases of humans and of the animals and plants on which we depend for our health and wellbeing. This includes areas for improvement such as better collection and use of environmental and earth observations.

Climate change

With DfID and others we will continue to support international efforts to prevent and manage future disasters. With DECC and the FCO we will contribute to the challenge of addressing the risks of global climate change both before and after the 21st Conference of the Parties in Paris in December 2015.

Systemic risks

We will address systemic risks, such as those created by the increasing complexity of electricity supply, distribution, storage and use. Cyberspace is now a critical infrastructure that brings important benefits and new risks and we will continue to work with partners across government to help to ensure that UK citizens reap the benefits whilst mitigating the risks.

National security

We support the National Security Council through NSC(O)S&T, conducting reviews of research and development capability in cyber and chemical, biological, radiological and nuclear defence, and in human factors.

Scientific Advisory Group for Emergencies

We will continue to deliver SAGE (Scientific Advisory Group for Emergencies) input to COBR as required. Each emergency in turn highlights further improvements to the system, including, but not exclusively, how data can be rapidly collected, visualised and used most effectively.

How we work with others

Drawing on our extensive internal and external networks, we act as a key transmission mechanism between the world of science inside and outside government. Major partners include the Council for Science and Technology, National Academies (Royal Society, British Academy, Royal Academy of Engineering and Academy of Medical Sciences), expert professional bodies and universities. Departmental Chief Scientific Advisers work on all aspects of science for their 'home department' and use their scientific domain expertise to support colleagues across government.

We will always prioritise the areas of highest impact and will only act where we are clearly best placed to add value. We work most effectively when there is a clear policy customer for our work and we will always seek ministerial support and sponsorship. In designing projects we use our expertise to get best value from others, and we ensure that 'form follows function' in order to deliver efficiently. We welcome proactive commissioning of work from across government.

Government Office for Science successes across government and beyond

'Innovation: managing risk not avoiding it'

The Government Chief Scientific Adviser's first annual themed report 'Innovation - managing, risk not avoiding it' has helped reframe the debate on risk. Science is not the only lens though which to view major policy questions but evidence and rigour are essential. Discussion should focus on specific possible uses of a technology, their respective alternatives and attendant costs and benefits, as well as the implications of inaction.

In the Government Office for Science the report has strongly influenced how we work, the areas in which we work, the clarity of our message and the range and variety of our partners. The report has achieved significant influence in the debate around science advice in Europe and continues to inform UK regulatory priorities in the EU. Parochially, it has stimulated Research Councils UK (RCUK) to develop proposals for coordinating research and communication activity on risk.

Responses to GM crops illustrate the power of fear of threats to basic values.

Blackett reviews

Internet of Things

Technologies that could allow billions of everyday objects to communicate with each other over the internet have enormous potential to change all of our lives. They could boost productivity, keep us healthier, make transport more efficient, reduce energy demand and make our homes and workplaces more comfortable.

The 10 recommendations from our recent review about the potential of the Internet of Things (IoT) were accepted by government. These include coordinating effort with the right leadership in and outside of government, securing technologies where data is sensitive and demonstrating system scale. The 3 autonomous car projects will be used to show how connecting roads and vehicles can lead to fewer accidents and shorter delays. A proposed health demonstrator will connect patients with GPs and hospitals for quicker diagnosis and more personalised care. IoT initiatives were funded by a £40 million investment announced in the 2015 Budget.

Financial Technologies (FinTech)

The UK is a world leader in the development and commercialisation of new financial business models and disruptive innovation, known collectively as 'FinTech'.

Recommendations from our recent review of the opportunities and barriers will shape the UK FinTech sector out to 2025. The review featured in the 2015 Budget. Firstly, the development of a regulatory 'sandbox' will create a safe and controlled environment for financial services innovators to experiment without risk to the financial system. Secondly, support for adopting new technologies to meet rapidly evolving regulatory requirements – so-called 'RegTech' - and finally the development of regional FinTech hubs to promote collaboration.
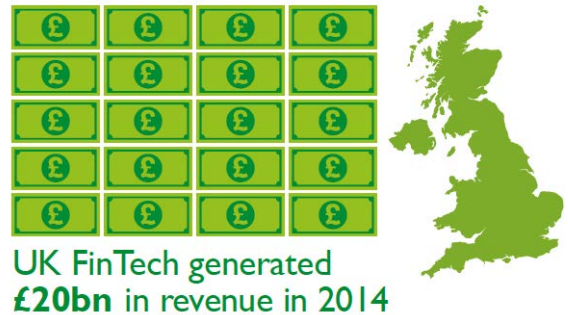
# Responding to emergencies

Nepal earthquake

A 7.8 magnitude earthquake struck Nepal on the morning of 25 April 2015. The earthquake and its subsequent aftershocks, including a 7.3 magnitude aftershock on 12 May, caused widespread destruction and triggered more than 3,500 devastating landslides. Over 8,800 people were killed, 23,000 injured and over 2.8 million displaced.

