fst journal

The Journal of the Foundation for Science and Technology
(formerly Technology, Innovation and Society)

Volume 19, Number 8, July 2008

Development in Scotland

Freight transport

DNA profiling

Innovation

Carbon trading

The Select Committees

THE FOUNDATION FOR SCIENCE AND TECHNOLOGY

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 ISSN 1475-1704

fst journal
Volume 19, Number 8, July 2008

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Support for career researchers

A new agreement should ensure that the UK's researchers are nurtured and supported during their career development says Research Councils UK. By setting out clear expectations for researchers, research managers, research institutions, and funders of research, the Concordat to Support the Career Development of Researchers aims to enhance the research workforce and thereby sustain research excellence in the UK, bringing benefits to the health, economy and well being of our nation.

Minister for Science and Innovation, Ian Pearson, said: "We want the UK to be the best place in the world for science, research and innovation. The Concordat is an important contribution in realising the potential of researchers and demonstrating both nationally and internationally that researchers working in the UK can expect a high standard of management and support."

Research Councils UK (RCUK) and Universities UK (UUK) brought together a higher education sector working group with representatives of the UK's principal research funders, including the UK funding councils and Government departments, to develop policies and practices to support the growing number of staff employed to carry out research. This commitment to adopt the Concordat's principles should ensure maximum benefit to the researcher during their employment in higher education.

Vitae, a new initiative to champion the professional and career development of both doctoral researchers and research staff in higher education institutions and research institutes was also launched at the end of June. The new organisation will play a major role in working with institutions and researchers to implement the Concordat. Funded by RCUK and managed by CRAC: The Career Development Organisation, Vitae builds on previous work by the UK GRAD Programme and UKHERD to build capacity in the HE sector to support researchers. ❐

The Concordat is available to download at: **www.researchconcordat.ac.uk**

* The difficulties facing early career researchers was the subject of a dinner/discussion at the Foundation on 7 February 2007. A summary can be found on the Foundation's website at: **www.foundation.org.uk**

Public dialogue in science

Engaging with the public about the potential impacts of new and emerging science and technologies may become easier following the launch of the Sciencewise Expert Resource Centre for Public Dialogue in Science and Innovation (ERC). The new centre – a virtual information hub together with a range of offline support services - was unveiled on 29 May by Baroness Delyth Morgan, Parliamentary Under-Secretary of State at the Department for Innovation, Universities and Skills. She said the resource would be an invaluable tool in helping ministers and officials understand public views and concerns on complex and potentially controversial scientific issues.

The services available through the Sciencewise-ERC will be targeted at all those who have a responsibility for national policy-making in science and technology across Government – including Government departments and agencies and Non-Departmental Public Bodies. In addition, it will interact with other stakeholders – including scientists, businesses, dialogue and engagement delivery organisations and the science communication community – and will provide information to the public about how they can become involved in dialogue.

The Sciencewise-ERC will also provide co-funding to Government departments and agencies to conduct dialogue projects linked to specific policy issues. A number of potential areas, for example synthetic biology and aviation, are being discussed with a view to commissioning projects in the next few months. ❐

www.sciencewise-erc.org.uk

Government presses ahead with regulator

DCSF and DIUS published their response to the consultation on reforms to improve confidence in the standards of qualifications and tests at the end of June. The December consultation document, *Confidence in Standards*, set out detailed proposals on setting up a new independent regulator, the Office of the Qualifications and Examinations Regulator – Ofqual – and the evolution of the Qualifications and Curriculum Authority into a new development agency.

The Government said the proposals were broadly welcomed by respondents who were enthusiastic about the proposal to create a new independent body to regulate qualifications and assessment. Respondents also felt that this would be helpful in highlighting the importance of qualifications and assessment. They also felt that a separation between developing qualifications and regulating them helped maintain the reputation of the regulatory body.

The Government is therefore pressing ahead with the reforms.

www.dcsf.gov.uk/consultations/conResults.cfm?consultationId=1519

UK firms outperform their European competitors

The largest UK-owned companies continue to dominate their European counterparts when it comes to the creation of wealth, according to the *2008 Value Added Scoreboard*, published by DIUS on 9 June. The top 185 UK companies continue to be more efficient at creating value, or wealth, than their European peers.

The annual scoreboard uses 'Value Added' (Operating Profit + Employee costs + Depreciation & Amortisation/ Impairment) to measure the amount of wealth companies create. This is particularly important as it reflects the ability of companies to provide their customers with what they want and are prepared to pay for. It shows almost 23 per cent of all European 'Value Added' came from UK companies, more than any other country.

The Scoreboard lists the value added, or wealth created, by the top 750 European companies and the top 800 UK companies. It provides a broader perspective on a company's economic contribution than operating profit. Key findings include:

- the Value Added by the UK 800 has increased by 9.6 per cent in the last year amounting to some £646 billion;
- the top 10 sectors contribute 62 per cent of the UK's Value Added;
- the E750 companies generated Value Added of £2,027 billion and this was concentrated in three countries: the UK, France and Germany. ❐

The Government has released its response to the report by the House of Commons Select Committee on Innovation, Universities, Science and Skills (IUSS) on Science Budget Allocations. It can be found at: **www.publications.parliament.uk/pa/cm200708/cmselect/cmdius/639/639.pdf**. See also page 24 of this issue.

How should the economy of rural areas in Scotland be managed? This was the subject considered by participants at a dinner/discussion of the Foundation, held at the Royal Society of Edinburgh on 31 October 2007.

What should the development policy be for the remote regions of Scotland?

Gavin McCrone

Scotland's rural areas have done well over the past 30 years; in several areas population has risen and unemployment is low. But this buoyancy has much to do with growth in services and an inflow of population. Agriculture now accounts for only about 10 per cent of gross value added but, because of the many activities that depend upon it, this figure understates its importance.

Hill and island agriculture, overwhelmingly livestock farming, is now in a critical state. These areas account for 70 per cent of Scotland's sheep output and 50 per cent of cattle. The high sterling exchange rate is part of the reason for the decline but so too are changes in the European Union's Common Agricultural policy (CAP). Alterations to the CAP have come about through pressure from the World Trade Organisation (WTO) to reduce protectionism. This has led to the decoupling of support from production.

Support systems

Two principal support systems remain: the Single Farm Payment (SFP), costing some £400 million for Scotland as a whole and in excess of £200 million in the hill and island areas, and the Less Favoured Area Support Scheme (LFASS), available only in the designated areas, costing £61 million a year. The SFP is not related to output at all and only requires a farmer to keep land in 'good agricultural and environmental condition'. The LFASS had formerly a minimal requirement to keep livestock but that too has now been removed.

Ultimately, profitability now depends on market prices and these have been very low. Some estates in the Highlands have got rid of their livestock altogether while many farmers have reduced the numbers drastically. Sheep numbers, for example, have already fallen by 18 per cent and further decline is inevitable. But the process of change is by no means complete. Many people expect the SFP to end altogether in 2013, and the Treasury appears to favour this; LFASS may be replaced because there are many other disadvantaged agricultural areas in the EU, but its future is uncertain.

Professor Gavin McCrone CB FRSE was the Chairman of The Royal Society of Edinburgh Inquiry into Scotland's Hill and Island Areas. He is a former Vice-President of the Royal Society of Edinburgh and was Vice-Chairman of the RSE Inquiry on the Future of the Scottish Fishing Industry. Professor McCrone was Chief Economic Adviser to the Secretary of State for Scotland from 1970-1992.

While agriculture may be in a difficult situation now, much of it in the Highlands and Islands of Scotland and in the Southern Uplands would be unable to continue in anything like its present form if support were further reduced. It is because of this situation that the RSE set up the Inquiry to consider not only the future for agriculture, but the implications for the environment and the scope for increased activity in other sectors.

There are many reasons why we should not be content to see agriculture disappear. Many farmers in the most fertile parts of the world are turning to biofuels, China and India are likely to become major food importers and climate change is having an adverse effect on production in many parts of the world. Already grain prices have doubled. This has only made matters worse for livestock producers but a time may well come when their prices too have to rise. We may then be glad of as much home production as we can get. But secondly, abandonment of agriculture in the hills and islands will have a major impact on the environment and landscape. Grazing is essential to maintain the biodiversity of these areas and an unkempt landscape will have an adverse effect on tourism, by far the largest industry in Scotland's rural areas.

Other activities

The RSE Inquiry is looking at the scope for an expansion of other activities in these areas. The Scottish Forestry Strategy envisages an expansion of woodland cover from 17 to 25 per cent of land area by 2050. Clearly forestry has an important role as a carbon sink and therefore in offsetting climate change. So far it is not profitable without grants but this provides a major reason for supporting it.

VisitScotland is aiming for a 50 per cent increase in tourist revenue, and many other activities in the more remote areas could prosper and expand as a result of developments in information technology, especially the use of broadband. This needs to be made more widely available and transport infrastructure also needs to be improved. Affordable housing is also a major issue. As people move into the area from elsewhere, many in retirement, and houses are sold for second homes, the price of housing rises far beyond the reach of local people even if they have employment.

Environmental issues form a major part of the Inquiry. Many people regard public goods, of which preservation and enhancement of the environment are essential parts, as the main justification for agricultural support in future. Many farmers are already participating in agri/environmental schemes. Yet this needs to be developed further if hill and island agriculture is to continue. Land management for the offsetting of climate change and the promotion of biodiversity will involve new ways of looking at agriculture: farmers may be expected to adopt methods which go against previous practice.

There are therefore many issues for our Inquiry still to examine. But if we can chart a way forward for agriculture and do something to unlock the potential for growth in other activities, we will have achieved our objective. ❐

www.rse.org.uk/enquiries/hill_and_island_areas/index.htm

Empowering communities is the key

Mark Shucksmith

The question of the right development policy for the remote regions of Scotland goes much wider than just the future of hill-farming. When you look at the numbers employed in agriculture and fishing – just over 1 per cent in Scotland as a whole, just over 2 per cent in the Highlands and Islands, 3.7 per cent in the Western Isles – you can see what a small proportion this is of the rural economy, compared with distribution, hotels and restaurants, and of course the public sector (public administration, health and education).

