Government Office for Science

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Annual Review 2012-2013

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Foreword

Good policy making requires robust evidence and analysis. As Government Chief Scientific Adviser (GCSA), I am responsible for ensuring that the Government has the latest science and engineering evidence, and access to the best experts and advice.

Over the past year, I worked with colleagues across government on a large number of interesting and challenging issues. The role of GCSA requires both reacting to immediate questions on one hand, and providing strategic advice on longer-term issues on the other.

This year we have looked at diverse issues, including ash dieback disease, the potential of shale gas, civil nuclear power and horticulture innovation, and were part of the planning and organisation that helped to deliver a safe Olympic Games.

Over a longer timeframe, through the Foresight Programme, we have produced comprehensive reports on reducing the risk from natural disasters, on computer trading in financial markets, and on the future of identity. All are already having impact. Foresight produces its own annual review, which is available for download from the GO-Science website.

To ensure the government is equipped to use this advice well, it is important that science and engineering capability is in place to underpin policy making at all levels of government. This means having the right people in the right place when they are needed most, and that is why I have continued to work on developing the network of departmental CSAs, who now cover every government department. A highly effective, cross-disciplinary network, the CSAs have been able rapidly to exchange the latest intelligence, provide deep specialist science and engineering expertise, and provide advice and impromptu problem-solving support to each other.

We have also this year carried out a wide ranging review of the science and engineering profession in government, which will help us build on its strengths as an open, collaborative and diverse profession with a key role to play in the future Civil Service.

This report sets out the activity of my office during 2012 and early 2013, at which point my time as GCSA ends. My thanks go to colleagues both within government and outside for their support, and I offer my best wishes to my successor Sir Mark Walport, who takes over as GCSA on 1 April 2013.

Professor Sir John Beddington CMG FRS

Government Chief Scientific Adviser

March 2013

Highlights 2012-2013

Spring

- The new Science & Engineering Curriculum is launched on the Civil Service Learning (CSL) Gateway, giving the 3500 Government Science & Engineering Community members access to profession-specific training.

- In a first step to following up Lord Ashdown's *Humanitarian Emergency Response Review*, the *Science in Humanitarian and Environmental Disasters* (SHED) report is launched. It leads immediately to the creation of a new expert group to scan the horizon for emerging humanitarian disasters, and suggests measures to ensure experts can be got together more rapidly when a crisis occurs.

- GCSA attends the meeting of the Carnegie Group in Constance, Germany to promote UK priorities in developing global science infrastructures.

- *Foresight Food and Farming Futures* project one year review is published. The Department for Environment, Food and Rural Affairs and the Department for International Development have used the report to inform and help shape actions across several of their major priorities. The report has had a wide impact, including shaping the Biotechnology and Biological Sciences Research Council's (BBSRC) activities relevant to food security.

Summer

- GCSA works with the larger science and technology community to provide operational support and contingency planning for a safe Olympic Games.

- Publication of the Science and Engineering Assurance reviews of the Foreign and Commonwealth Office and Department for Energy and Climate Change. Both reviews were helpful in raising awareness of the evidence support systems and processes available to policy makers. The Foreign and Commonwealth Office have subsequently commissioned an internal review, to establish how to effectively implement improvements to scientific input across a wide range of business areas.

- The Council for Science and Technology (CST) writes to the PM about STEM education, smart grids, industrial strategy and the training and education of future generations of doctors. They also hold a science seminar with the PM on advanced materials and nanotechnology.

- The Horizon Scanning centre publishes a report on *Technology and Innovation Futures (TIF)*, highlighting UK growth opportunities in the 2020s. TIF informs the selection of the 8 Great British Technologies announced in the Chancellor's speech to the Royal Society in November 2012.

- GCSA joins a host of UK scientists and policy makers at the United Nations Rio+20 Conference, giving a speech entitled Future Challenges of Global Food and Farming.

Autumn

- The Royal Society and the Royal Academy of Engineering publish a report on the management of shale gas extraction in the UK, as requested by the GCSA. DECC and the PM refer to this work as they develop UK policy in this area.

- GO-Science with the Royal Society delivers the annual pairing scheme, bringing MPs and civil servants together with more than 30 scientists.

- The CST continues to work with the Department of Health on following up their letter on the NHS as a driver for growth.

- GCSA gives the keynote address at the Green Growth Conference in Burma, on climate change and disaster risk mitigation.

- Foresight reports on *The Future of Computer Trading in Financial Markets* and *Reducing Risk of Future Disasters* are launched. The former, chaired by Treasury Financial Secretary Greg Clark, has already informed EU regulatory proposals.

- The GCSA chairs a meeting on energy and the environment at the Science and Technology in Society (STS) forum in Kyoto, Japan.

Winter

- The report *Engaging with Academics: How to Further Strengthen Open Policy Making* highlights the wide range of ways departments provide robust evidence through constructive engagement with scientists, and how this increasingly supports open policy making.

- The recommendations of the GCSA-chaired Nuclear Research and Development Advisory Board are published, together with a review of the UK nuclear R&D landscape produced by GO-Science, plus a new civil nuclear R&D roadmap. These lead to new funding for nuclear R&D and structural changes to ensure future success in this area.

- Launch of the *Future of Identity* Foresight report discussing how new technology is changing the role of identity in the UK. It is GO-Science's most downloaded report ever.

- The Horticulture Innovation Partnership is launched.

- Consolidating the rapid growth of the science and engineering profession, a major review highlights the four areas of focus for the future: leadership, openness, agility and professionalism. It is strongly welcomed by the head of the civil service, and leaders within the profession are now taking the key actions forward.

Building Capabilities and Networks

The Science Capability and Networks (SCAN) team support the underpinning network of scientific advice across government. Activities include supporting the network of CSAs, maintaining the GCSA's guidance on the use of science and engineering in government, maintaining an overview of the science and technology related activities within different departments, and supporting the GCSA on cross-cutting issues.

SCAN also hosts the secretariat to the Council for Science & Technology (CST).The CST is the UK's top-level science advisory body, reporting directly to the Prime Minister, and is co-chaired by the GCSA and Professor Dame Nancy Rothwell (Vice Chancellor of the University of Manchester).

Supporting Open Policy Making across Government

This year we have worked to consolidate and strengthen the network of Chief Scientific Advisers (CSAs). In this we were supported by the recommendations of the House of Lords Science and Technology Committee report on the role and function of CSAs, to which we responded in June 2012.