Experts were called on immediately from the British Geological Survey and several UK universities to provide initial assessments of the expected number of fatalities and casualties, as well as secondary hazards. The Scientific Advisory Group for Emergencies (SAGE) further refined the assessments for the best and worst case scenarios, providing technical advice to the Cabinet Office Briefing Room (COBR) on the risk of further aftershocks and earthquakes, the risk of landslides and additional hazards posed by the monsoon season. Scientific advice also fed into Foreign Office decisions on travel advice for the region.

Ebola

Scientific advice and technical information have been critical in getting the outbreak of Ebola in West Africa under control. While the outbreak continues at low levels, weekly case numbers in Sierra Leone have been reduced from a peak of over 500 in December 2014 to fewer than 10 in June 2015.
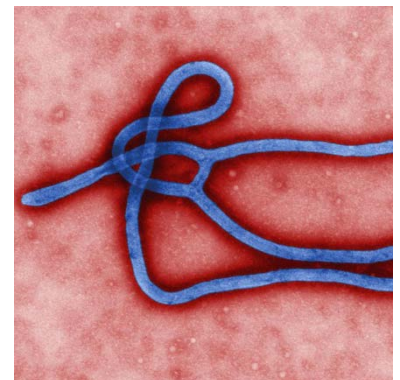
SAGE and its sub-groups provided advice to COBR on a range of issues; including the likely evolution of the outbreak, when case numbers would start to decline, key interventions to get the outbreak under control, and vaccine trials and treatment options. They also provided advice on the risk to the UK and it spreading to other countries. In addition to medical scientists and modellers, we gathered a multidisciplinary team of anthropologists and social scientists to advise on burial practices, travel behaviour and general communications.

Foresight projects

Future of Cities project

The Foresight Future of Cities project focusses on the role that science can play in supporting the analysis, design and action which shape our urban future. This project provides policy makers with the evidence, tools and capabilities needed to support policy decisions in the short term which will lead to positive outcomes for the UK's cities in the long term.

The project identified issues that are inhibiting the growth potential of UK cities and, in collaboration with Cabinet Office and the DCLG cities unit, is now mobilising a plan to address one of the most pressing – retention of skilled labour in order to boost productively in regional urban areas.

Working with our academic partners respected authors, the project has gathered a large body of evidence and academic insight to answer broader questions around city governance, planning and organisation. The project has informed HMT questions on their work on devolution of power to regional authorities, with analysis including the benefits of linking up places through transport, and digital connectivity; economic evidence around good governance and the mayoral model; and International standards and benchmarks for what makes an 'attractive' city.

The Future of Manufacturing project

The Foresight Future of Manufacturing project advised how policy must evolve to support the future growth and resilience of UK manufacturing by analysed the important long term changes out to 2050.

The project report identified 3 future systemic challenges for government and findings are now being used to inform policy development. In particular: enhancing industrial metrics; supporting industrial sustainability as a route to future competitiveness; and strengthening cross-cutting manufacturing policy capability.

Alan Turing Institute

The UK is at the centre of a global technological and economic revolution, with the emergence of new sectors centring on the application of data science to rapidly expanding quantities of data. The potential is already being realised in some areas, notably finance. It is growing in others such as retail but in some its potential remains relatively untapped.

The Council for Science and Technology wrote to the Prime Minister in July 2013, recommending that action was needed to anchor the UK's research capabilities in the fundamentals of data science - mathematical sciences and algorithms.
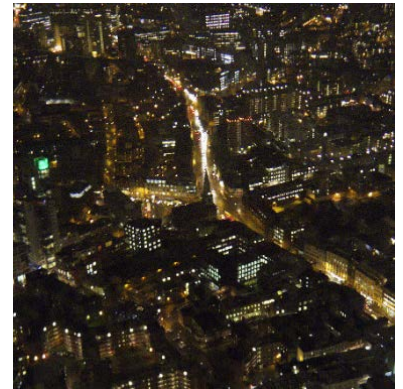
In the 2014 Autumn Statement, the Chancellor of the Exchequer announced that the creation of the Alan Turing Institute will enable different research, industry and user groups to come together and develop ideas with applications right across the big data landscape. This will be supported by £42 million in government investment over 5 years. The British Library has now been confirmed as the site for the institute.

Science and Engineering fast stream

The Science and Engineering fast stream is the flagship development scheme for postgraduate scientists and engineers across government. Science and Engineering fast streamers play an essential role in ensuring the best science underpins the development and application of government policies.