Agriculture is not always the main source even of farm household incomes. A recent report by the Macaulay Institute (Table1) showed the percentage of farm household incomes in different regions of Scotland: the proportion from non-agricultural sources rises from a low of 15 per cent in the Borders up to 84 per cent in the Western Isles. The other two columns separate out the proportion coming from the Less Favoured Areas Support Scheme (LFASS) and from other agricultural schemes. These show the differences in farm households' vulnerability to any potential decline in the LFASS.

Many remote rural regions are doing very well – growing in both population and economic terms. So remoteness need not in itself mean decline. So what makes some regions successful when others are in decline?

John Bryden led a European research project looking at exactly this question. The key factors affecting the development of successful rural economies identified in the Dynamics Of Rural Areas (DORA) study were:

- the contribution of cultural traditions and social arrangements – things like self-reliance, independence and autonomy which help people adapt to change;
- peripherality can be a disadvantage, but the quality of the infrastructure may help to overcome this – things like transport and broadband;
- governance, institutions and investment;
- entrepreneurship and a 'can-do' culture;
- economic structures and organisations;
- human resources and demography – not just skills but education, health and all the other features of the population.

Another crucial issue for the sustainability of remote regions is affordable housing. The proportion of social housing (rented from council or housing association) in the remote areas is very low – 15 per cent council housing, 3 per cent housing association. I would advocate increased funding for affordable housing (both public and private). I believe that councils should be allowed and indeed encouraged to build housing again, but not to manage it. One thing we might learn from the past is the virtue of councils building houses, but passing them on to more localised management – preferably community-based.

Professor Mark Shucksmith is Professor of Planning at Newcastle University. He recently chaired the Scottish Government's Committee of Inquiry on Crofting, is a board member of the Commission for Rural Communities in England and was a member of the Government's Affordable Rural Housing Commission.

Public services are vital, but are we talking about equal entitlement regardless of where one lives, minimum standards – like a Post Office within three miles, for example? Or must people in rural areas just put up with whatever they have?

This takes us on to the fundamental requirement of empowering rural communities. How can communities have more control over their own destinies, imagining their own futures and working together to achieve these with the support of other stakeholders and government? This approach requires local institutions with the skills to work together, with legitimacy and with accountability, promoting inclusion through community agents and with the support of other organisations like the Community Land Unit. The role of the state is to support and to enable, to help people in the rural communities take on more responsibilities and work together towards a collective vision.

Finally I return to agriculture, because this is still important - to identity, to the sustaining of local cultures, to environmental objectives and for quality foods. Current support through the Common Agricultural Policy is not well targeted towards any of these objectives. Indeed agricultural policy is failing both remoter regions and the pursuit of these important public benefits.

Consider the Less Favoured Area Support Scheme: the remote regions get the lowest rates of payment and the least 'Less-Favoured' areas get the highest.

The support schemes are paid largely in relation to profit foregone. The problem is that this builds in higher payments to areas where agriculture is most profitable or rather than to the areas where there is potentially high nature-value. So it is not surprising that the farmers and crofters in the remoter rural regions are less incentivised to take the payments. There could be great merit in considering other logics for these payments – for example the potential value of the public goods concerned: some countries pay people according to the value of their labour input in supporting environmental goods.

The policies which would support strong remote regions in Scotland therefore cover a broad range of issues beyond agriculture. Empowering rural communities through long-term action to build a collective capacity to act is vital. So is support for affordable housing, for public services, for innovation and for better governance.

What are the essential roles for Government in this? Enabling and capacity-building, first and foremost; promoting social justice and territorial justice – not only in terms of services, but in relation to other public spending as well; and supporting the provision of public benefits through incentives, through regulation and through the definition of property rights. ❐

	Percentage of farm household income from:		
	Non-agriculture sources	LFASS	Other agriculture
Aberdeenshire	36	8	56
Caithness	31	14	55
Dumfries & Galloway	32	9	59
Lochaber	47	15	38
Western Isles	84	6	10
Borders	15	31	54

Table 1. Farm household incomes in Scotland (Source: Schwartz *et al*, 2004)

Preserving the social fabric of our rural communities

John Cameron

As a farmer, I want to begin with the role of agriculture in these remote areas in economic terms. I still believe that agriculture in its widest sense is one of the main pillars of the whole economy. The largest manufacturing sector in Scotland is the food processing sector. Total sales are now over £7.5 billion and it employs over 122,000 people. Importantly, 36 per cent of imports in this sector come directly from Scottish agriculture.

Now only about 2 per cent of Scotland's Gross Value Added (GVA) comes from agriculture (and 8 per cent of the UK's GVA) but the percentage of agricultural GVA increases substantially in the more remote regions. For example in Dumfries and Galloway, 9 per cent of GVA is from agriculture and in the Borders 10 per cent. In Argyll, Western Perth and Western Inverness, the figure is 12 per cent, in Orkney 14 per cent and finally in Shetland 20 per cent. In addition it is largely these areas that are responsible for the higher quality produce in which Scotland specialises. Incidentally, just to indicate the future potential of this, a recent survey showed that 42 per cent of M&S customers and 48 per cent of Waitrose customers are now prepared to pay a premium for the Scotch Quality Guarantee.

The 2003 reform of the EU Common Agricultural Policy (CAP) and its focus on decoupling has not helped the sector. There has always been some concern about the value of agricultural subsidies. As an industry we did not do enough to explain the real value of those subsidies in non-agricultural terms such as the support of rural infrastructure, nor to quantify them. But there is no doubt that decoupling has brought into focus the low level of financial return to hill farmers and many of them are now seriously considering their options.

Conservation and environment

Another significant change is society's expectations in terms of conservation and environment. If we are fortunate enough to have one of the most scenic environments in Europe, by all means let us make the most of it. I also support most of the current measures to protect our very special biodiversity. Yet where does our hill livestock industry fit in against these new requirements and expectations? I have no doubt that whatever the future requirements our economically Less Favoured Areas (LFAs) have to meet, they must be achieved by local people who know the land and who know the local infrastructure. For agricultural, environmental and tourism reasons, it is critical to support the infrastructure and the social fabric of these areas.

John Cameron CBE is a farmer and a former President of the Scottish National Farmers Union (NFU). Mr Cameron has farmed arable, grassland and hill units from East Fife to West Perthshire and has been a global representative for Scotland's farming community. He has been a President of the National Farmer's Union in Scotland, a member of the Agricultural Praesidium in Brussels and was the first chairman of the EEC Sheepmeat Committee.

This is a challenge which, at present, nobody appears willing to address. Do we want the hills grazed or not? If we do, how is this requirement to be funded? Once the Single Farm Payment runs out (perhaps by 2014), if there is no alternative funding then quite simply there will be little or no livestock in 90 per cent of our LFAs.

With no requirement in the Single Farm Payment (SFP) scheme to maintain stock numbers and with the present lack of profitability in the hill livestock sector, the temptation to put stock off, reduce labour, take things easier and live off the SFP without losing money is increasingly attractive. And once these acclimatised breeding stocks have been dispersed, it will take years to reestablish them.

The social fabric

What is the most important aspect of the social fabric? In my opinion it has to be the maintenance of local people and local services – the village school, post office, church, the local bus service and so on. In this new conservation era it has become fashionable to talk about endangered species: well, the most endangered species in our LFAs are the people who live and work there.

What can be done? We need to get more people back into the rural areas. Although the actual population of the Highlands and Islands is broadly static, it is declining in the most rural country areas and increasing in the main centres. The new EU rural development programmes which are currently being drawn up offer a unique opportunity. Why not, as part of this programme, introduce a labour subsidy? Labour unit input has been subsidised and eligible for grant aid under some previous agricultural grant schemes. The farmer who was going to put stock off and reduce labour could well decide to keep them, or even increase them, if he was economically assisted to employ another man. I must make it clear that this labour unit subsidy would not only apply to agricultural employment. Conservation, environmental protection, tourism, fish farming, forestry – all these could benefit, subject to the necessary criteria.

The most important of these criteria would be the requirement to live and work in the appropriate local environment. There could for example be a differential rate of growth for those living up the glens compared to those in the village. The Agricultural Committee of the European Parliament came within a whisper of approving such a scheme some two years ago and it was only set aside because of the imminent review of the CAP.

To summarise, I think the most important target for the LFAs is to achieve a local economy that will protect and maintain the social fabric. The most important element of the social fabric is people. It is not impossible at this particular time, when new development programmes are being drawn up, to envisage such support. One of the most important assessments of any scheme would be to judge whether it gives good economic value to the taxpayer.

My late father said every highland community has three wise men – Minister, Schoolmaster and Station Master. How many of rural communities have these three wise men today? ❐

Broadband, the highway to the islands

Frank Rennie

I would like to speak of the contribution of broadband to rural and regional development. In preparing this talk, I was thinking about the time a number of years ago when I was speaking to my grandmother – now dead – who was bamboozled by my digital watch. This watch lit up in the dark, played various tunes, changed the calendar and the date automatically, and so forth. As a young lad I was really quite entranced with this new thing that had come on the market and my Grandmother was absolutely sold on it – but bamboozled. I was, in the arrogance of youth, quite dismissive! Relatively recently, though, as I have been getting older I realised that I was talking to a woman who had grown up in the previous century and had seen such huge societal change in her time although she did not understand the science behind these events. In coming here tonight it occurred to me that the change in society and technology from the late 1800s until the 1970s is as nothing compared to the change that will take place over our own or our children's generation with digital technology.

First, though, a word about broadband. Broadband is simply a facility. It is not a panacea, it may not even be the most important facility but it is extremely powerful. Broadband is simply large bandwidth, a bigger pipe bringing more information. It allows you to transmit, through telephone cables or via satellite, enormous quantities of information. That is all, nothing more. However, even the exponents of broadband, in my experience, rarely appreciate the full potential scope of this thing – which is truly astronomical. The quantity of information that can be transferred can actually change the way we think in life and work. Most of the studies have shown that the broadband development track is unpredictable. However, the results are hugely significant and have some sort of knock-on effect in almost every aspect of society.

Education

We now have the possibility of sitting down in some remote corner of the world and speaking with a tutor, wherever that person may be, and hearing them as clearly as if they were in the room. It is possible to see their face, perceive their body-language. And this can take place at a convenient time, in a convenient place, whether it is a live transmission or whether it is recorded and then broadcast later. This is part and parcel of my daily life.