CSA appointments are now all externally advertised, at a minimum of 'Director' level, and the GCSA is involved in appointment, role definition and performance management. The network meets informally weekly, with quarterly meetings on a more formal basis, to bring their collective cross-disciplinary expertise to bear on policy issues, particularly those with cross departmental remits. An increasing number of departments now have a Deputy CSA, and a network for this group has also been established, supported by GO-Science.

Many departments are supported by Scientific Advisory Committees and Councils (SACs) which provide expert independent science & engineering advice and evidence to underpin policy making. CSAs met twice this year with the Chairs of the 65 SACs across government. Following the Lords CSA report recommendation, we have reviewed the functioning of the six strategic SACs to develop knowledge of good practice and what works well. This body of knowledge is now available to other departments who are considering whether to introduce similar arrangements.

Changes to the CSA Network

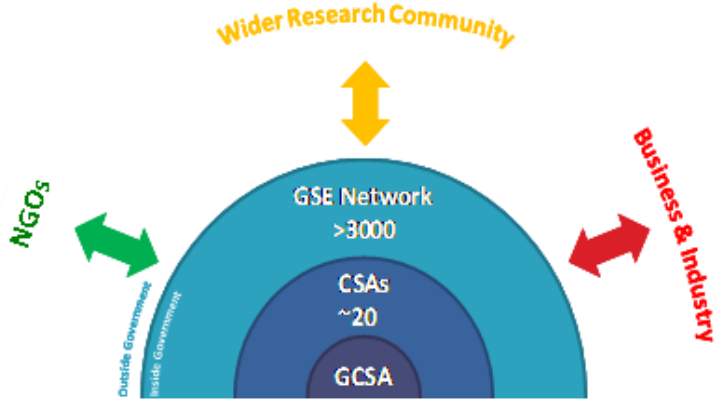
2012/13 saw two changes to the CSA network. In Defra, Professor Ian Boyd took up post as CSA in September. Professor Boyd has been Director of the Scottish Oceans Institute at the University of St Andrews and the Sea Mammal Research Unit, a partner institute of the Natural Environment Research Council, from 2001-2012. He was responsible for the creation of the Marine Alliance for Science and Technology for Scotland in 2009, a partnership of nine institutions conducting marine science across Scotland, and is a member of the Scottish Science Advisory Council.

In February, Professor Robin Grimes was appointed as CSA at the Foreign and Commonwealth Office. Professor Grimes is currently Professor of Materials Physics at Imperial College, Director of the Centre for Nuclear Engineering at Imperial College, and Director of the Rolls-Royce University Technology Centre for Nuclear Engineering. He is a Fellow of several learned societies, including the Institution of Nuclear Engineers and the Institute of Physics.

Government Engagement with the Research Community

Engagement with the UK's academic base is essential to inform government at all levels and support evidence-based policy making. Given the Civil Service Reform Plan's commitment that open policy making should be the default, bringing in expert external views has never been more important.

CSAs have continued to engage with the wider scientific community, hosting two meetings this year with representatives of the science academies and institutes, other public science bodies and, for the first time in November 2012, representatives from business and industry. At these meetings they have discussed the challenges of integrating natural and social science advice and what open policy making means for the relationship between government and the wider scientific community.



GO-Science has produced a short guide and a collection of case studies, designed to encourage and provide tips on constructive engagement with academia for government officials. It is primarily aimed at policy makers working in science, technology or engineering related areas, but should be useful for any in government who work with evidence. The guide is available for download from the GO-Science website.

Transparency

In the Innovation & Research Strategy for Growth the Government stated that taxpayer funded research should be a public good in the public domain, and that greater transparency in research is a key objective. GO-Science is playing a number of roles in the transparency agenda:

- The Administrative Data Taskforce (ADT) report was published in December 2012 and examined the best procedures and mechanisms to make administrative data available for research. The Taskforce worked with a range of government departments including GO-Science, as well as academic experts and funding agencies. GO-Science is now working with BIS to coordinate the government response, due in summer 2013.

- The Government announced in the 2012 Open Data White Paper that it would set up a Research Sector Transparency Board. The board consists of government departments, funding agencies, and representatives from universities and other stakeholders. It is working to develop policy on expanding access to the data that underpins the UK's research effort. GO-Science provides the secretariat to the board, which held its first meeting in February 2013.

- The Data Strategy Board (DSB) held its inaugural meeting on 11 July 2012. The purpose of this board is to raise UK economic competitiveness, increase accountability and improve public services through greater access to public data for people and businesses. The GCSA has a seat on the board, and acts to provide an important link to scientific research and collaboration with scientific institutions.

A Space for Ideas: Cabinet Office Seminars

In a new initiative for 2012, GO-Science with support from the Behavioural Insights Team organised two seminars at the Cabinet Office, which were intended to bring new insight and thinking into the heart of government.

Firstly in June, Mark Henderson, Head of Communications at the Wellcome Trust and formerly of the Times, set out some of the main propositions in his book *The Geek Manifesto*. In his talk Mark built a case for science to become more central to government and the wider national conversation.

In October, a cross-government group met in the historic Churchill Room in the Treasury building to hear businesswoman and former TED talker Margaret Heffernan discuss her book *Wilful Blindness; or missing the obvious at our peril*. The lecture explored how the phenomenon of wilful blindness develops, and went on to outline some of the mechanisms, structures and strategies that institutions and individuals can use to combat it.

Reviewing Departmental Science and Engineering Advice

GO-Science works with departments to help them use science and engineering evidence and advice as effectively as possible. A programme of reviews looking at departmental evidence capacity and capability was started in 2003. These reviews assess how scientific advice and expertise are used by departments, and how departments engage with key stakeholders to get the evidence required to make effective policy decisions. The reviews produce an assessment of the fitness of departmental information systems, and make strategically focused recommendations to help support and improve departments' capacity to access, manage, quality assure and use science in policy and strategy.

The current SEA programme, developed in 2008 from the original Science Reviews, is due to be completed in March 2013. This year saw the completion of reviews of Department for Energy and Climate Change (DECC) and Foreign and Commonwealth Office (FCO). All reviews have helped raise the profile of good quality scientific and analytical evidence in policy development. In DECC further engineering expertise has been taken on, and following the FCO review the systems for engaging with scientific advice have been strengthened. The final review in the programme looks at the analytical capability of HM Treasury. Completed reports can be found on the GO-Science website.

