Science in the new parliament

How will the UK meet its energy needs in the future? How can raw human genome data help to understand and treat disease? What is the best way to combat internet crime? Will there be a shortage of science graduates in some subjects? All of these are science and technology (S&T) based-issues that the new Parliament may face. They show how deeply embedded S&T has become in public policy. This briefing highlights issues that could be topical in the coming years. It covers those with a largely national focus such as public health, new technology, security and science policy, as well as those with a more global focus such as energy, climate change and development.

Personal choice, public health?

The new Parliament may need to deal with a number of health and S&T issues that balance personal responsibilities and wider community interests.

Mental health

The 2004 draft Mental Health Bill, yet to make the statute book, was criticised for putting too much emphasis on protecting the public from a small minority of dangerously ill people. Any new legislation would need to address such concerns and also take account of the Mental Capacity Act 2005. New legislation would feed into an intergovernmental review of the European Mental Health Declaration, scheduled before 2010.

Beginning and end of life

Assisted reproduction is regulated by the Human Fertilisation and Embryology Act 1990. A review of the Act in 2004 raised fundamental issues such as the appropriate balance between regulation and reproductive freedom, the impact of technological developments and changes in societal attitudes. Such issues, and controversies over stem cell research and cloning, are likely to prompt continued parliamentary debate. A report on the Assisted Dying for the Terminally Ill Bill may be debated early in the new Parliament. It highlights the need to distinguish between assisted suicide and voluntary euthanasia.

Public health policy

Public health policy often demands a trade-off between individual interests and collective benefit. The 2004 White Paper on Public Health emphasised individual choice, rather than imposing top-down directions for public health. Parliament will face decisions on how best to take public health policy forward. This is particularly important given the increasing proportion of elderly people in the UK, resulting from declining mortality and fertility rates. Issues surrounding obesity, smoking and vaccine development are likely to fuel the debate. Ways of dealing with hospital-acquired infections and The Government's commitment to reduce MRSA blood infection rates by 50% by 2008 will also be key issues.

Health, society and the environment

The increasing numbers of people working long or unusual hours generates health and social concerns, which Parliament may need to address. The next few years will see the implementation of the European Union (EU) Working Time Directive and the 2003 Licensing Act. In 2005, air quality will be a focus of the European Commission, and Parliament may need to debate how to achieve the ensuing environmental air quality objectives.

Harnessing technology

Technology can greatly enhance quality of life. Digital technologies are becoming faster, devices smaller and networks more efficient. However, this has implications for health, privacy and security as well as raising regulatory and intellectual property rights issues.

An avalanche of data?

Over the next 5 years increasing amounts of information will be stored digitally. For instance, under current National Health Service (NHS) plans, medical records will be fully available electronically throughout the NHS by 2008. At the same time, there will be a substantial rise in the amount of genetic information held in databases, as large projects such as Biobank begin to recruit and the police National DNA database continues to expand. A trend towards remote environmental monitoring, whether via satellites or sensors in the environment, means that a wider range of environmental data will be available, giving additional ways of monitoring compliance with regulations.

Keeping in touch

The speed at which people communicate and access information will continue to increase. Advances in telecommunications, mobile (3G) and wireless communications will help to make this possible. Broadband internet is rapidly becoming faster and more

widely available. The switchover from analogue to digital television due to start in 2008 will free up bandwidth to allow faster access to a diverse range of services. As such technologies become more prolific, bridging the digital divide − the gap between those that have them and those that do not − will be increasingly important

Better networking could allow more people to work remotely. Public services are already being transformed under 'e-government' initiatives. The aim is that all government services, from booking hospital appointments to reporting crimes, should soon be available electronically. There is a trend towards 'm-government': using networked hand-held devices to deliver mobile public services. This will have knock-on effects in areas such as housing, public transport and crime prevention.