Frank Rennie is Professor of Sustainable Rural Development at the UHI in the Highlands and Islands of Scotland and is the Head of Research and Post Graduate Development at Lewes Castle College, UHI, Stornoway. His research interests lie in the general areas of rural and community development, especially in community-based approaches to integrated sustainable development.

Recently, I was speaking with colleagues on our research project in Bhutan via Skype – by audio and video. We had the conversation, we could see them laughing. We could see the gradations of emotions, gradations of knowledge that you simply do not get by telephone – and far less by an email or a letter.

Half a dozen years ago in Canada – which is, I would say, six to ten years ahead of us in broadband – I saw the fiddle being taught to remote schools. These schools are so remote that a peripatetic teacher could not get round them all in a week, so they used broadband to teach (in this case the fiddle but it could have been anything – jazz or classical even). Broadband gives a vast quantity of information plus the fidelity of the sound, and the fidelity of the visual. It gives a completely accurate rendition of whatever is transmitted.

Less dislocation

In education this allows people to study where they want to study, rather than having to uproot and live in a city where the university or town college happens to be, incurring the costs of living in a city and so on. There is far less dislocation than moving from one's home area. As many of the students are mature students, they would normally have to take their family or leave them behind. Now they can remain within their home area, they can continue to work and then study part-time, putting their wages back into the local economy. Pioneers of rural health in Canada and Australia are using broadband to link communities that cannot just pop in and talk to a doctor. I was in the Small Isles just a few months ago looking at the possibility of broadband links. There are four small islands and one doctor – if the doctor happens to be on the wrong island, it is very difficult to get an in-depth consultation. Broadband provides the necessary quality of transmission to see the doctor, show him or her the burn or the rash, discover it is not serious and arrange a future appointment for an in-person meeting. This is part and parcel of working life in rural Canada and in Australia, where the distances are the problem. In Scotland the problem is that places are harder to get to – there is often a stretch of water in between. Broadband can also be used to communicate results in the high definition needed for looking at x-rays or CAT scans. The surgeon in my local hospital can view immediately, through a secure connection on his home computer, chest x-rays, scans and so on, as clearly as he would in a hospital 10 miles away.

There is the possibility of using broadband to monitor different parts of a building, to give readings at any time required. One pilot study has used broadband sensors to detect motion in a room for elderly people living by themselves. Studies show that the elderly in particular like to go home after an operation and that they recover faster – they are in familiar territory and are away from bugs in the hospital and the sheer boredom of the hospital routine. They can live at home, but if they do not move regularly an alarm signal is sent. Sensors on their medicines can indicate when and what they are taking. Under such a system, intervention happens only if there is a problem. Services are deployed better, faster and with greater ease.

Education and healthcare are just the tip of the iceberg. Business is making money out of these technologies. The potential for using broadband to relocate information and jobs to rural areas is real. Rather than living in inner-city areas where the price of buildings is expensive, where there is congestion, traffic pollution, commuting and so on, a switch to rural areas can be hugely beneficial. I think we will see many more such initiatives in the near future. ❐

Government policy has focussed recently on personal vehicle movement but how vulnerable is our freight transport system? This was the question addressed by a meeting of the Foundation for Science and Technology held on 6 November 2007.

Defining the elements of a freight transport system

Brian Collins

I should begin by saying that freight transportation in the UK is not a 'system' in the true sense of the word. Most purveyors of freight pass it through many other carriers, who optimise its movement for their own particular purposes at a specific stage. In planning for the future, one of the problems we face is the lack of comprehensive, collated information showing the logistics of freight movements from beginning to end.

The type of information we currently lack on freight transport can be seen in a Ministry of Defence (MoD) study examining military logistics. The MoD aims to track military components – the elements of material that make up a jet engine, or a tank, or ammunition, or body armour – all the way from the factory right through to delivery in theatre. Very few organisations have such an advanced level of information management.

In terms of freight transportation, we should consider whether information logistics are as much about the material itself as about its transport. The latest available statistics tell us that most freight – defined as bulk goods carried for commercial purposes – travels by road, and that 40 per cent of this road freight is not classified in terms of commodity. Nor do the statistics tell us whether 'most' refers to weight miles, weight kilometres, or weight alone.

Furthermore, we have no information about the interplay between road and other forms of freight transport and very few ways of systematically gathering information about what is going on in the UK freight network.

Similarly, capacity could mean volumetric capacity (numbers of lorries and vans on the roads), economic capacity (economic value of lorries and vans on the roads) or environmental capacity (carbon dioxide emissions and other types of pollution, including noise pollution). It could also encompass social acceptability (for example, whether freight is being directed by satellite navigation systems around back streets and through villages, which someone told me the other day nearly wrecked a 17th century bridge in his village). Finally, capacity could also include logistical management to ensure optimal use of containers and vehicles.

It is clear that we need to gather better data. We need to collect information from numerous different sources and develop a more coherent method of classifying that information. We also need to look at multi-mode analysis. Why is freight switched from one mode to another? Are the reasons purely commercial, or are regulatory issues involved?

Optimising freight delivery is another important area. 'Just in time' is no longer an acceptable target. 'At the right time' is the goal we must aim for, in order to avoid problems with availability of loading bays and parking slots.

We need to consider the growth in disaggregated freight – the ubiquitous white van. We do not know why the white van is on our roads in much greater numbers than previously, because this is not an area that has received much attention. We have just completed a review of the literature about 'light commercial vehicles' that has produced more questions than answers. We need more information from the commercial world since it is one of the major drivers behind the internet-based commerce that frequently results in relatively small packages being delivered (or not) in vans, a development which has both advantages and disadvantages.

Finally, we are no longer an island. International transport in the form of long-haul, large lorries from other parts of Europe is causing safety, regulatory and legal problems. Where can we find best practice for managing these problems? Should we be looking to other countries in Europe to see whether their regulatory and legal practices are different?

There are a number of options available to us, including regulatory measures, the development of intelligent transport systems, freight tracking and (dare I say it) road-user charging. At present we lack adequate evidence on which to make such decisions. However, the Department for Transport has recently published a consultation paper, *Towards a Sustainable Transport System: Supporting economic growth in a low carbon world*[1], that addresses the entire issue of transport and invites feedback from all sectors. I would commend this paper (which is available online) to everyone concerned with transport issues. It is intended to provide a basis for formulating a long-term, sustainable network to serve both freight and individual transport needs for at least the next 50 years. ❐

1. **www.dft.gov.uk/about/strategy/transport-strategy/pdfsustaintranssystem.pdf**

Professor Brian Collins is Chief Scientific Adviser (CSA) at the Department for Transport and in addition was recently appointed CSA at the Department for Business, Enterprise and Regulatory Reform (BERR). He is Professor of Information Systems at the Defence College of Management and Technology, Cranfield University.

discussion

The use of information. Although the need for more data has been emphasised, it is not clear what would be done with these data once they become available. There is a danger that the Government, with the support of major transport users, will decide to use the data to plan and operate a centralised economy while seeking to avoid risk by overriding or spurning market solutions. The proper use of the data would be to provide a level playing field and enable the Government to know when to intervene, how to encourage investment by the private sector, and when and how best to make investments itself.

Forecasting for future policy and investment

Tony Berkeley

There is a general lack of data on transport, both within the UK and to a much greater extent across Europe, where it is extremely difficult to compare information from different countries since it is collected and categorised in different ways.

I am going to concentrate on rail freight and in particular on the value of forecasting in informing future policy and investment. The main routes for rail freight are between the centres of economic consumption and production, on the one hand, and the ports, both air and sea, on the other.

Overall, rail freight in the UK represents 12 per cent of total 'road plus rail' transport. However, this figure varies widely between sectors. For example, coal accounts for approximately 33 per cent of UK rail freight traffic, followed by metals at 19 per cent and construction materials at 16 per cent. Movements through the Channel Tunnel, where on some days there is only one freight train, account for only 3 per cent of all freight traffic.

Currently, there are 67 trains carrying freight on the West Coast Main Line. This is in addition to passenger trains. The Government has produced an energy policy that predicts a decrease in coal consumption as more sources of 'green' energy, including nuclear energy, become available. On that basis, it can be expected that there will be a reduction in the movement of coal. However, this is not known with any certainty.

The Rail Freight Group has produced a forecast for the year 2030 (see Table 1) which shows a sharp rise in the volume of freight, from 123.7 million tonnes in 2006 to 197.8 million tonnes in 2030, with a concomitant rise in the number of trains – from 409,000 in 2006 to 634,000 in 2030. This forecast shows that by 2030, 300 freight trains will be using the West Coast Main Line. These figures are alarming.

The Lord Berkeley is Chairman of the Rail Freight Group and a Labour hereditary peer. He worked as a civil engineer for Sir Alexander Gibb and Partners and for George Wimpey. He was also public affairs manager for Eurotunnel. Lord Berkeley was the Labour spokesman on transport from 1996 to 1997 and has served on a number of select committees.

We need to consider ways in which we might address this predicted rise in rail traffic. We could, for example, make the trains longer. We could introduce double-deck passenger trains. We could ship goods over short distances by sea. We could build new high-speed and freight lines. Whatever methods are chosen, it is certain that we shall need to increase port and terminal capacity.

Increasing rail freight capacity is preferable, both economically and environmentally, to building more roads. The CO_2 emissions produced by rail are the lowest of any form of goods transport, barring pipelines.

On that note I would like to consider the example of Crossrail in London. Ken Livingstone, as Mayor of London, indicated his support for the use of environmentally friendly forms of transport, including more rail freight. He wanted more freight to go by rail into London but he also wanted Crossrail — more passenger transport. However, he was not prepared to spend money on building the extra capacity on the surface routes on which his new trains would run. Some feel, therefore, that he was 'stealing' the capacity that freight thinks it had invested in. The answer must be to build more capacity to cope with both passengers and freight, but to do it together.

Now 2030 is over 20 years away but, given the time it takes to debate the problems, design the solutions and secure the finance to put the solutions into place, it is clear that the time has come to begin thinking globally about our capacity to cope with freight traffic in the future. ❐

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discussion

Meeting consumer expectations. Comments were made about the inaccuracy of past forecasting (particularly on demographics). Some were concerned that too much focus on consumer demand, leading to increased global traffic, would result in wasted investment. However, the market-led nature of transport, its sensitivity to competitive costs and the small element these costs form in total goods prices mean that further capacity will continue to be needed. It might be the case that the Government has made provision for emergency supplies of essential goods, but because of the absence of data about their contents it cannot safeguard against a disruption of container traffic. We do not know which goods are so important that a breakdown in supply could destabilise the economy.