With the completion of the review programme in sight, GO-Science has created a working group of Chief Scientific Advisers (CSAs) and deputy CSAs, representatives from the Cabinet Office and from the other government analytical professions, to develop a successor programme that reflects Civil Service reform and reduced resource needs. Elements of the proposed new approach are currently being prototyped in a number of departments.

GSE
Government
Science &
Engineering

Science and Engineering in Government

Over the past four years, the Government Science & Engineering (GSE) community has been developing as the public face of the profession. It now has over 3,500 members. It is a diverse community, already adept at supporting open and collaborative policy making by working closely with external experts, academics and the public. It also has strengths in working flexibly across departmental boundaries to provide strong and shared evidence.

The GSE skills framework sits alongside the Civil Service core competencies framework to identify the additional skills required to perform well in a science or engineering job within the service. During the last year the profession has worked with Civil Service Learning to pull together a curriculum of learning resources for scientists and engineers working in government, and to develop tools for capability building in key areas such as risk communication, futures analysis and systems thinking.

In 2012, GO-Science conducted a review to provide information about the current state of the profession, propose a vision for the future and highlight priorities for action.

The review involved close working with others, notably the policy profession, the other analytical professions, Prospect, and the external science and engineering community. Some 5000 people, within and outside the Civil Service, have contributed by answering one of our surveys, participating in one of a range of workshops, or being interviewed.

The review highlights how the science and engineering profession has an important role to play in making the Civil Service a more open, flexible organisation with access to the skills and expertise needed to tackle future challenges. The profession needs to become more visible and better integrated in the day-to-day business of government.

To achieve this, the GSE has set out to:

- Build on its strengths as an open, collaborative and diverse profession.
- Make its in-house expertise more visible, better connected and better integrated across government organisations.
- Strengthen its leadership networks, and offer clearer guidance on skills and career pathways to ensure our people are knowledgeable, skilled and motivated.

Engaging with the PM

Emerging Technologies Seminars

Emphasising the role of emerging technologies in contributing to UK growth, Sir John Beddington and David Willetts jointly delivered a seminar to the Prime Minister on advanced materials and nanotechnology in August 2012. This showcased recent developments in advanced materials science and mechanisms, which British business is translating into commercial products. The seminar was a key input to the *Eight Great Technologies* publication launched by David Willetts at the Policy Exchange in January, underpinning £600 million spending on science announced in the Autumn Statement. In the follow-up of this seminar the PM is now helping BIS to identify how growth might be enabled in these underpinning technologies.

The Council for Science and Technology

COUNCIL FOR SCIENCE AND TECHNOLOGY

The CST operates at the very highest level in government, reporting to the Prime Minister directly. Building on the expertise from its membership, the CST meets with Ministers across government and has offered advice to the Government on a range of topics.

In spring 2012 the CST wrote to the PM and recommended steps the UK could take in the translation of science into growth, using international comparators. CST also wrote to the PM about procurement as a driver for innovation, and made recommendations on how to exploit opportunities presented by the Government's procurement reform programme.

Science, Technology, Engineering and Mathematics (STEM) education was the focus of CST's advice to the PM in July. In its letter the CST made recommendations around supporting an integrated approach to STEM from ages 4 to 24 (covering school, further education and training, and university). CST met the Secretary of State for Education, Michael Gove, to discuss the letter, who asked CST for further advice on assessing practical science in schools.

In July 2012, CST wrote to the PM with advice and recommendations on the development of a smarter electricity network (a smart grid) and its analysis of the current state of training and education of future generations of the medical profession.

CST Members

Professor Sir John Beddington CMG
Government Chief Scientific Advisor

Professor Dame Nancy Rothwell FRS FmedSci
President and Vice-Chancellor of Manchester University

Professor Sir Keith Burnett CBE FRS
Vice-Chancellor of Sheffield University

Professor Steven Cowley
CEO of the UKAEA

Professor Dame Sandra Dawson
Social scientist

Mr Rowan Douglas
CEO of Willis Re Global Analytics and Chairman of Willis Research Network

Dr Paul Golby CBE FREng

Professor Dame Julia Goodfellow FMed Sci
Vice-Chancellor University of Kent

Dr Hermann Hauser Hon CBE FREng
Venture Capitalist and co-Founder of Amadeus Capital Partners

Professor Alan Hughes
Director of the Centre for Business Research at Cambridge University

Dr Michael Lynch OBE FREng

Sir Paul Nurse FRS*
President of the Royal Society

Sir John Parker FREng*
President of the Royal Academy of Engineering

Sir Adam Roberts KCMG, FBA*
President of the British Academy

Mr Colin Smith FREng
Director of Engineering and Technology at Rolls-Royce

Professor Sir Christopher Snowden FRS FREng
Vice-Chancellor and CEO of Surrey University

Dr Graham Spittle CBE
IBM Chief Technology Officer Europe & Vice President, Software Group

Professor Sir Michael Sterling FREng
Chairman of the Science and Technology Facilities Council

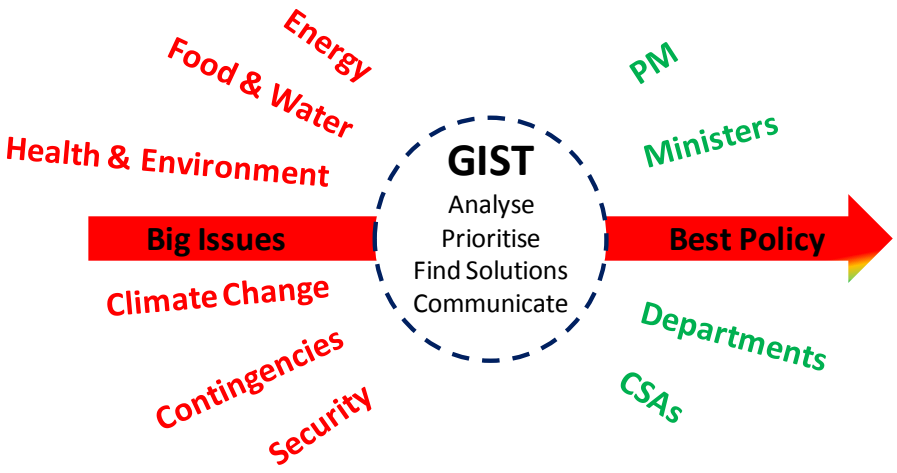
Professor Sir John Tooke*
President of the Acadmey of Medical Sciences

Sir Mark Walport FMedSci FRS
Director of the Wellcome Trust

** ex-officio member*

Global Issues: Evidence into Policy

The Global Issues Science Team (GIST) is focussed on getting the best science into today's policy thinking. The team brings together expert advice and evidence to provide solutions across Whitehall. GIST's work is prioritised on science and engineering issues with high political and economic importance that require cross-departmental responses. The team engages with current policy and conducts short pieces of work that look up to 20 years into the future. In the past year GIST has responded to many external challenges and new initiatives.