Advances in computing
As computers become smaller, more powerful and better networked, it will be easier to transport and distribute them, to control homes and workplaces. 'Ambient intelligence', where small networked devices are dispersed throughout the environment, could become a reality within the next few years. This could have applications in many sectors, from health to crime prevention. There may be debate over the privacy and security implications of such scenarios. The advent of the Grid (increased sharing of computer power) will boost the computing capacity available to users, in particular for major research projects.

Nanotechnology
Nanotechnology (exploiting the properties of materials at the molecular level) has great potential, but raises possible environmental and health concerns. The Government will publish plans for a public dialogue on nanotechnology in 2005 with the aim of steering future research and informing future decisions on regulation.

Better treatments for human disease
The human genome project has successfully delivered the raw genetic code. This has huge potential to improve understanding of diseases and lead to better treatments and diagnostics. However, more population studies and research are needed. The first commercial gene-based therapies may be developed during the new Parliament.

Security
Crime prevention and electronic crime (e-crime)
As society becomes more dependent on computers and the internet, e-crime is increasing. Common problems include viruses, hacking, child pornography, identity theft and fraud. Fear of e-crime and low awareness of basic security measures deter many people from using electronic services. The annual cost of e-crime to UK business is estimated at around £3bn. The Home Office is developing a National E-crime Strategy to address this.

Technologies used to verify a person's identify will become more important, with the possibility of ID cards, smart cards/phones (e.g. for medical records or digital cash) and more on-line services. Potential methods include iris scans or fingerprints. Information Communication Technologies (ICTs) are being used to modernise and join up the criminal justice system of England and Wales. This initiative should be complete by 2008. All these applications will raise questions about access restriction, security and reliability.

Defence
Defence accounts for ~30% of UK public research and development (R&D) spending. In recent years several new collaborations have been launched between military corporations and universities. This trend may continue in the coming years and stimulate debate over the involvement of the military sector in publicly funded research. Security research within the EU will expand, with a €1 billion European Security Research Programme starting in 2007. The distinction between civilian and military space-based EU research is becoming less well defined, with more EU programmes having applications in both sectors.

Debate over US plans for national missile defence will continue. The first ground-based interceptors (to stop incoming missiles) were installed in the US in 2004. More will be installed in the coming years. Plans for space-based interceptors are also being developed. However, there are major technical hurdles to overcome in both cases. There may be speculation and debate over the possible siting of ground-based US interceptors in the UK. The future of the UK's nuclear deterrent will also be debated during the new Parliament. A key issue will be the extent of US/UK collaboration, both on nuclear weapons and on missile defence.

Resources and infrastructure
The new Parliament will see changes in how energy, natural resources, infrastructure and waste are managed both in the UK and abroad, as pressure on the world's resources increases.

UK energy policy
There will be continued debate over how to meet the UK's energy needs while minimising carbon emissions. Ensuring security of supply will be an issue, since the UK's indigenous oil and gas reserves are declining. At some point over next 5 years the UK will no longer be self-sufficient in gas or oil production and will revert to being a net importer of both. An update of the Government's policy of 'keeping the nuclear option open' is widely expected. Skills shortages could be a key problem if new nuclear power plants were to be built. How to deal with the UK's radioactive waste will also be a key issue. In particular, there is likely to be controversy over where any waste management facilities should be located. In 2006, the Committee on Radioactive Waste Management will submit its final recommendations to the Government on preferred management options, although it will not make recommendations on the preferred choice of site.

Uptake of renewables must increase substantially if the Government's target of 10% of electricity from

renewables by 2010 is to be met. Wind power is expected to make the biggest contribution in the short term. Research will continue, aimed at enabling energy sources such as wave, biomass and solar cells to be competitive in the longer term. Forecasts predict solar cells could be competitive in southern Europe by 2010 and in most of Europe by 2030.