	2006	2015	2030
Total tonnes (million)	123.7	130.3	197.8
of which coal	*51.4*	*35.7*	*41.1*
Tonne km (billion)	23.5	31.0	50.4
Trains (thousands)	409	434	634
Indices for tonne km	100	132	215

Table 1. Future demand for rail freight (Source: Rail Freight Group)

Part of a global supply chain

Tom Falcon

Britain's economy is based on imports. About half of everything Britain imports is non-unitised (in bulk) such as coal and oil. The second largest category of imports is 'roll-on/roll-off' (Ro-Ro), principally in large trucks, and the third 'load-on/load-off' (Lo–Lo), primarily in containers. Container transport is growing rapidly in comparison with the other import mechanisms, especially with bulk imports which are predicted to remain close to current levels. This explains the increasing attention paid to 'intermodal', or container, transportation and the increasingly public pressure placed on Britain's intermodal infrastructure.

Containers are now used for transporting all manner of goods, from textiles and refrigerated foods to metals, commodities, beverages and a whole host of others. Some of these were traditionally imported as bulk goods, but are now quite literally thrown or blown, in huge sacks, into containers allowing efficient handling and shorter transit times.

Within a 'typical' global supply chain, for example a container from China to the British Midlands, the UK element of the transportation cost is around 15-20 per cent of the total. Although that may seem high, it is not uncommon in developed countries where congestion and taxation add to the cost. Interestingly, the consumer often does not notice the transport aspect of the total price because at the unit level, the impact on the price is very small. However, the consumer does notice availability: this is noticeable in the panic-buying of goods such as bread during fuel shortages.

Tom Falcon is Director of Strategy and Process Excellence at Maersk UK. His involvement in transportation began in East Africa where he spent several years working for Transami SDV, the region's main transportation and freight forwarding group. He left East Africa to take an MBA at INSEAD and subsequently joined A T Kearney, a leading management consultancy. More recently Tom was Director of Vessels and Equipment for Maersk Line, where he established the asset management and procurement team for the company's core shipping assets.

To better illustrate the global supply chain, we can look at coffee, a much-loved commodity. It may originate in a little village northwest of Kampala, Uganda. There it is picked and transported by pick-up to Kampala, where it is graded and dried. It is then moved to a container freight station and transported by truck across Kenya to Mombasa. From there, it crosses by sea to Felixstowe and is taken by either road or rail (or both) to York for processing. Eventually it is moved via road to distribution centres and onwards to supermarkets.

These days it is commonplace for deliveries to take place 'just in time' in order to optimise the timing (and pricing) in a market, reduce waste (e.g. inventory), cut costs and improve reliability. This results in an increased sensitivity to supply: if there is only a two-week supply of coffee, it will disappear from the shelves very quickly. Today, supermarket retailers are keenly aware of the sensitive products which require a buffer stock, but a disturbance to set off a buying spree is more than just an theoretical possibility. For example, a ship overturning at a terminal, a bridge collapse at a key rail junction, acts of terrorism at specific pinch-points in Britain's network: all could create havoc in the supply chain.

Some of the constraints, and exposure, we face in the UK are to do with limitations in our infrastructure – ports, rail and road – others are to do with shortages of equipment (wagons and trucks), skilled people (such as drivers), and adequate data to enable the design and management of a truly efficient transport system.

Looking at terminals, we can expect a very tight supply until 2015, which will be a critical year for completion of additional capacity. Any port operating at more than about 85 per cent of its capacity struggles to turn round extra trucks or bring in extra trains. As capacity becomes more and more limited we will see costs increase as alternative feeder routes and methods are needed, competition for space increases, and congestion drives down efficiency. Limited terminal space will also make it difficult to use rail wagons to their full capacity.

Similar challenges can be expected land-side, with significant growth predicted in trucking volumes and rail freight. Note that rail freight increases will still result in increased road freight for the final leg of journey other than in those facilities with their own rail siding – and these are limited.

To ensure that we have sufficient capacity in the future, we need to plan for tomorrow today. Currently we only just have sufficient capacity for our freight transport needs. However, to cope with future demand we will need to find intelligent solutions and different ways of working. These may include improving rail wagon productivity and extending delivery periods – doing away with the '8 o'clock syndrome' in which every customer wants goods delivered, be it in a container or in a white van, at 8 o'clock in the morning. We also need to shorten the lead time for infrastructure development. ❐

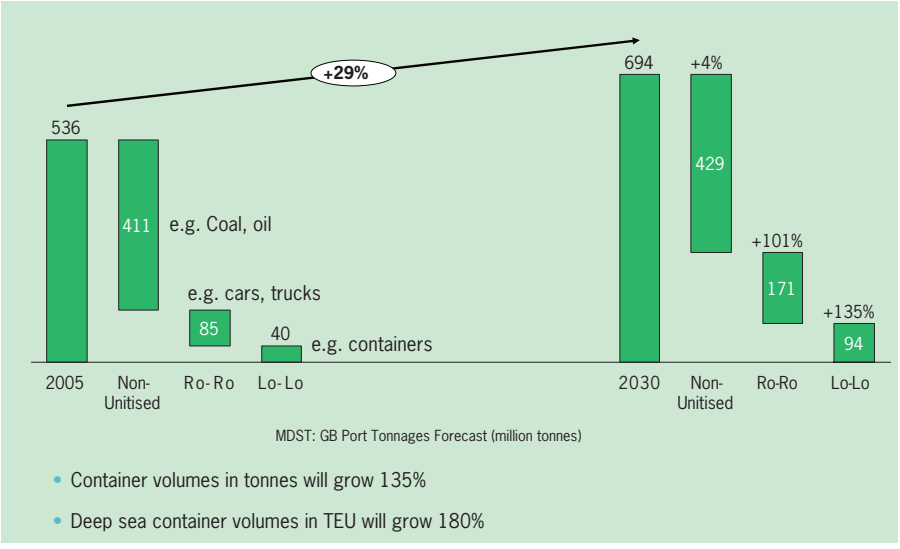

Figure 1. Changes in import transportation modes to 2030

Mathematical modelling of complex transport networks

Michael Stumpf

Biology thrives on comparing systems. Comparisons allow us to understand how systems have come into being and the causes, mechanisms and constraints by which they operate. The statistical and mathematical tools that we apply to solve problems in different areas are often identical, or at least very similar. I believe that mathematical concepts can be applied across disciplines, in particular the process of learning about transport phenomena, such as the flow along a road, or the flow through a metabolic network. For that reason I want to make some loose analogies between transport networks and biochemical pathways and molecular interactions. For example, we can compare trucks, trains and ships to molecules or cells. Seaports, airports and stations can be compared to cell or membrane receptors.

The basic questions that we try to address in our research and that might be relevant to transport are how networks or complex systems grow, how the structure of a system affects its dynamics, and how to analyse the data that we have in a meaningful way. That last question is complicated because the data in our field are of such a low standard that it is very hard to learn anything from them.

One fact that is quite important to remember in this context is that evolution does not result in an optimised solution to any problem. In evolution you just have to be better than the rest – you do not have to be better than everything that could potentially exist. One of the early discoveries in biology was the fact that humans and other organisms do not need all of the genes they have in order to survive. Yeast, for example, has about 5,000 genes but you could throw away 4,200 of them, one by one, and the organism would still survive.

That means that these systems are incredibly robust in the face of random perturbation, so knocking out a single gene will not kill an organism. Unfortunately, an individual gene's place in the network structure does not indicate whether that gene is essential or not. A gene located in the centre might be one that could be removed from the system with no effect on survival, whereas a gene in a more peripheral location might be essential. That is because there is both network and function redundancy built into the system, whereby a gene in one location can substitute for a gene in another location.

Professor Michael Stumpf holds the Chair in Theoretical Systems Biology in the Bioinformatics Centre at Imperial College, London. His research group uses mathematical, statistical and computational methods to explore evolutionary and functional problems in systems biology. Their research covers a number of areas, including the evolutionary, functional and statistical analysis of complex biological networks.

Do we find this level of robustness in technological or transport systems? Well, we carried out a study on rail networks in France and England and looked at how tolerant these networks would be to random perturbation, very much in the way that colleagues of ours were doing experiments with yeast.

We found that if you were to knock out the major train stations – or nodes – in Paris, the entire French transport system, as far as the TGV goes, would fold. The British rail system, however, is remarkably robust and it is quite hard to determine the minimum number of nodes you would have to knock out before the system broke down. The number is surprisingly high – much higher than in the French system.

However, in the UK it is not necessary to knock out a train station: you probably know from experience that a seemingly minor disruption at Leicester can propagate very, very quickly throughout the whole rail network. This is why mathematical modelling is so important.

Data are essential for modelling. If we have a network and we decide to look at only nine nodes, then we can only observe the connections that are between those nine nodes. We may not be able to understand the behaviour at one of these nodes if we are not aware that another node is missing. So the way that data are collected in a network is very important. A simple analogy to this is electoral forecasting: whether an individual votes for one party or the other does not affect the electoral outcome – or electoral position – of any other person in the population: however, as far as the network is concerned, the implications of ignoring the properties of one node might be significant and will, in fact, alter the properties of many other nodes. Thus the statistical analysis of processes on networks is much more difficult than we are conventionally used to.

So, briefly, how do we deal with bad data and bad models? One way is to look at an ensemble of models, rather than a single model, and base the predictions about the behavioural performance of the network on this ensemble of models. We have different models, all of which are plausible and all of which we admit freely are wrong at some level, but averaging over all of these models, almost by magic, makes the predictions much more meaningful.

However – and this is one of the things that is disappointing – despite the similarities at the generic and methodological levels, the details in any process are crucial to our understanding of it. So although my comments may not relate directly to the intricacies of transportation modelling, I hope you will be tempted to look at the mathematical methods that people in our field, or other fields such as computer science, have been developing. ❐

discussion

Meeting increased demand for transport capacity. There was strong support for the view that demand for capacity would increase sharply and that, although it could be mitigated by economic and environmental factors, failure to provide it could have catastrophic results. There is no one answer: more data, better understanding of the market, more international cooperation, greater awareness among consumers and collaborations between government, academia and industry are all needed.