Energy

Shale gas

The GCSA asked the Royal Society and the Royal Academy of Engineering to produce an independent report summarising the relevant scientific and engineering knowledge, including levels of uncertainty and potential risks, associated with the extraction of shale gas. The report was published in June 2012, and informed the Government's later policy decisions on the future of exploration for shale gas. In December 2012, the Government announced that exploration for shale gas using hydraulic fracturing technology could be resumed in the UK.

Nuclear energy

In November 2011, the House of Lords Science and Technology Select Committee published a report on nuclear R&D capabilities in the UK. Responding to its recommendations, the Government asked the GCSA to lead a review of the current nuclear R&D landscape in the UK and to chair an ad hoc Nuclear Research and Development Advisory Board. The Advisory Board met seven times between March and December 2012, and has used the evidence generated by the review to make a series of recommendations to government on the future direction of civil nuclear R&D in the UK. The Government has accepted all the headline recommendations.

Health and Environment

Ash Dieback Response

As part of the Government's response to the ash tree fungus, Chalara, Sir John Beddington established a group of experts to provide commentary and advice on DEFRA's emerging scientific evidence and approach. The group included departmental Chief Scientific Advisers and eminent government and academic experts. The group has discussed the robustness of the current sampling strategy; diagnostics; the scientific understanding of Chalara; and also modelling. It contributed substantially to the Chalara Control Plan, produced by the wider Tree Health and Plant Biosecurity Expert Taskforce established by DEFRA. The report will be published on DEFRA's website in spring 2013.

Successful Risk Communication

The GCSA with Michael Gibbens, Chair of the Regulatory Policy Committee, jointly led a workshop on *Policy Makers, the Public and Perceptions of Risk*. The conference aimed to respond to recommendations in the report *Reclaiming health and safety for all: An independent Review of health and safety legislation*, presented to the Secretary of State for Work and Pensions by Professor Ragnar Löfstedt in November 2011. The workshop examined how consideration of risk shapes policy thinking, through reviews of case studies, analysis of regulatory mechanisms and structures that evaluate risk, tools such as horizon scanning, and public engagement used to manage risk. The final report of the conference was published in March 2013. The report urges that additional training is provided to those in the GSE profession on risk communication, and that a robust campaign is maintained at the UK and EU levels to ensure that regulatory responses are underpinned by scientific evidence.

Climate Change

Over the past year the climate change team has worked to support the GCSA in promulgating the evidence for climate change, as well as the use of climate science in domestic and international policy and decision-making. A priority has been to help mitigate emerging risks to scientific capability and capacity for monitoring and modelling environmental and climate change and its impacts. For example, throughout the year the GCSA has taken a close interest in the issues that give rise to instability of funding for environmental and climate monitoring. In discussion with senior figures in relevant organisations, he has sought to put mechanisms in place to enable high level consideration of the needs and priorities for scientific observations to meet the Government's requirement for environmental data to inform and support environmental research, operational needs and policy making.

Food and Water

Food

The Food Research Partnership, chaired by the GCSA with representatives of academics, non-governmental organisations (NGOs) and industry from the agri-food sector, continues to provide a high-level forum to promote cross-sector dialogue and jointly to deliver enhanced leadership in addressing key strategic issues for food research and innovation. This year, areas of focus have been developing proposals to improve the short-term resilience of the UK food supply chain, innovation in crop protection, and academia-industry collaboration in applied research. Reports from these and earlier initiatives are helping to inform the key work strands on skills, translation of research into use, international engagement, regulation and applied research in the Government's Agri-Tech Strategy, which is to be published in Spring 2013.

The report *Engineering: a Key Discipline for Agriculture to Deliver Global Security*, commissioned by the GCSA and prepared by the Institute of Agricultural Engineers, was launched In June 2012. This is now informing a planned call for collaborative industry/academia research from the Technology Strategy Board on precision agriculture.

In March 2013, the GCSA launched the Horticulture Innovation Partnership to stimulate world-class innovation for growth in commercial UK horticulture, and to develop a sustainable, profitable and expanding sector, maximising the contribution the industry can make to the supply of products to UK consumers and for export. This was the culmination of several GCSA-led roundtable discussions with representatives from academia and the horticulture industry to identify the future vision for the industry, the contribution from research and innovation, and the mechanisms needed to stimulate more applied research and innovation in the sector.

Water

The GCSA has continued to chair the UK Water Research and Innovation Partnership (UKWRIP). This has enabled partner organisations from the public, private and third sector to prioritise the national and global water security challenges that could best be addressed through the evidence generated and impact achieved by UK research and innovation. Six new sub-groups are being established with agreed action plans to address the challenges to water security from business and economy, environment and climate change, food and farming, health and sanitation, infrastructure and water use.

Contingencies

Humanitarian emergencies

Recommendations made in *The Use of Science in Humanitarian Disasters and Emergencies* report were endorsed by Ministers in May 2012. The report was then launched at the Wellcome Trust in June 2012. This report proposed changes to the way the Government uses science in planning and preparing for international humanitarian emergencies.

This led to the establishment of the Risk and Horizon Scanning Expert Group (RHEG), chaired by the GCSA. This group is making forward projections on a quarterly basis, and provides Ministers with forecasted areas of concern. The Humanitarian Emergency Expert

Group (HEEG) has also been agreed to deal with the science aspects of any humanitarian emergency. This group has not had cause to meet yet.

Civil Contingencies

The GCSA has continued to provide advice to Ministers on scientific aspects of contingency planning. This includes monitoring and assessing various threats/hazards, planning to mitigate the risk, carrying out research and evaluation to ensure that the plans are suitably robust, and exercising and training to ensure implementation of the plans.

