# 100 days as the Government Chief Scientific Adviser

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I am now three months into my role as the Government Chief Scientific Adviser (GCSA), and am beginning to see the scale of the task ahead. This is an exciting and challenging time to be advising the Prime Minister and Cabinet – I doubt if the potential for science and engineering to contribute to good policy making and sound government has ever been greater.

Science and engineering will help us to address the main challenges we face as a nation, and as a planet – adapting to climate change, global security and international terrorism, rising populations and the consequent pressure on food, water and other natural resources and the impact of human and animal diseases.

These challenges are deeply interconnected. To tackle them will take important cross-department and multi-agency relationships. I see a vital part of my leadership role as working in partnership with others in Government and beyond – in the UK and overseas. Clearly I have the privilege to be working with many talented people. The challenge is to identify where there is a need for stronger leadership and co-ordination, so that we can bring the power of those combined talents to bear on the problems we are facing.

The Government Office for Science (GO-Science), which I lead, lies within the Department for Innovation, Universities and Skills (DIUS). This provides valuable opportunities for us to interact with the Science Minister, Ian Pearson and the Secretary of State, John Denham as well as the newly appointed Director General of Science and Research, Adrian Smith.

A crucial resource is the network of chief scientific advisers (CSAs) who operate within most Government Departments and I am now meeting with a "core issues" group of CSAs every three weeks. I am also arranging for regular meetings with the CSAs and the Chief Executives of Research Councils.

I also believe it is vital that the CSAs co-ordinate their efforts and advice. Within the CSA group, I have begun to set up subgroups to focus on key problems across departments. We now have a Climate Change/Food Security subgroup, which should help harmonise scientific advice that can seem on the surface to conflict. I am thinking for instance of the recent issue of biofuels, where the environmental impacts (DEFRA) suggested different approaches from the renewable energy obligations (DfT). We are also looking at the possibility of similar cross-department co-ordination for Infectious Diseases and other areas.

## Wider World

But the need for co-ordination goes beyond the networks within Government. Many of the problems we are facing over the next few decades – climate change, food security, energy and infectious diseases – are global in nature and will require global solutions.

On a government level, I was impressed by the willingness of China to collaborate on these issues when I met Minister Wu at the UK-China Joint Commission on Science and Technology in London on 16 April. One pleasing example is that our two countries are collaborating on a project to investigate the potential for near-zero emissions coal (NZEC) power plants and on vaccines for avian influenza. This is all the more important considering China's current extraordinary pace of economic growth and its impressive expansion in science and technology.

Such collaborations involve not just governmental agreements but the co-operation of scientists and engineers too. The UK's Medical Research Council has recently signed memorandums of understanding with the Chinese Academy of Sciences, the National Natural Science Foundation of China and the Chinese Academy of Medical Sciences – an excellent example of co-ordinated efforts in action. Further opportunities for us to promote such international co-operation should come when DIUS takes over leadership of the Science and Innovation Network, which comprises more than 100 science attachés based in UK embassies overseas.

## Climate Change

Climate change is of paramount importance. We must radically curb global emissions and we must adapt to those changes that we cannot avert. Robust international agreements and policy frameworks will be critical. But a key priority is also to fully mobilise the practical skills of our engineers. We will need to bring engineers into Government in a much greater way than before.

The Energy Technologies Institute is a key organisation and I am delighted to have been invited to join its Board. Jointly funded by Government and the private sector, the Institute will

identify the most promising low carbon technologies from research and accelerate these towards market readiness.

I am also impressed by the Carbon Trust. With the Government-led goal of carbon reduction but with the freedom of an independent company, the Carbon Trust offers everything from support for research through to venture capital and advice to business.

At the strategic level, I have been delighted to contribute to the Energy Research Partnership. Initially established and partly driven by GO-Science, the Partnership brings together key individuals at senior levels from across the public sector, business and research, to focus on raising the scale, impact and coherence of the UK's low-carbon innovation investments and activities.