The storage of personal genetic information on a police database is controversial. A meeting of the Foundation for Science and Technology on 6 February 2008 considered the issues.

The holding and use of DNA profiles on police data systems

Written by Meg Hillier, MP, and presented by Peter Neyroud

The central question raised by the prospect of a large-scale DNA database is whether solving crime by DNA identification should take precedence over an individual's right to refuse to allow his or her DNA fingerprint to be on the database. To answer this, it is important to remember what it is we take, why we take it, and what are we trying to achieve.

The term 'DNA fingerprint' gives a misleading impression. Most items in the database start as a mouth swab. DNA from the swab is linked to a code number that, with some nominal detail, is held on the DNA Database, managed by the Forensic Science Service.

There are two further types of profile, those made from DNA found at crime scenes and profiles taken from volunteers, primarily individuals present at a crime scene who have been asked to provide a sample for a process of elimination. A crime investigation may be kept open for a considerable time, so these samples can be on the database for an extended period.

Providing intelligence

The DNA database is designed to provide the police with intelligence that an individual's sample matches to a scene sample. It simply indicates presence at a scene, and the rules state that DNA cannot be used as the sole evidence in a case.

The initial legislation came in the *Police and Criminal Evidence Act* (PACE) and there have been several amendments leading to the present position in law, where a sample is taken from anyone who is arrested and detained in police custody in connection with a recordable offence (a limitation that excludes minor offences).

The DNA samples and the database itself can be used only for the purposes set out in law. These are to assist the police in the prevention and detection of crime, in the investigation of an offence, and in the conduct of a prosecution. It may also be used for one other purpose, to assist with the identification of a deceased individual: this option was added in the light of the lessons of the Asian tsunami. The database can, in addition, be used for research into those specified objectives.

Meg Hillier MP is Parliamentary Undersecretary at the Home Office. A former journalist, she began her political career in 1994 when she was elected to Islington Council in London. She became the youngest mayor of Islington in 1998. Meg Hillier was elected to Parliament in 2005.

Peter Neyroud QPM, who delivered the talk prepared by the minister, is the Chief Executive of the National Policing Improvement Agency (NPIA).

The database is at its most effective dealing with the most serious crimes. That is for two reasons – first, because it will be in those crimes where the police deploy their forensic capability to recover scene samples and, second, because it is in those cases that it is more likely that samples will result.

Importantly, the database does more than just detect and convict offenders: it also eliminates the innocent from inquiries. It saves police time by directing an inquiry to potentially fruitful areas, and builds public confidence by bringing serious offenders to justice.

Public confidence

How do we maintain public confidence in the database and in forensic science in general? There are four principles that we seek to embed in our work: transparency, integrity, effectiveness and redress. To ensure transparency, the governance of the database is carried out by a board that represents the Association of Chief Police Officers, the Association of Police Authorities, the Home Office, the National Policing Improvement Agency (NPIA) and also independent members.

An annual report is published, providing detailed statistical information. An independent Ethics Committee advises ministers and provides advice to the board. Its programme of work considers research, access to the database, how the database is operating, and all aspects of the confidence and transparency of the DNA Database.

Maintaining the integrity of the database is the job of the NPIA and the Custodian, a senior civil servant working for the NPIA. We put great emphasis on ensuring that the processes and the accreditation of laboratories, and those submitting samples to the database, are subjected to routine random inspection. It is vital that we have high quality science and high quality processes supporting the database. The Data Quality and Integrity Team ensures that data in the database are double-checked.

To ensure effectiveness, a core set of data is routinely and regularly gathered concerning DNA hits, results in detections and the types of detections involved. The DNA Database also plays an important role in cold-case reviews because of the ability to look back across major investigations.

It is important that the public has confidence in the system, which means that we need mechanisms that allow people to seek redress where appropriate. Retention guidelines are openly published and there is a process for people to challenge these. There are mechanisms by which information can be removed from the database but we need clarity on this: for instance a card that would accompany every swab kit and provide every arrestee and volunteer with a clear description of their rights, the police powers and their options for redress, would be welcome.

Leading the way

We lead the way on the use of DNA and fingerprints in crime detection. The DNA Database has played a part in nearly 400,000 detections, many of them serious crime cases that have put dangerous people in prison. The structure has recently been strengthened with the creation of an Independent Forensic Regulator to look at processes separately from both the Custodian and the operators. The Government is committed to ensuring that DNA data are used to the maximum benefit, to protect the public, to detect crime and to bring offenders to justice. ❐

Individual rights and databases

Jonathan Bamford

It is a challenge for society to ensure that we have effective measures to prevent and combat crime and bring offenders to justice, whilst at the same time avoiding unwarranted intrusion into the lives of individuals. The growth of the forensic use of DNA presents just that sort of challenge.

The National DNA Database now comprises 4.2 million records linked to a record on the Police National Computer. The 4.2 million includes people who have committed no, or very minor, offences and who pose little ongoing law enforcement concern. In addition, there are records of volunteers who initially consented to profiling and then found that they could not withdraw consent later. This presents legitimate data protection concerns. There is, in fact, no statutory footing for the National DNA Database itself. However, we have seen steady re-classification of offences so that more and more profiles are collected for minor offences, and we are seeing increasing pressure to share our DNA profiles across national boundaries. It is right, therefore, that we should reflect upon our current approach.

The law allows the samples necessary for DNA profiles to be obtained. We also have laws governing our privacy, and there is a well-established international framework of data protection and privacy controls.

Balancing competing interests

How do we balance those competing interests? There are measures concerned with fundamental human rights, such as Article 12 of the Universal Declaration of Human Rights and Article 8 of the European Convention on Human Rights, which require respect for privacy. We have specific data protection rules in a Council of Europe Convention on Data Protection and the EU Data Protection Directive which, whilst not directly applicable to law enforcement, spawned our own national *Data Protection Act 1998*. None of this is 'privacy at all costs' legislation.

Within the UK, the *Human Rights Act* gives effect to the European Convention and Article 8. It talks about respect for individual privacy but not as an absolute right: it is a right that can be interfered with if it is in accordance with the law and the interference is a proportionate response to a pressing need. We also have the Data Protection Act, giving informational privacy rights to individuals and regulating how information can be held, used and disclosed.

Jonathan Bamford is Assistant Commissioner at the Information Commissioner's Office. He joined the Data Protection Registrar when the office was first established in early 1985 and has remained through its transition to the Information Commissioner's Office with the introduction of the *Data Protection Act* 1998 and the *Freedom of Information Act* 2000. The Information Commissioner enforces this legislation in the UK. Jonathan Bamford is Director of Data Protection Development.

The current database has grown up as a result of the police being given powers to obtain DNA profiles, but it has not been established on a statutory footing. Whilst I welcome the fact that we have introduced, belatedly, the idea of a National Custodian for DNA which provides some elements of safeguards, as well as an Ethics Group, we have to ask whether these provisions are sufficient?

The Data Protection Act outlines legally enforceable standards that lie at the heart of Data Protection law. We are using some of these at the moment to take issue with the police over their continued retention of some very minor, aged conviction details that would have been deleted but for changes in rules and practices within the Police Service.

Unanswered questions

What do individuals understand when they provide information? Are the consent forms easily understood? Do volunteers realise that they cannot withdraw consent? There is concern about personal data being relevant and not excessive for the purpose. Are details of people who have not been convicted really relevant to crime detection? Questions like that go unanswered.

The Data Protection Act requires that personal data are held no longer than necessary for the purpose. Are very minor convictions a long time ago sufficient justification for retaining not only the DNA profile but also the record on the Police National Computer – with the potential risks that go with that?

The information on the National DNA Database is for any recordable offence irrespective of conviction. If you were stopped by the police and a Police National Computer check proves positive, even though you were not convicted, do these police officers treat you with more suspicion than he would another person where there is no trace? Yes, they probably do.

There is always a risk that records may fall into the wrong hands and there are concerns about continued retention. Retention is for life unless you can prove it is an exceptional case, which according to police guidelines means that "there was never really an offence in the first place". In practice, hardly anything gets deleted.

In Scotland they have a different approach: if you are acquitted, with a few exceptions they will delete your profile. If it works in Scotland, then why not here?

Ways of using technology

I would suggest, if there is a real need for continuing to retain records because of the value of DNA profiles, that we need to devise more privacy-friendly ways of using technology. For example, the database could be set up so that after time a DNA profile obtained in relation to an aged minor matter remains available for comparison with crime scene profiles but the nominal record on the PNC is not searchable using the name of the individual. If the profile does match to crime scene DNA, the block is removed and the nominal details can be viewed so further action can be taken. This would reduce the privacy risk that accompanies the unnecessary availability of personal information whilst preserving the crime detection potential of a DNA profile.

What about very old minor records? Is it legitimate to keep these records until someone is 100 years old? Is the exceptional case procedure that I have mentioned adequate here? Can we not design-in privacy, not so that the guilty can get away with crime, but so that we protect individuals from the potential misuse of their information?

I am pleased that the Human Genetics Commission has launched a Citizens' Inquiry on the forensic use of DNA. There are many questions for debate, but I sincerely hope that we manage to produce solutions that ensure an effective and responsible use of an extremely powerful tool for law-enforcement purposes; solutions that provide appropriate protection and safeguards for those who pose no risk to society and which also inspire public confidence in the National DNA Database. ❐

Policing with DNA: how profiles are used in practice

Tony Lake

The National DNA Database began in 1995: now we take 60,000 samples each month and 3,000 crime scene samples are loaded onto the database. We have the largest DNA database per head of population in the world, although the USA now has the world's largest DNA database.

Not surprisingly, there is an unprecedented level of debate on the subject of DNA and DNA retention, and I welcome that. The Government must have a perspective for the future on the strategic direction for the use of DNA, and against that background it is instructive to look at a few real examples of the use of DNA.

The first shows the value of taking DNA when the opportunity arises. When the database was created, Lincolnshire Police included samples from people arrested for burglary. This solved a murder case.