The work of the GCSA and GO-Science is to ensure that all of these stages are underpinned across government by strong science – whether through research or advice. This year, the GCSA has worked closely with Cabinet Office to strengthen the robustness of the science in both the National Risk Assessment (NRA) and the National Security Risk Assessment (NSRA). The National Risk Register is the public facing version of the NRA and provides an update and assessment of these risks. Over the past year, the GCSA has been particularly involved in challenging the current scientific assessments for space weather, an effusive volcanic eruption, and a number of security related threats.

Security

The GCSA chairs the National Security Council (Officials) Science and Technology Committee. The committee was established following the 2010 Strategic Defence and Security Review, to advise the National Security Council on how it can best provide focus and overall strategic direction on the science and technology capability contributing to national security. The GCSA also led work in the run up to and duration of the London 2012 Olympics, ensuring that emergency response processes were clear and effective. Lessons learned are being shared with the organisers of the 2014 Commonwealth Games and the 2016 Olympics.

Foresight

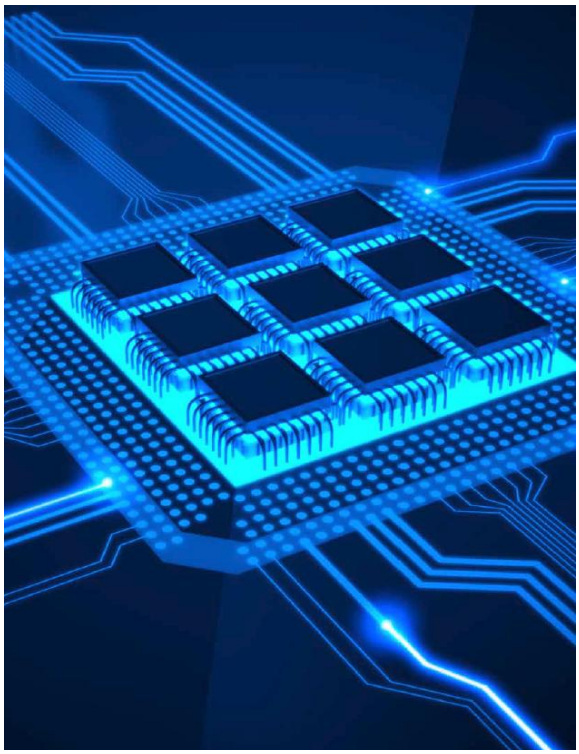
Foresight is the part of GO-Science that is tasked with advising government about how to ensure that current policies are robust in the light of future uncertainties.

Combining the latest science and evidence with futures analysis, Foresight aids policy makers in tackling complex issues to give them a better understanding of the potential opportunities and challenges that lie ahead, in collaboration with a wide range of leading experts. Our work is used to stimulate and inform the development of more effective strategies, policies and priorities at both national and international levels.

Foresight has a separate annual review, summarising its work this year and setting out forthcoming projects. The Foresight Annual Review 2012 can be downloaded from here.

Computer Trading

The Future of Computer Trading in Financial Markets, An International Perspective was published by Sir John Beddington on 23 October 2012 to a finance, business and academic audience at Bloomberg in London. The main findings of the report were also presented to UK Parliamentarians and the Committee on Economic and Monetary Affairs (ECON) at the European Parliament in Strasbourg.



The report aimed to shed new light on technological advances that enable computer algorithms, rather than humans, to drive high-speed stock trades, and which have transformed market structures in recent years.

This two-year project drew upon scientific evidence from across the world, to consider how computer trading will affect financial markets globally over the next ten years. It was guided by a group of leading experts in economics and computer science, who were chaired by Dame Clara Furse.

Computer trading is at the top of the regulatory agenda. Foresight briefed the European Commission Joint Research Council in a workshop focusing on the role of science in financial stability. The project's lead experts were also invited to present at the European Securities and Markets Authority (ESMA), and the Task Force on micro-structural issues. The Task Force encompasses a number of European securities regulators, and delivers

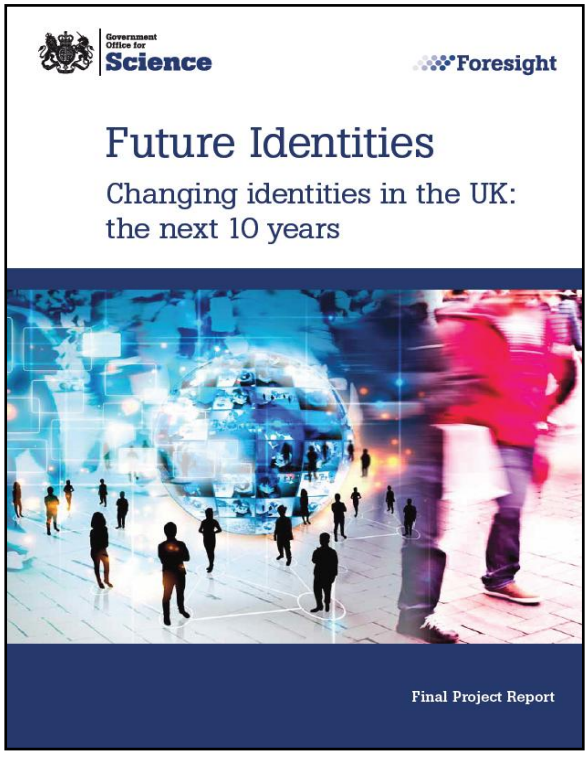
regulatory advice to the Commission on the topics related to algorithmic trading and high frequency trading.

Reducing Risks of Future Disasters

This Foresight Policy Futures project Reducing Risks of Future Disasters made the case that the rising risk of disasters in developing countries can be tackled with the effective use of science. These disasters have impacts across the world, through the global connections of trade, family, commodity prices and security.

Policy Futures projects aim to synthesise and supplement existing evidence on specific policy questions into a form that highlights the main issues for policy makers and other decision makers in the public, private and third sector.

The catalyst for this project was the call in the *Humanitarian and Emergency Response Review,* led by Lord Ashdown, to make better use of science and technology in addressing disaster risk. The project was overseen by a Lead Expert Group of 11 senior representatives from academia, NGOs and the private sector, chaired by Professor Angela Mclean from the University of Oxford. It drew on more than 400 existing reports from around the world, commissioned 20 synthesis papers, and was guided by a high level summit of senior practitioners of disaster risk reduction. The final project report and the synthesis papers are available from the Foresight website.