Together approaches such as these will lead us towards the energy savings we need in buildings, transport and infrastructure, while seeking alternative low-carbon energy sources.

## Food security

Less widely acknowledged until recently, but potentially just as serious as climate change, is the related problem of food. The world's population is now increasing by 6 million individuals per month. Moreover the burgeoning economic growth in Asia (mainly China and India) is taking people out of poverty and giving them more purchasing power. As a result they are asking for the reasonable things that we all take for granted: meat and dairy foods, which take considerably more production power than simple grains. Thus demand for food is predicted to increase by a full 50 % in the next two decades, and the very proper goal of alleviating poverty is presenting us with a major issue of food production.

Until now, science and technology have ensured that agricultural production keeps pace with increased demand. But new factors have emerged to decrease the supply of food just when demand is rising ever farther.

One such is the rise of biofuels. In principle they can help to mitigate climate change. But in practice, using an agricultural product for energy means that it becomes more scarce, and the price of food sky rockets. The resulting shock to world agriculture is a stark reminder of how interrelated the problems of food, energy and climate change really are. However, biofuels have great potential for good and proper scientific analysis is essential to discriminate between the sustainable and unsustainable.

In addition there is the problem of water shortages. One factor in this is urbanisation and the growth of megacities. By 2030 60% of the world's population will be living in cities, and competing with farmers for water. Moreover, climate models suggest that water availability will begin to decrease in many parts of the world. Indeed this may already be happening – the high price of wheat today is in part due to recent extensive droughts in Australia.

Following a food prices summit on 22 April 2008 with leading experts, the Prime Minister pledged £30m to support the World Food Programme to address the problem in the short term. He has also recognised the need for longer term technological solutions, for example developing higher-yielding and more climate-resilient varieties of crop.

This is especially important as I do not believe that the extent of the recent price increases for food can be dismissed as a short term phenomenon. All of the factors I have described – climate change, population growth, water availability, growth in biofuels, the shift towards a meat-eating diet in developing countries – will bring more sustained upwards pressure on food security and prices. Somehow we will have to satisfy those demands while also addressing climate change. I am considering the possibility of starting a new Foresight project later this year to look at the future of food and farming systems in a global context.

The bottom line is that agriculture will need to deliver more food, and more crops for energy, on less land and using less water. The only way to do this will be to improve agricultural production using the best science and technology. We need a new green revolution.

## Problems at Home

The problems I have been discussing also have a serious impact here in the UK. For instance, wheat is now three times the price it was three years ago, so naturally farmers are planting much more – with implications for biodiversity. GO-Science includes the Foresight and the Horizon Scanning teams and we are about to begin an extensive Foresight project on land use in the UK. Moreover, the inflationary effect of increased food prices clearly hits the poorer sections of our society as a higher proportion of income is spent on food, which provides an uneasy parallel with the developing world.

There are many other problems on the horizon which scientific knowledge will be vital to address. For instance, the Foot and Mouth outbreak in Surrey last year and the recent emergence of bluetongue both pose a stern reminder of the need for research into animal diseases. This is important for humans too. If H5N1 virus – avian flu – mutates to transmit itself readily between humans the consequences will be very serious. Pandemic Influenza occurred three times in the twentieth century and there is no reason to believe it will not recur in the 21st Century.

All of these problems are complex and all will need fully co-ordinated solutions. I am a firm believer in the power of integrated approaches. I started academic life as an economist and, before I became GCSA, my research involved applying both science and economics to the effective use of natural resources.

My new position puts me at the Head of the Science and Engineering Profession in Government. My task for the next five years is to lead those talented scientists and engineers whose expert guidance the Government urgently needs. I intend to provide them with an environment in which they will develop a spirit of camaraderie, networking, and interchange of ideas. The problems we face both in the UK and in the world at large are formidable. But I strongly believe that together, through the powerful collaboration that I envisage between science and engineering, business and government, we will find ways to solve them.