Managing natural resources

Many natural resources are unsustainably exploited or under pressure. Half the fish landed by the UK fleet come from unsustainable, or close to unsustainable, sources. Many governments are attempting to conserve natural resources while realising their benefits. There is a trend away from considering specific resources, such as fish stocks, in isolation and towards treating ecosystems and landscapes as a whole. Several changes in UK and EU policies suggest this trend may result in practical measures during this Parliament. For example:

- The 2001−2005 Government announced the creation of an integrated land management agency responsible for nature conservation, landscape, access to the countryside and recreation. The new agency is expected to be in place by 2007.
- The EU Water Framework Directive requires Member States to draw up management plans for entire river basins.

Infrastructure

Plans for large-scale house building will focus attention early in the new Parliament on resources used in their construction and occupation, such as building materials and water. Electricity supplies will also be an issue. An EU Directive on Security of Electricity Supply and Infrastructure Investment is now before the European Parliament. Presented in 2003 following the blackouts across Europe, it requires Member States to set targets regarding the security of their power networks. In transport, key problems will be capacity (particularly for air transport), reducing environmental impact and safety. ICTs will continue to have an impact, from more smartcards on public transport to growth of Intelligent Transport Systems.

Waste

Pressure to use natural resources more efficiently and to minimise waste may lead to innovative product design and better waste management. The 2003 Household Waste Recycling Bill requires local authorities to be collecting at least two recyclable materials from households by 2010. In 2004 the UK recycled 12.2% of its household waste; the Government's target is to increase this to 30% by 2010. In 2005 the UK will seek to introduce legislation on electrical and electronic waste, based on an EU Directive on Waste Electrical and Electronic Equipment.

Climate change

Over the next 5 years, climate change will be a major issue for Parliament. It will have direct impacts on the UK and further afield, raising questions over policy and international aid. Within the UK, climate models forecast increases in coastal and river flooding and more frequent and intense heatwaves and storms. Such changes would have health, environmental and social impacts. The 2003 heatwave is thought to have caused around 2,000 'excess deaths' in the UK. Adapting to such events and minimising their impact will have economic implications.

In some areas of the world, the impacts of climate change will be even more severe. For instance, more frequent extreme weather events, such as heatwaves and prolonged dry spells, are expected throughout Asia. This has implications for the UK's international aid policy and for achieving the Millennium Development Goals (MDGs), one of which is targeted at protecting the world's most vulnerable countries from the impacts of climate change.

The importance of meeting international emissions targets may be given added momentum during the new Parliament for three main reasons. Firstly, in many of the countries that produce the most emissions, progress towards reduction has been slow and not all have agreed to the Kyoto targets. Secondly, increased energy consumption in the two most heavily populated countries, India and China, is likely to be mainly coal-fuelled and so will significantly increase global carbon dioxide emissions. Thirdly, there is the possibility of 'rapid climate change', where changes in climate take place over decades or even years rather than centuries. Average temperatures are now $\sim0.6^{\circ}C$ above pre-industrial levels. Research increasingly suggests that once temperatures exceed a threshold level, estimated at $\sim3^{\circ}C$, the likelihood of rapid climate change increases dramatically. This could affect the North Atlantic Ocean circulation that maintains Britain's moderate climate. Parliament is likely to be engaged in the debate over whether existing emission targets are attainable. In November 2005, the parties to the Kyoto Protocol will meet to discuss a post-Kyoto climate change agreement. Given that some degree of climate change is inevitable, Parliament may need to debate adaptation strategies.

S&T and development

In 2005, the UK presidency of the G8 will focus on international development, in particular the MDGs. These were agreed at the United Nations (UN) Millennium Summit, each with specific targets to be achieved by 2015. Nearly 190 countries have since signed up to them. Several of these goals address issues of health and S&T.

- MDG4: Reduce child mortality
- MDG5: Improve maternal health
- MDG6: Combat HIV, AIDS, malaria and other diseases
- MDG7: Ensure environmental sustainability
- MDG8: Develop a global partnership for development

The MDGs are the basis of the Department for International Development's (DFID's) overall aim to '*eliminate poverty in poorer countries in particular ... by 2015*'. DFID has set its own targets to be reached by 2006. Most MDGs remain seriously off-track. For example, there has been no real change globally in the proportion of children immunised against measles,

diphtheria, tetanus and whooping cough in the last 10 years. Parliament will have to consider how the MDGs can be met and how to reach the UN's aim of spending 0.7% of gross national income on international aid.