Changing Identities in the UK: the Next Ten Years

This Foresight Policy Futures Report makes the case that people have many different, co-existing identities. Hyper-connectivity, where people are constantly connected to social networks and streams of information, will have a transforming effect on how we see ourselves and others in the next decade. The report highlights that to create effective policy, government has to keep up with how people's identities are changing.

The Foresight study *Changing Identities in the UK – the Next Ten Years* was commissioned to provide policy makers with a better understanding of identities in the UK. The project, carried out over a year and steered by 10 leading academic experts, considered a

range of areas affected by identity, including social inclusion and mobility, education and skills, crime and mental health.

The report shows that traditional ideas of identity will become less meaningful as boundaries between people's public and private identities disappear, with wide ramifications for policy-makers.

Horizon Scanning Centre

The Horizon Scanning Centre (HSC) in Foresight helps deliver long-term futures analysis and capability in government. Our work with government departments and agencies of government improves the resilience of policy and decision making.

This year, Jon Day reviewed strategic thinking and horizon scanning functions across government for the Cabinet Office. The *Civil Service Reform Plan (2012*) commits to 'improving the ability to scan the horizon better for threats and opportunities ahead'. HSC networks (Fusion and Heads of Horizon Scanning) were integral to meeting that commitment.

In Government

The HSC worked with a variety of departments and agencies in 2012, to carry out several internal horizon scanning projects on social mobility, identities, aviation, technology and innovation, and the Government Science and Engineering Profession. These ranged from delivering workshops, facilitating events held by other government departments, or undertaking more in-depth work to identify drivers of change and develop futures scenarios. In November 2012, the Universities and Science Minister David Willetts published a report updating the Horizon Scanning Centre's 2011 review of *Technology and Innovation Futures* to identify new opportunities for UK growth.

Capability

The HSC trained over 100 officials in futures analysis in 2012, providing advice and coaching, running networks for analysts, and aiding strategy or policy development. Training delivered by HSC for 2013 will be updated and integrated into the Civil Service Learning syllabus, with new materials that reflect the latest developments in tools and techniques.

Professional Networks

Horizon Scanning Centre networks have thrived over the past year; sharing work and experience amongst analysts in government and exploring some of the key issues facing the UK. The HSC is continuing to expand into areas external to government, enabling external organisations, academics and private sector contacts to share information, consult widely, and gain access to the networks.

Working Internationally

International Knowledge and Innovation Unit (IKIU)

GO-Science is also supported on international science, research and innovation issues by the BIS International Knowledge and Innovation Unit (IKIU). IKIU is responsible for the Global Science & Innovation forum, which engages across government and with key stakeholders on overseas science and innovation strategies. IKIU co-ordinates the GCSA's overseas travel and the Global Science and Innovation network (SIN), comprising 90 staff working out of British overseas missions in 48 different locations in 29 countries and territories.

Representing the UK internationally

The challenges we face are increasingly global in scope, from climate change and food security to an ageing population and infectious disease. For science to play an effective role in finding solutions we must work internationally.

GO-Science International objectives

GO-Science has several international objectives, all derived from its overall strategy. These include:

1. To promote good use of science in other countries and the European Union.
2. To develop strong relationships with international scientists and promote international collaboration.
3. To provide science support in civil contingencies arising in other countries.
4. To build science advisory capability in other countries.
5. To promote the UK as an excellent place to do science and business.

The GCSA overseas visit programme is strategically targeted to deliver GO-Science international objectives. In the past year the GCSA has attended a number of high profile events globally.

Asia and Australasia

Engaging with Japan

In October, the GCSA led the UK delegation at the First UK-Japan Annual Nuclear Dialogue. This provided a useful platform for ongoing co-operation across key strands of safety, decommissioning, R&D, public communication and spent fuel management.

Disaster Research

SIN Japan organised a week-long UK disaster research mission, led by Professor Sammonds of UCL. This included a tour of the areas of North-East Japan affected by the tsunami, and a visit to the Fukushima Dai-Ichi Nuclear Power Plant (NPP). At an event promoting UK disaster research expertise, SJB spoke of the increasing financial impacts of natural hazards, especially from flooding, earthquakes, tsunamis and volcanoes, where Asia is particularly vulnerable. The UK is looking to build links with Japanese research institutes on natural hazards, including their financial and psychological impact.

STS-Forum

The Science and Technology in Society (STS) Forum represents a rare networking opportunity with the cream of the international scientific community. The GCSA chaired the plenary session on energy and environment, pressing on the need to reduce emissions and move to a low carbon economy. He repeated the message in his bilateral meeting with Seiji Maehara, the new Japanese Minister for National Policy. Other high-profile UK speakers included Sir Mark Walport, who spoke in the session on global health. Sir John Sulston led a plenary session on behalf of the Royal Society on population and resources, focusing on tensions arising from increasing population, the need to lift billions out of poverty, and the impact that would have on resources and climate change.

Australia

In October 2012, the GCSA had meetings with Australian Cabinet Ministers and two Shadow Cabinet Ministers to discuss topics ranging from shale gas, climate change, ocean acidification and science in government. Following this, the GCSA gave speeches at the Australian Academy of Science and the annual conference of the Crawford Fund, which promotes food security and agricultural research in developing countries. The GCSA described the challenges posed by climate change, population growth and urbanisation. He also engaged in a lively breakfast discussion on these issues from a business perspective, with members of the Australian British Chamber of Commerce .

Burma

UK-Burmese relationships were the focus in November as the GCSA delivered the key note address at the Green Economy and Green Growth Conference in Nai Pyi Taw. His address promoted the adoption of climate-smart agriculture in Burma, and he took the opportunity to visit the local Yangon University to discuss higher education links with the UK. He also had bilateral meetings with Ministers for National Planning, Environmental Conservation and Forestry, and Science and Technology, as well as with the Minister for the President's Office.

India

In Delhi the GCSA met with the Principal Scientific Adviser, Dr Chidambaram, to explore synergies and establish links between his office and GO-Science,. He met with Dr Ramasami, Secretary DST, and key staff to take stock on UK-India S&I collaboration agreement and look to the future. He also met with Dr Montek Singh Ahluwalia, Deputy Chairman of the Planning Commission, to promote Foresight and seek planning commission participation in a proposed Foresight mission to India.