For example, fast streamers act as expert customers, develop evidence and/or undertake systematic analyses. They are not lab based scientists or technical engineers but source, analyse and communicate technical advice and innovative solutions for issues as diverse as climate change, nuclear non-proliferation, defence technology and food production.

Horizon Scanning

The Horizon Scanning programme supports the government to identify and respond to future challenges. It deploys the expertise of independent organisations within Whitehall and through specialists at the centre of government. For example helping government to think innovatively about opportunities from emerging technologies and the future of regulation.

The programme also works to strengthen core departmental capability to address uncertainty and spot opportunities for departments to collaborate so that work is done well but only once. For example, a competence framework has been embedded in the policy profession to ensure good practice is shared across government.
The Foreign Office is piloting a module on horizon scanning for the Diplomatic Academy.

We recently hosted a workshop with experts from Google, Deloitte, Goldman Sachs to McKinsey on long term trends and disruptors. This will be expanded to a world view with a series of international events run by the Science and Innovation Network. Together the outputs of these events ensure internal thinking is challenged by both leading-edge UK and international perspectives.

Science networks

The Government Office for Science supports science across government.

We work with a network of embedded Chief Scientific Advisers (CSAs), a range of scientists and engineers within government, National Academies, the Research Councils and the country's best universities and scientific institutions. Together we work on projects which address the most important scientific challenges confronting the UK and provide the best evidence and analysis to inform policy decisions.

Our projects include supporting a programme of work in collaboration with DECC, the Royal Academy of Engineering and the Council for Science and Technology on strategic issues

relating to energy which address energy scenarios and the electricity capacity margin amongst others.

We led the review with Defra on 'Animal and plant health in the UK: building our science capability'. The report, which is now being taken forward by Defra, set out a way forward for more effective and more co-ordinated research to tackle diseases in animals and plants, which can have significant impacts on the economy, the environment and society.

We are working with the Council for Science and Technology and research networks across industry and academia to develop a clearer picture of the Science Landscape in the UK.

We commissioned the Royal Society report 'Observing the Earth - expert views on environmental observation for the UK' which gathered expert views on how the UK might create an integrated system for environmental observation to manage the increasing volume of observation data in a way that creates knowledge to inform policy and action.

For the first time the government has taken a national approach to prioritising the use of evidence in decision-making through the What Works Networks. These are based on the principle that good decision-making should be informed by the best available evidence on both what does and does not work. They are already changing the way policy is delivered in areas such as Health and Social Care, education, crime and local economic growth.

Communications

The Government Office for Science supports open policy by ensuring the public also has access to the scientific facts that inform key issues. Public communication forms a key part of the work the GCSA does. In 2014 the GCSA undertook series of talks 'The Planet in Our Hands' exploring the issues around climate change. He delivered the talk to well over 1,000 people at venues across the country and online materials were viewed by about 2,500 people.

In the last year the Government Office for Science has been involved in 2 major public engagement projects. 50 members of the public were bought together with policy makers, scientists and other expert stakeholders to discuss food system challenges and possible solutions. The recommendations were presented to government. Space weather, which is a set of phenomena that are now recognised as a significant natural hazard with the potential to disrupt many of the technologies that are critical to the functioning of modern societies, was also considered in a similar way.
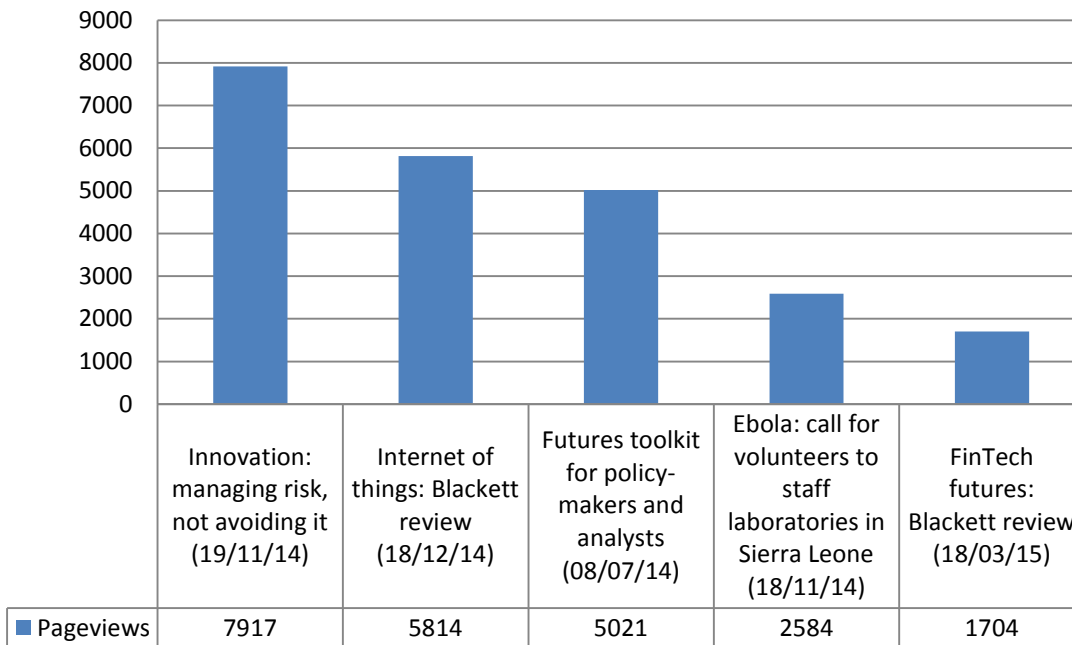
Twitter is an important channel for the GCSA to communicate with the public about our work. Our @uksciencechief twitter feed continues to grow in popularity with new followers joining all the time. From 1 April 2014 to 31 March 2015 the GCSA account gained over 3,000 new followers to reach over 16,500.