Stephen Hughes committed a burglary in 1995 and his DNA was sampled. In March 2002 Kim Newson, a neighbour of Hughes, was reported missing. There was no known link between Hughes and Newson. At around this time Hughes was arrested for another burglary and later, Kim Newson's body was found. Hughes took precautions not to leave fingerprints during the burglary, but as he left the scene he pealed off his rubber gloves with his mouth and threw them away. The police found the gloves, with Hughes' DNA on them. By this time Hughes had become a suspect, and when his house was searched we found Kim Newson's birth certificate with Hughes' blood on it. Hughes was later convicted of murder.

International cooperation

The second example illustrates the value of the international exchange of DNA. Teenager Caroline Dickinson was on holiday with her school, staying in a Youth Hostel in Northern France. She was raped and murdered in the room in which her friends slept. Two years later, in 1998, a homeless man claimed to have killed her. His DNA was taken and it was quickly established that he had nothing to do with it. But the enquiry came up with some suspects, one of them a Mr Montez. An immigration officer from Chicago Airport was visiting the UK and saw a *Sunday Times* article on the case, mentioning Montez. The immigration officer checked a database and found a Francisco Arce Montez in jail in Florida for an unrelated sex offence. Through the French, British and Americans, the DNA was matched and Montez was convicted.

Tony Lake was Chief Constable of Lincolnshire Constabulary from September 2003 to June 2008. He was involved in planning major public order policing operations in the early 1980s. He served in senior positions in Sussex, West Yorkshire and the British Transport Police forces. He chaired the Association of Chief Police Officers Forensic Science Portfolio.

The third example involves familial searching and illustrates the value of not weeding the data. James Lloyd was convicted in 2006 for rapes committed during the 1980s. The police had known from DNA and forensics that the rapes were carried out by the same person, but the DNA was not on the database. When the South Yorkshire Police re-opened the case, familial searching — narrowing down the identity of a sample based on matches to parents and siblings — was part of their armoury. They found a partial match for the crime-scene DNA: James Lloyd's sister had been arrested for drink-driving and her DNA was now on the database. Lloyd was arrested and on searching his house newspaper cuttings of all the different rapes were found.

These cases show how DNA retained from individuals who have not been convicted of serious crime, and DNA profiles exchanged between police forces, can convict serious criminals. It is right and proper that we should preserve the rights of the suspect and that they should have their rights enshrined. It is also right that victims should have their rights enshrined: we should spend as much time considering the plight of the victims as the plight of suspects.

Currently there is much discussion of DNA retention, and particular concerns surrounding the volunteering of DNA samples: the issue is one of the first items before the DNA Database Board, which I chair. It is worth noting that there is a lot of misinformation about: it has been claimed that the National DNA Database holds people's medical histories. This is nonsense: we do not. We hold and analyse a particular part of the DNA, but we do not hold medical records.

Different databases

Some argue there are too many innocent people on the database. This is to confuse two different databases, a conviction database and an intelligence database. Ours is an intelligence database, made up of a substantial number of convicted people, but also containing details of people who have volunteered their DNA.

Young persons are also a concern. The age of criminal responsibility in England and Wales is 10 years, and eight years in Scotland. A significant number of people have their DNA taken when they commit their first crime. The fact is that a lot of crime is committed by offenders aged between 13 and 18, and in law the definition of a child or young person is anyone up to the age of 18 years old. The purpose of the DNA database is to prevent and detect crime, and it makes sense for DNA from these young people to be there.

Some have argued that there should be a universal database, and that the current database is discriminatory. Regardless of the merits of the case, I believe that there is no prospect of a universal database. The cost alone would be prohibitive.

Public confidence

Public confidence is my overriding concern as the ACPO Chief Lead on forensic science and also as the Chair of the DNA Database. We must ensure that what we do is at all times ethical, proportionate, concentrates on bringing offenders to justice and incorporates the highest quality standards. We have recently seen the appointment of a regulator to help ensure these aims are achieved.

The National DNA Database is an invaluable tool. It has helped us to solve some of the most serious types of crime, but more minor types of crime too: the chances of detecting a burglary trebles, from a 15 per cent detection rate to over 45 per cent, when we find DNA.

Finally, I look forward to Members of Parliament debating these issues. Parliament gave us the powers to use DNA for solving crime, and will be able to judge us on our achievements. We have led the world in this area and the eyes of the world are upon us: it is important that we maintain standards and public confidence. ❐

The science behind DNA profiles

Peter Gill

We have considered the ethics and practicalities of a national DNA database. What about the science that has made all that possible, and how it can be used in the future?

A DNA profile looks like a series of pyramid-shaped peaks on a graph. A ten-marker system is commonly used, though the more markers we have, the more powerful the search. Figure 1 shows what we see when a search on the National DNA Database comes up with a match. Very often a crime stain is not a complete profile but a partial one. Instead of having six of these pyramids, it has just four. It is partial, either because there is not enough DNA to visualise or because it has degraded.

The strength of the evidence is determined and the report is written. But the statistic that is given to the court depends on the number of matching markers, which could be anything from one-in-10 to one-in-a-billion.

It might be supposed that a DNA profile, when it is presented to a court, is co-incident with the crime event, but that is not necessarily true. Consider the possibility that some chance contact may have occurred some time before the event, or after the crime when the investigators arrived. The DNA transfer is not necessarily related to the crime event and this becomes crucial for low-level DNA.

Use in evidence

The fact there is a DNA profile match to a suspect is one piece of information, but how the profile became evidential is a separate consideration. It is important to stress that the uncertainty of the latter does not invalidate the former: a DNA profile match means that there is a high probability that it came from a certain individual. It is crucial to distinguish between the identification of this fact — the scientist's job — and its use as evidence use in court proceedings.

The Omagh bombing trial is a case in point. There has been much publicity about the use of DNA matching, and the judge criticised police procedures. Yet there is no doubt that the Omagh trial profiles matched that of the suspect. The main question was 'how did they get there?'

What are the lessons to be drawn from the Omagh case? The Crown Prosecution Service position — and it is a sensible one — is that DNA evidence cannot be used without non-DNA supporting evidence. The position of the Northern Ireland Public Prosecution Service is slightly different, in that they seem happy to proceed with a prosecution without supporting non-DNA evidence.

Dr Peter Gill is a member of the European Network of Forensic Science Institutes and Chair of the Methods, Analysis and Interpretation Subgroup, University of Strathclyde. He jointly published, with Sir Alec Jeffreys, the first demonstration of forensic DNA profiling and is the inventor of the low-copy-number method.

The scientist

Where is the scientist in all of this? First, it is not up to the scientist to decide whether or not a prosecution should proceed. The role of the scientist is to assist the court in assessing the meaning of the evidence. We interpret the evidence in the context of the whole case, in a neutral way and preferably without duress. Each case is considered on its merits. The presence of a profile does not always mean someone is guilty.

Furthermore, it should be irrelevant whether a scientist is called by the prosecution or the defence — it should make no difference to the evidence whatsoever, but there is a serious need to educate the courts and others in the criminal justice system. The courts should be made more user-friendly, so as to facilitate discussion and debate on the meaning of evidence. I am not convinced that the adversarial system is user-friendly to the scientist.

We should be proud of our role as a world leader in DNA technology. In the Omagh trial it was suggested that the low-copy number methods that were being used were unsound because they were not being used widely in other countries. But someone must be first, and the rest of the world still looks to us for leadership: by definition, if you are first then no one else is doing that same thing.

On 27 May 2005, the Prüm Treaty was signed by Germany, Spain, France, Netherlands, Luxembourg, Austria and Belgium. One part of that Treaty calls for the law enforcement agencies in different countries to be allowed to search one another's DNA databases. If the integration of databases within Europe is on the agenda, it is worth asking if the system used in the UK will be fit for purpose?

The UK database is on the third iteration of the Multiplex system, the workhorse that produces the pyramids shown in the graphics. Multiplex has a lifespan of perhaps five to 10 years, so we have to consider how we manage continuous change in the technology in the future, both on a national and international level. ❐

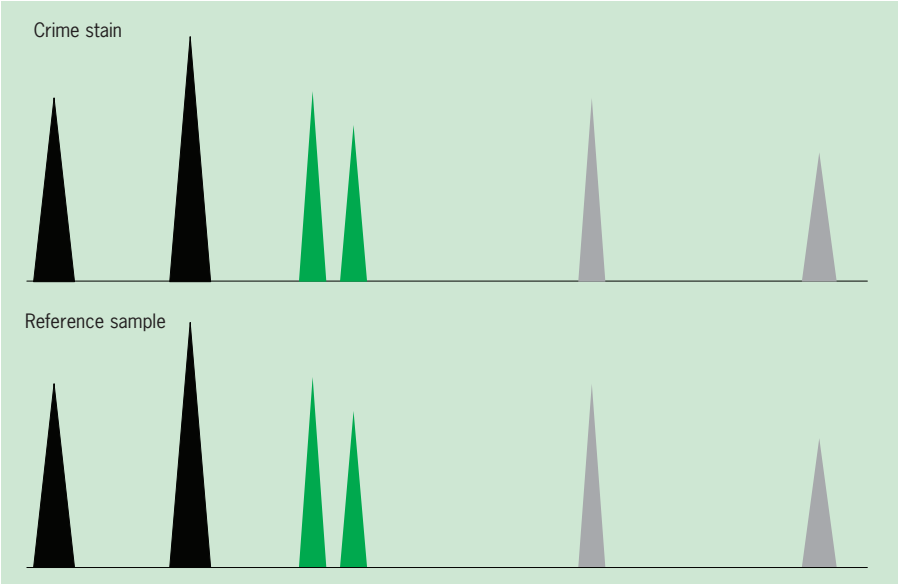

Figure 1. A match is found for a DNA sample

The Technology Strategy Board figures prominently in the Government's new innovation strategy. A meeting of the Foundation held at the Royal Society on 19 March considered its role and strategy.

The mission of the Technology Strategy Board

Iain Gray

This is a very significant time for the innovation community in the UK and for the Technology Strategy Board in particular. The White Paper published earlier this year, *Innovation Nation*, set out the Government's views on innovation and, by implication, the expectations it has for the Board.

I am acutely aware that there are many who have seen Government initiatives and institutions come and go. However, I believe that the timing was right for the creation of the Technology Strategy Board in 2007. The policy framework is more conducive to innovation than at any time I can remember. Our collective capacity to innovate is greater than it has been in many decades in areas such as genetics, robotics and new materials. Business in the UK has a new market-driven psychology and a sophistication in handling innovation that augurs well for the decade to come.