In Mumbai he visited the Bhabha Atomic Research Centre and saw firsthand the progress on the UK-India civil nuclear cooperation since the signature of the cooperation agreement in February 2010. He also met with Dr R K Sinha, Secretary Department of Atomic Energy, to reaffirm commitment to civil nuclear energy cooperation with India and explore appetite for sharing experience on nuclear safety.

In January the GCSA visited Kolkata to speak at the inauguration of the 100th annual Indian Science Congress. He took part in a distinguished panel chaired by Prime Minister Singh, with Science and Technology Minister J. Reddy and Professors Chidambaram and Swaminathan. The panel addressed the role of science in shaping India's future, which was the overall theme of the centenary Congress. The GCSA gave a speech identifying India's key challenges in food and agriculture, water, energy and health. These are driven by population growth, urban migration and climate change.

The Americas

Rio+20

In June, over 100 Heads of State and government attended the United Nations Conference on Sustainable Development, or Rio+20. The GCSA attended, alongside a host of UK scientists and policy makers, including the Deputy Prime Minister. They worked to showcase the UK as a champion for sustainable development and a great place to work, study and visit.

The meeting had two major themes: a green economy in the context of sustainable development poverty eradication, and the institutional framework for sustainable development.

At the UK pavilion the GCSA delivered a speech entitled "Future Challenges of Global Food and Farming". The speech highlighted the challenges in responding to a growing, increasingly urbanised, population in the context of a changing climate. At the Resilient Cities event the GCSA also made an appeal to scientists to use plain language if they are to play a larger part in policy making.

They key objective of the conference was to secure renewed political commitment for sustainable development and to assess the progress made to date in implementing recent goals. By the end of the conference over 700 voluntary commitments were announced by member states, highlighting a new bottom-up approach towards achieving sustainable development.

Europe

Carnegie Group Meeting

The annual meeting of the Carnegie G8+5 group, held this year in Constance, Germany, was attended by the GCSA. The meeting saw productive discussions on disasters, green growth and demographic change. The GCSA was involved in moving UK priorities in establishing global science infrastructure development forward. The European Commission's Joint Research Centre also agreed to hold global scenarios workshops between the G8+5 members to test response systems and co-ordination problems.

Interacting with European Industry

In the summer the GCSA gave a lecture on population growth, urbanisation and climate change to the German Academy of Science and Engineering (ARATECH). The audience included the CEOs of many German multi-nationals and presented a chance to facilitate talks between the Met Office and Munich Re, the world's largest reinsurance company, to discuss climate change.

Germany

In the autumn the GCSA gave a speech at the annual Leopoldina (National Academy of Sciences) conference. In addition, the GCSA participated in a round table discussion with the Industrie 4.0 Group on Advanced Manufacturing to secure interest in the Foresight Future of Manufacturing project. He also met with Prof John Schellnhuber, Director PIK, to discuss a joint publication raising public interest in climate change

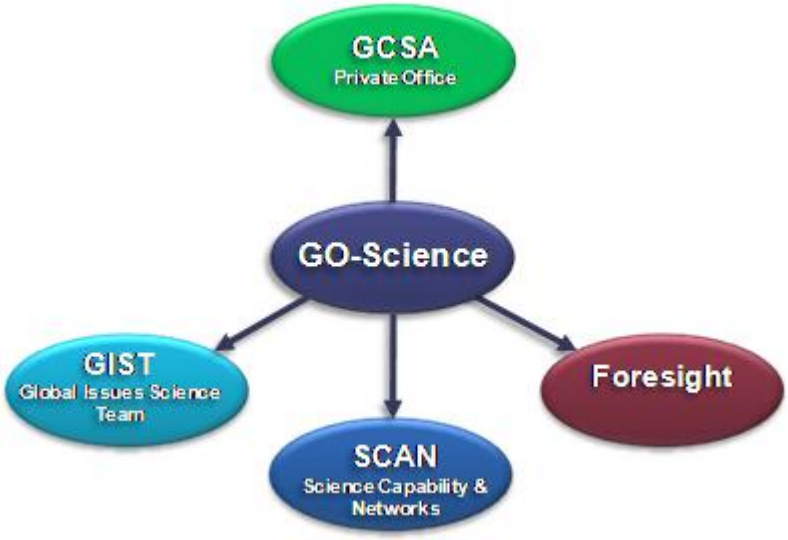
Annex A: About the Government Office for Science

GO-Science supports the GCSA in ensuring that the UK Government uses the best science and engineering research and advice for policy development and delivery.

The GCSA reports to the Prime Minister, and, within the civil service, to the Cabinet Secretary. The GCSA advises Cabinet and works closely with the Minister for Universities and Science.

There are now CSAs covering every government department. The CSAs work together under the GCSA's leadership to address issues that cut across departments. CSAs also work closely with economists, statisticians, operational researchers and social researchers to ensure a joined up evidence base across departments.

GO-Science supports the GCSA and is located in the Department for Business, Innovation and Skills (BIS), yet is semi-autonomous from it. In 2012/13 its activities were broken down into three areas.



Science Capabilities & Networks (SCAN)

The Science Capability and Networks (SCAN) team support the underpinning network of scientific advice across government. Activities include supporting the network of CSAs, maintaining the GCSA's guidance on the use of science and engineering in government, maintaining an overview of the science and technology related activities within different departments, and supporting the GCSA on cross-cutting issues.

SCAN also hosts the secretariat to the Council for Science & Technology (CST).The CST is the UK's top-level science advisory body, reporting directly to the Prime Minister, and is co-chaired by the GCSA and Professor Dame Nancy Rothwell (Vice Chancellor of the University of Manchester).

Global Issues Science Team (GIST)

The GO-Science Global Issues Science Team supports the GCSA in ensuring policy decisions are well-handled by government and that science and engineering evidence is properly considered. Particular areas of focus are issues that cut across several departments' responsibilities. In 2012 these included: climate change, energy, food, health, and the effective use of science in emergencies to safeguard against threats.

Foresight

Foresight uses the latest scientific and other evidence, combined with future analysis, to tackle complex issues and help policy makers take decisions affecting our future. Foresight's work makes a critical contribution to meeting important challenges of the 21st century, including food security, flooding and obesity. Foresight teams undertake in-depth studies examining major issues up to 100 years in the future, and the Foresight Horizon Scanning Centre carries out short projects looking at discrete issues across the entire public policy spectrum.

Annex B: GO-Science Financial Information

The Government Office for Science is financed via the Department for Business, Innovation and Skills.