MDG8 and the Commission for Africa's report stress the need for capacity development in S&T in low to middle income countries, both in terms of infrastructure and in human resources, but little tangible support has been committed. There is increasing awareness of the need to ensure that these countries retain their S&T skills base. In 2006, the High Level Dialogue of the UN General Assembly will focus on international migration and development.

Science policy
Science funding and skills
Great emphasis has been placed on the contribution S&T can make to UK economic growth and public services. In 2004, the Government published a 10-year framework for science and innovation. This proposes to increase investment in R&D from 1.9% GDP to 2.5% by 2014. The UK currently ranks 14th behind countries such as Japan (3%), USA (2.7%) and Germany (2.5%). The Government's strategy for meeting the target depends on extra investment from business and research charities. The new Parliament will see initiatives to enhance business-university collaboration.

A recent inquiry found that many university science departments have closed due to falling student demand for science and because universities compete for relatively limited funds. Closures have accelerated since the last Research Assessment Exercise (RAE) in 2001. This apportioned funds on the basis of research excellence. For the next RAE, scheduled for 2008, these criteria will be revised but there may still be repercussions for university science. The decline in the numbers of students studying physical sciences may impact future government S&T goals. Scientific employment patterns may change after July 2006, when limits are imposed on the use of fixed term contracts. Skills shortages in sectors related to S&T will be an important issue in the new Parliament. Various new initiatives will be taken to maintain the UK skills base, for example by the UK Sector Skills Councils.

Big science
In August 2005, Research Councils UK will update its 'roadmap' of large science facilities thought to be of strategic importance over the next 15 years. One of these is ITER, the next experimental nuclear fusion reactor. A decision on its location is expected by July 2005. Candidate sites are in France and Japan. The Large Hadron Collider particle accelerator is due to be switched on in summer 2007. It may resolve many questions in fundamental physics and raise awareness of the value of international participation in large science experiments. Over the next few years, decisions about the funding of several such experiments and extent of UK involvement will need to be made. These include the International Linear Collider particle accelerator; the HECToR

supercomputing project, and the Neutrino Factory, a $1−2 billion project starting in 15−20 years, which could be based in the UK.

Public engagement
S&T innovation fuels economic growth and science increasingly informs public policy. Greater attention is being paid to public dialogue on the use of science and the direction of research. There may be a trend towards 'upstream engagement' in the new Parliament, that is, involving the wider public and those directly affected in debates earlier in the development of a new technology than has previously been the case.

Public dialogue and notions of accountability will also come to the fore when important decisions about infrastructure and environmental management are made. For example, the EU requires Member States to encourage public participation in decision making for water resources. To date it has proven difficult to find a way of feeding the output of public dialogue into decision making. The next few years will see the development of different forms of public dialogue and may see a re-appraisal of its value.

Ethical scrutiny of research
The UK has no single, national ethics committee. The process for ethical review of scientific research is complex and varies for different types of research. The Research Ethics Committee (REC) system in the UK operates through regional committees that assess any research on humans using NHS patients or resources. Ethical scrutiny of non-NHS research is the responsibility of the funding body or host institution. In 2004, the UK adopted the EU Directive on Good Clinical Practice, which requires Member States to establish ethics committees on a legal basis, to ensure that the rights, safety and well-being of clinical trial subjects are protected by internationally recognised principles. This means that even clinical trials falling outside the NHS REC system in the UK must receive approval by an ethics committee. However, some research, for example some aspects of social research, still does not need to receive such approval.

Let us have your ideas
This briefing is POST's evaluation of the S&T issues that are likely to occupy the new Parliament, but we would like to hear your views. Do you agree with our choice of topics? One of the reasons for putting this paper together is to help POST plan ahead. If you have suggestions for topics please use the contact details below to tell us about them.

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