I am convinced that the Board, together with our partners in the universities and the rest of the research community, can, working with business, the Government, the regions, venture capitalists and the financial community, help to make challenge-led innovation happen at or near the necessary speed and scale.

Types of innovation

At the Technology Strategy Board we have spent much time over recent months thinking about how innovation occurs and how, by implication, policy can be used to promote more and better innovation in the UK. We have come to the conclusion that there are three types of innovation.

The first is 'challenge-led' innovation – finding innovative responses to the challenges that the world faces, such as those caused by climate change and the ageing population.

The second type of innovation is the more familiar 'classical' or 'technology-inspired' innovation. The UK has a stock of intellectual assets that few nations can match. Many of our technologies are world-beating and it makes sense to invest in areas where we have strengths. It is vital not only to support existing expertise but to maintain a pipeline for new advances, where existing technologies can be twisted, turned and transformed into emerging technologies with the potential to have a major impact and create new markets or industries. We will continue to invest in this type of innovation in key areas such as advanced materials, bioscience, electronics and ICT.

Iain Gray FREng is Chief Executive of the Technology Strategy Board. He began his career as a structures engineer on Airbus wing development programmes. In 2001 he was appointed Vice President, Engineering, Airbus UK, and subsequently Senior Vice President, Wing Engineering Integration Centre. In 2004 Iain Gray was appointed Managing Director and General Manager of Airbus UK. He moved to the Technology Strategy Board in 2007.

The third type of innovation concerns culture, networks and people. It is what we call the 'innovation climate'. To accelerate innovation in the UK, it is essential to persuade individuals and companies to make the choice to innovate. We must retain and attract talented people. We need a culture that enables, celebrates and ultimately rewards talent and innovation.

Innovation platforms

The TSB has introduced multidisciplinary 'innovation platforms', each focussing on a particular social or economic challenge. Innovation platforms are mechanisms through which companies, Government departments and universities are brought together to seek innovative solutions. We currently have five innovation platforms – on assisted living, intelligent transport systems and services, low-carbon vehicles, network security, and low-impact buildings. We plan to introduce another five over a three-year spending period.

The assisted living platform is looking for solutions to the problems posed by our ageing population. The number of elderly people needing sustained care will increase, while at the same time the number of working-aged people available to provide care will decrease. Moreover, cultural change means that the elderly will be less willing to enter institutionalised care.

Information technology, combined with improved methods for delivering medicines, ought to make it easier for the elderly to be cared for in their own homes. However, it requires clinicians to speak to product designers, care-providers to speak to network developers and people from the voluntary sector to talk to some of the biggest corporations in the world. We need to develop some very impressive information technology; equally, we need to understand why, as often as not, people either do not use information technology at all, or do not use it in the way expected. We are working with the Department of Health to develop a plan whereby new technologies will be evaluated and shaped by care-givers.

Belief in innovation

A vital part of our mission over the next three years is to foster a national belief in the power of innovation. To this end we have established 'knowledge transfer partnerships' and are committed to doubling the number of these. We are also committed to maintaining, after review, the knowledge transfer network model.

An example of these in action is the Morgan Motor Company where, through a knowledge transfer partnership with Birmingham City University, several graduates are working to develop new vehicle designs. One of their designs, the Morgan Life Car – a fuel-cell hybrid sports car – made its debut at the Geneva Motor Show in March 2008.

Some may still be sceptical. However, it is important to note that the Board is not a Government department – we stand at arm's length. Moreover, our frontline team has an average of over 16 years of commercial experience. This means that we will be investing according to a strategy, and not according to who shouts loudest, nor on the principle that we must continue to support those who have always received what used to be known as 'DTI funding'.

We will invest only where we believe

discussion

Delivering the White Paper aspirations. The principal focus of the ensuing discussion was the ability of the TSB to achieve the White Paper aspirations, and how it could measure its success. A number of speakers endorsed the business-led approach, but there was some scepticism about whether there had been any significant addition to funding and whether the new regime was much more than a reshuffling of responsibilities and functions. The proof of the pudding would lie in the networking opportunities that were delivered and in the willingness to take risks – as well as the ability to stand up to political pressure if these went wrong.

there is a market opportunity, and we will not hesitate to stop an investment that does not seem to be working. We are about to launch a creative industries knowledge transfer network and are in discussions with the financial services industry. Although these are two of the largest sectors in the UK, neither has received funding in the past.

We are willing to take risks in harnessing some of the annual Government procurement budget of £150 billion. Lord Sainsbury's seminal report, *Race to the Top*, included among its many recommendations a specific proposal for encouraging innovation in small business through research. As many of you know, this arose from dissatisfaction with the achievements of the Small Business Research Initiative or SBRI. We have been asked to work with the Department for Innovation, Universities and Skills (DIUS) to pilot a reformed SBRI with the Ministry of Defence and the Department of Health. This will get under way quickly and is one of the many steps we will take in the next three years to harness Government procurement to innovation.

I will leave you with some questions. First, are we right in identifying a wide-ranging role for ourselves, catalysing researchers and businesses to work on challenge-led innovation, or should we just leave this up to the market? Second, are we right to look at the creative industries and other areas of the service sector? Third, since innovation does not respect national boundaries, how do we ensure that the UK receives maximum benefit?

Our mission at the Technology Strategy Board is to challenge, connect and catalyse. In that regard, if none of my words cause you to disagree, then I will have failed. Of course, if you disagree with everything I have said, then I have failed too. ❐

Developing the geese that lay golden eggs

Andy Hopper

What is the role of the university sector in innovation? In my view, it is to train people. In the university system people are measured on individual achievement, not teamwork. The consequence is that the type of person who is attracted to, and remains in, the university system tends to be rather academic. Some people who have a choice of going into university or into industry may have less incentive to choose the former because of the difficulties of performance measurement. For example, it has been suggested that the Research Assessment Exercise should use journal publications as an indictor of quality. I cannot think of a single worse way of encouraging innovation than to reward people on the basis of archived citations.

Commercialisation poses challenges to universities, which do not necessarily focus on creating fundable entities. There is a gap between universities and industry and we need intermediate organisations to bridge that gap.

Conventional obstacles to innovation within universities include a lack of flexibility in organisational structures as well as restrictive management and planning practices. These make it very difficult to change direction or to take risks.

Creating wealth

There are strengths and weaknesses of different approaches to wealth creation. For a university, the business plan is to aim for volume – to produce as much material as possible. For a large company, the business plan is to aim for leverage in the market, but it tends to be a slow process and technology can be wasted. Smaller companies have greater potential for growth: start-ups and spin-offs are flexible but risky, and obtaining capital is always a problem. However, some of the greatest success stories have been spin-offs. An example is ARM, which was a spin-off from Acorn.

Andy Hopper CBE FRS FREng is Head of the Computer Laboratory at the University of Cambridge. His research interests include networking, pervasive and sentient computing, and using computers for assuring the sustainability of the planet. He has worked in senior roles for multinational companies and co-founded a dozen spin-offs and start-ups, including Acorn. Professor Hopper is a Fellow of the Royal Society and the Royal Academy of Engineering, and was made a CBE for services to the computer industry in 2007.

Let us look at three aspects of wealth creation. The innovation model 'bets' on particular pieces of applied research. In this model it is important to buck the trend, construct a real system (whether it is a box, a flashing light or a prototype) and use assets wisely. If working with an industrial partner, it is best not to do exactly what is expected or wanted: by remaining innovative you will avoid inadvertently joining the pack.

An operational model is people-oriented and plays to local strengths. The team must have a 'can-do' attitude and aim to be the best in the world at what it is doing. The team should be empowered, given control of the project and provided with sufficient resources. At the same time, the project needs to be actively managed to ensure that it maintains its momentum and stands the test of time. Finally, it is vital to join the network of universities, multinationals and start-up 'angels'; they are needed to help make wise commercialisation decisions. With that operational model in place, the very best people should be attracted to work on the project.

In the commercial model, the team is transferred to the sponsor. The transfer is of people, not of technology. If

discussion

International collaboration. Participants endorsed the importance of international collaboration, which means not only working for markets abroad but also making the UK a place where innovation is incentivised and entrepreneurs can thrive; tax is an important consideration. The TSB should also ensure that it has close relations with the EU to enable the UK to bid successfully for the financial support that is available.

some of the technology is not required, it should be used in a spin-off: licensed, open sourced or given away. Under no circumstances should technology be discarded. In my experience, sponsors will typically take 20 per cent of the company. Potential customers should be educated in order to create a market.

Finally, industrial 'dates' or 'marriages' should be arranged. An example is Olivetti, an Italian hardware company, which was paired with Oracle, an American software company, with excellent results.

Success stories

There are a number of commercial success stories that had their roots in university research. Virata (1993-2002) set out to manufacture a networking box, which was initially turned down by the sponsor because it was not ethernet-based. In response, Virata changed direction and began work on an ethernet chip. It went on to manufacture the chips for 30 per cent of the world's DSL connections, and its valuation grew from £1 billion to £5 billion.

Another example is Solarflare Communications (2002-present). Again, its roots lie in broader, earlier research. Solarflare now makes 10GB ethernet chips for data centres and enterprise networks. It has its headquarters in the US following a merger worth about $100 million and is well positioned to sell to big US multinationals such as IBM, Dell and Hewlett Packard.

Ubisense (2003-present) is a very interesting and rather different example. It is developing precise, real-time, in-building location systems – indoor satnav, if you like. This is a new market area in the sense that such technologies do not yet exist and, again, this venture is rooted in extensive research carried out over many years. The technological 'bet' is on ultra-wideband radio technology as the right implementation method. Ubisense is the technological leader at both the hardware and the system levels. It failed to attract any venture capitalists and is funded wholly by 'angels'.

Finally, Real VNC is a company that makes software for remote control of computers. In terms of technology it provides real-time cross-platform (between different computers) networking. This is a difficult area and the implementation mainly concerns protection. This company was open-sourced and hit the jackpot. It now has 50,000 customers and 100 million licences.

Laying golden eggs

If we want more geese to lay these sorts of golden eggs, we need to ensure that our approach encompasses five features.