GO-Science Spend

GO-Science total spend in 2012-2013 is projected to be £6.8 million. Of this, £4.2m is admin spend and £2.6m programme spend.

The table below shows outturn for 2009/10, 2010/11, 2011/12 and projected figures for 2012/13. Figures are quoted in £m.

	2009/10	2010/11	2011/12	*2012/13*
Programme				
Foresight	2.9	2.3	2.3	*2.6*
Admin				
GCSA/Private Office/Deputy Head	*0.9*	*0.9*	*0.7*	*0.8*
Foresight	*1.7*	*1.4*	*1.3*	*1.4*
Science in Government	*3.0*	*2.1*	*2.0*	
Science Capability and Networks				*1.2*
Global Issues Science Team				*0.8*
Total Admin	5.6	4.4	4.0	*4.2*
Overall total	8.5	6.7	6.3	*6.8*

What was previously called *Science in Government* has split into *SCAN* and *GIST* from 2012/13.

Annex C: Acronyms

ADT – Administrative Data Taskforce

ARATECH – German Academy of Science & Engineering

BIS – Department for Business, Innovation and Skills

COBR(A) – Cabinet Office Briefing Rooms

CoPSAC – Code of Practice for Scientific Advisory Committees

CSA – Chief Scientific Adviser

CSAC – Chief Scientific Advisers' Committee

CSL – Civil Service Learning

CST – Council for Science and Technology

DEFRA – Department for Environment, Food and Rural Affairs

DECC – Department for Energy & Climate Change

DSB - Data Strategy Board

ECON – Committee on Economic & Monetary Affairs

ESMA – European Securities & Markets Authority

FCO – Foreign & Commonwealth Office

GCSA – Government Chief Scientific Adviser

GO-Science – Government Office for Science

GSE – Government Science and Engineering

GIST – Global Issues Science Team

HSC – Horizon Scanning Centre

IKIU – International Knowledge & Innovation Unit

NGO – Non-Governmental Organisation

NRA – National Risk Assessment

NSRA – National Security Risk Assessment

RHEG – Risk & Horizon Scanning Expert Group

SAC – Scientific Advisory Committee or Council

SAGE – Scientific Advisory Group in Emergencies

SEA – Science and Engineering Assurance

SCAN – Science Capabilities & Networks

SHED – Science in Humanitarian Emergencies & Disasters

SIN – Science & Innovation Network

STEM – Science, Technology, Engineering and Mathematics

STS – Science & Technology in Society

UKWRP – UK Water Research & Innovation Partnership

Annex D: Key Publications

Science and Engineering in Government

New Perspectives from the Behavioural Sciences for Government Policy Making
http://www.bis.gov.uk/assets/goscience/docs/n/12-962-new-perspectives-behavioural-sciences-for-policy-making.pdf

Engaging with Academics
http://www.bis.gov.uk/assets/goscience/docs/e/13-581-engaging-with-academics-open-policy-making.pdf

Future of the Civil Service: Making the Most of Scientists and Engineers in Government
http://www.bis.gov.uk/assets/goscience/docs/r/bis-13-594-review-science-engineering-in-civil-service.pdf

Council for Science and Technology Reports

Smart Grids
http://www.bis.gov.uk/assets/cst/docs/files/letters/12-1360-smart-grids-letter-to-prime-minister.pdf

Transforming the Training and Education of Future Generations of Doctors
http://www.bis.gov.uk/assets/cst/docs/files/letters/12-1273-transforming-training-of-doctors-letter-to-prime-minister.pdf

Industrial Strategy
http://www.bis.gov.uk/assets/cst/docs/files/letters/13-570-industrial-strategy-letter-to-business-secretary.pdf

STEM Education
http://www.bis.gov.uk/assets/cst/docs/files/letters/12-1272-stem-education-letter-to-prime-minister.pdf

Foresight Reports

Future of Computer Trading in Financial Markets
http://www.bis.gov.uk/assets/foresight/docs/computer-trading/12-1086-future-of-computer-trading-in-financial-markets-report.pdf

Reducing the Risk of Future Disasters
http://www.bis.gov.uk/assets/foresight/docs/reducing-risk-management/12-1289-reducing-risks-of-future-disasters-report.pdf

The Future of Identity
http://www.bis.gov.uk/assets/foresight/docs/identity/13-523-future-identities-changing-identities-report.pdf

Horizon Scanning Centre: Technology and Innovation Futures
http://www.bis.gov.uk/assets/foresight/docs/horizon-scanning-centre/12-1157-technology-innovation-futures-uk-growth-opportunities-2012-refresh.pdf

Annex E: List of Departmental Chief Scientific Advisers

Department	CSA	Expertise
Government Office for Science	Sir John Beddington	Population biology and bioeconomics
Department for Business, Innovation & Skills	Prof John Perkins	Chemical Engineering
Department for Communities & Local Government	Stephen Aldridge (interim)	Economics
Department for Education	Carole Willis	Economics
Department of Energy & Climate Change	Prof David MacKay	Physics
Department for Environment, Food & Rural Affairs	Prof Ian Boyd	Marine and environmental science
Department of Health	Prof Dame Sally Davies	Health, including Biomedicine
Department for International Development	Prof Chris Whitty	Epidemiology
Department for Transport	Prof Rod Smith	Engineering
Department for Work and Pensions	Dr Bill Gunnyeon	Occupational medicine
Foreign & Commonwealth Office	Prof Robin Grimes	Materials Physics
HM Treasury	Dr James Richardson	Economics
Home Office	Prof Bernard Silverman	Statistics, Mathematics and Operational Research
Ministry of Defence	Prof Vernon Gibson	Chemistry

Ministry of Justice	Rebecca Endean	Economics, Modelling, Statistics and Social Research
Food Standards Agency	Dr Andrew Wadge	Environmental Science and Toxicology
Forestry Commission	Prof Peter Freer-Smith	Forestry and environmental sciences
Health & Safety Executive	Dave Bench	Environmental biology & chemicals regulation
Scottish Government	Prof Muffy Calder	Computing Science, Computational Modelling
Welsh Assembly Government	Prof John Harries	Environmental science (climate change, Earth observation)
Northern Ireland	Sinclair Mayne (interim) Prof Bernadette Hannigan (interim)	Agricultural and Animal Sciences Biomedical Science
Met Office	Prof Julia Slingo	Meteorology

This publication is also available on our website at http://www.bis.gov.uk/foresight

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