The Foresight twitter feed @foresightgovuk also continues to grow at a steady pace. From 1 April 2014 to 31 March 2015 the Foresight account gained over 845 new followers to reach over 2,200.
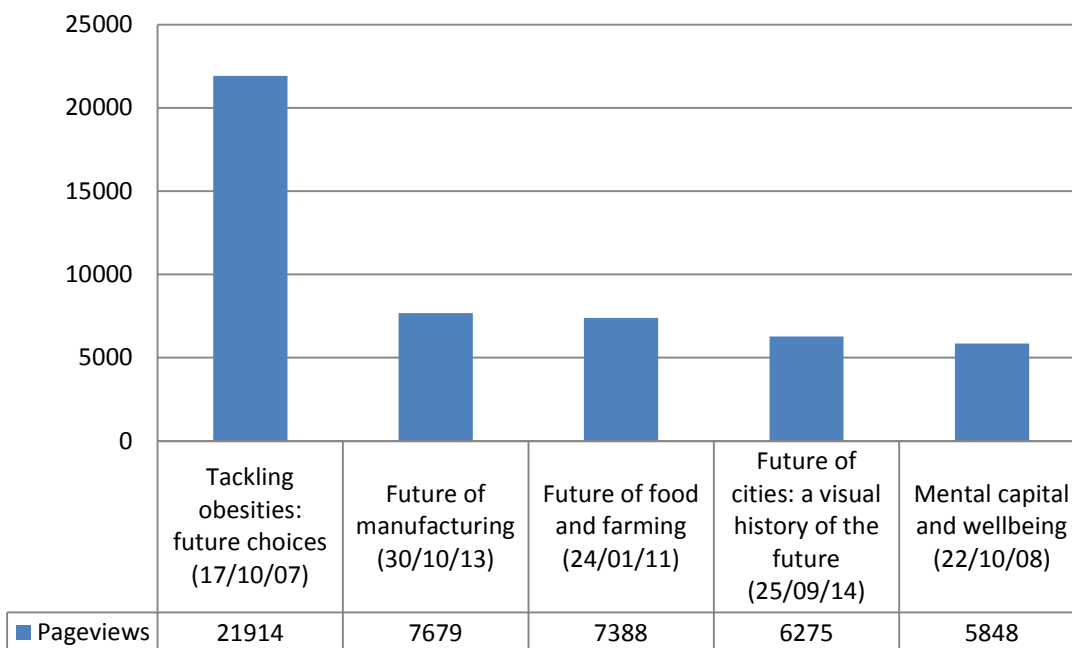
In the last year about 60 new reports were published on the GOV.UK website and between March 2014 and April 2015 the combined web pages received over 700,000 page views.

The most popular reports were:

Top 5 reports - GO-Science (excl. Foresight) 2014-15

	Innovation: managing risk, not avoiding it (19/11/14)	Internet of things: Blackett review (18/12/14)	Futures toolkit for policy-makers and analysts (08/07/14)	Ebola: call for volunteers to staff laboratories in Sierra Leone (18/11/14)	FinTech futures: Blackett review (18/03/15)
Pageviews	7917	5814	5021	2584	1704

Top 5 reports – Go-Science: Foresight 2014-15

	Tackling obesities: future choices (17/10/07)	Future of manufacturing (30/10/13)	Future of food and farming (24/01/11)	Future of cities: a visual history of the future (25/09/14)	Mental capital and wellbeing (22/10/08)
Pageviews	21914	7679	7388	6275	5848

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