First, experiment with autonomous, sector-oriented innovation laboratories, each with a theme and a strong leader. If I were to establish a new innovation laboratory right now, it would focus on computing for the future of the planet, but there are other areas.

Second, create broad-based teams and ensure they are given incentives to succeed – a cut of the action and, equally importantly, assurance that their technology will not end up in the bin. Innovation is people-centric, not idea-centric, so the way university technology transfers are handled requires care.

Third, operate independently of universities and multinationals to avoid restrictions. Fourth, compete and collaborate globally.

Finally, empower the people, not the process. In relation to the Technology Strategy Board, were I to make any suggestions, they would be to invest in experiments, take risks and empower people. Make sure these people are not drowned in complicated processes and procedures. ❐

Science and finance

Richard Ward

Chris Lowe of Cambridge, who has been a very successful entrepreneur in the biotechnology industry said recently: "To business people, academia appears sleepily distant from commercial realities. To the research scientists, business is rags, spanners and dirty work that is irrelevant to the intellectual." I spent the first 11 years of my career as a research scientist but have been working in financial services markets for the past 18. Having spanned both sectors, I am continually asked why I spent so many years in science and then gave it all up to move into financial services. However, my view is that my scientific training has been of great benefit to me in financial services, and the more we can strengthen the link between the people in science and those in financial services, the better.

Business people and scientists are actually very similar – they are fiercely competitive, have professional specialisms, enjoy a clear belief in their ability to solve previously insoluble problems, and continually make wild promises in order to secure funding! Despite this, the two have struggled to work together and both sides have underestimated the value and benefits that a partnership can bring. I believe that this is changing, however; and Professor Hopper gave examples of business and academia linking together. Mobile phone technology is another wonderful example of technology, business, science (chemists and physicists) all linking together to create an extraordinary business that is now worth trillions of dollars.

At Lloyd's, we have had a charitable foundation (The Lloyd's Tercentenary Foundation) in place for the past 20 years that has supported research in universities. The problem is that quite often that research is not related to our business. We do not want to jeopardise the charitable status of the foundation, which is a frustration, and we are continually looking to see how we can do research that is of greater relevance to our sector.

Dr Richard Ward is Chief Executive of Lloyd's of London, the insurance market. Dr Ward started his career at the Rutherford Appleton Laboratory near Oxford and then did research at BP's research centre in Sunbury before moving into oil trading with BP. From BP he joined the financial market as an oil broker and eventually joined the International Petroleum Exchange, becoming Chief Executive in 1999 and Vice-President of the rebranded IPE – ICE Futures – until 2006 when he moved to Lloyd's.

Insurance and science

Do insurance and science belong together? Yes, there is a real benefit from, and advantage to, insurance and science working together. Underwriting is both an art and a science. Underwriters use research and technology to enable them to insure risks that they might not have thought possible previously. Therefore, we need a link with science and with technology.

Lloyd's is the best known but least understood insurance brand. It is a marketplace of insurance companies that join together to insure specialist and complex risks. Because of the nature of our business, it is extremely important that we have a strong link with the scientific community to help us calculate these risks.

We do about £16 billion worth of business annually. We are well known for covering natural catastrophes. We first made a name for ourselves back in 1906, when we paid out to cover claims caused by the San Francisco earthquake. More recently, hurricanes Katrina, Rita and Wilma, which hit the Gulf of Mexico in 2005, caused about $60 billion worth of damage, of which we paid out $16 billion. Closer to home, the floods in the UK last year resulted in damage costing about $5 billion, of which we paid about half a billion.

Terrorism is a speciality of ours, unfortunately. The tragic attacks on the World Trade Center in 2001 led to claims of about $40 billion and we have paid out $11 billion. We are also involved in space insurance, covering satellites, and nanotechnology which is a new risk area for us. We need to know a lot more about nanotechnology and the risks we are actually covering.

Recently we insured a wine-taster's nose for $7 million. The older generation might be interested to know that we insured Betty Grable's legs; the younger generation may be surprised that we insure Ugly Betty's teeth!

We have a very proud reputation for covering the marine and aviation transport sector. So it is quite an unusual business we are in, and because of that we have to call upon the expertise of a very broad spectrum. We need actuaries, engineers, climatologists, oceanographers, meteorologists, physicists, mathematicians – the list is endless.

Modelling

Modelling is one of the fundamental tools we use in the pricing of risk, and a key link with the scientific community. It is particularly important for risks such as natural catastrophes. We have developed computer models of our business that can classically simulate a multitude of variables, whether they be investment returns, inflation, losses from hurricane damage, or earthquakes in the US or Japan. It is very sophisticated modelling and is only possible because of the work of scientists and actuaries.

At the end of the day, we are only as good as our models, and research that improves these is invaluable to us. This has spawned a completely new industry – catastrophe modelling – employing people from a wide variety of disciplines, including earthquake experts and meteorologists.

As with most things, models are not perfect. I mentioned the 2005 hurricanes. At the time, no one thought that they would cause the type of devastation they did. I do not think anyone predicted that the levees would be breached. So to us these hurricanes demonstrated the inadequacies of a model. Data are sometimes inaccurate, users may not fully understand the model and, of course, sometimes the model is not updated to reflect changes in the environment.

We were being warned in 2005 and even earlier that there was an increased risk of hurricane activity, and we did not modify our models to take that into account, so we got it wrong.

Interestingly, in 2006 we were told that there were going to be 16 hurricanes so we took that into account, and there were none. That probably led to the record results that we were able to report that year!

Testing

We stress-test our market continually to see how it will respond to chains of accumulated exposure in very extreme cases. This is a very important part of our business. We run various disaster scenarios to see how our market might respond – for example, to a major hurricane sweeping offshore through oil rigs and then onshore into Houston. We might look at a Japanese earthquake causing $50 billion worth of damage, or a European windstorm leaving $30 billion worth of damage. These are very important models that we run to make sure that our market can perform when these extreme events occur.

Every year we carry out disaster scenarios in which we ask the Lloyd's market to consider the claims they might face if certain disasters might occur. For example, we may look at property values in Florida and what might happen if a hurricane hit the Miami area. For this scenario we have had to update our models continually and have been using a lot of scientific data. In 2005 we assumed that if a hurricane hit Miami it would incur a $70 billion dollar loss – that was the stress-test. In 2006, following hurricane Katrina and the work of atmospheric scientists, we had to update that model to $100 billion. In 2007-8, based on demographic research, we ran the model at $120 billion. The scientists who did the research probably did not realise that we were using it in the insurance markets to help us manage those risks more effectively.

Another example is flood risk. Initially, when we tried to understand the impact of the 2007 floods in the Gloucester region we struggled to obtain the right information. Through the Lighthill Risk Network we found a company called Info Terror who have a technique called LDAR (light detection and ranging) that they were able to use to build a flood map for us. Why did we want to do this? To ensure that all the claims we saw were valid – sometimes there is a slightly different angle to the work we do.

The failure of the models that we used for hurricanes Katrina, Rita and Wilma encouraged us to establish a new team, the emerging risks team, who are doing research into new risks that could affect the insurance market.

Nanotechnology is another area where we in the insurance market have to pick up the pieces when things go wrong – think of the asbestosis claims that we are now dealing with in the Lloyd's marketplace. So it is very important to us that research is carried out into the new risks posed by nanotechnology.

We also do a lot of work in the area of climate change, in close collaboration with UK scientists. We have teamed up with the Engineering and Physical Sciences Research Council (EPSRC) to sponsor two students who are looking at climate models and their relevance to the insurance industry.

Building on the theme of information-sharing, knowledge-sharing is key to us. It has been very important for us to work with the Lighthill Risk Network to encourage the speedy uptake of academic knowledge within the insurance market. This network is open to all in our industry and we are pleased that the Technology Strategy Board is starting to work with it.

Data policy

Despite this openness, we have concerns about data policy in the UK. In the US, we obtain hurricane data freely via the internet from the National Oceanic and Atmospheric Administration (NOAA). We use those data to calibrate our insurance models. That leads to better conversations between academia and the insurance industry and it leads to better models. In the UK, we pay for the data both as a taxpayer and as a corporation. This 'double-dipping' discourages interactions between the insurance sector and the scientific community. We need to work with the Met Office, the research councils and the Technology Strategy Board on data pricing.

So insurance is not just knocking on someone's door and selling a motor policy. The insurance sector is highly complex. We are totally dependent on input from many disciplines, but especially from scientists and mathematicians. We need to work in partnership with the scientific community to better understand the risks we face, both now and in the future. ❐

The Technology Strategy Board formally published its three year strategic plan on 8 May 2008, setting out how it aims to make the UK a global leader in innovation.

Connect and Catalyse

Entitled *Connect and Catalyse*, the strategy outlines how the Technology Strategy Board will promote and invest in technology-enabled innovation for the benefit of business, to increase sustainable economic growth and to improve quality of life.

Working with the research councils, regional development agencies and devolved assemblies, the Board will invest more than £1 billion over the coming three years – using its proven ability to obtain matching private sector funding to double this to at least £2 billion.

At the formal launch of the strategy, Chief Executive Iain Gray summarised the Board's role as: "ensuring that the UK is in the forefront of technology-enabled innovation."

Main themes

Iain Gray explained that the Technology Strategy Board will, over the next three years, invest according to three main themes:

- innovation in response to societal and economic challenges;
- innovation inspired by existing and emerging technology, where the UK leads or could lead;
- encouraging an "innovation climate", or the culture in which innovation can grow.

Areas of activity

Turning to specific areas of activity, the Technology Strategy Board will:

- increase its focus on challenge-led innovation and will help business find opportunities in societal challenges such as climate change and the ageing population;
- double the number of Innovation Platforms (from five to 10), which take a cross-cutting approach to these societal challenges;
- develop strategies in key market application areas;
- develop and implement a strategy to promote the rapid commercialisation of emerging technologies and industries;
- double the number of Knowledge Transfer Partnerships, and increase their flexibility;
- carry out a strategic review of Knowledge Transfer Networks, and reinforce and extend their role;
- pilot a reformed Small Business Research Initiative (SBRI);
- work to maximise the positive impact of government procurement on innovation.

Iain Gray also emphasised that the Technology Strategy Board had listened carefully to business and to partner organisations before drawing up its strategic plan, and he made clear that the organisation will:

- ensure that the support provided is flexible and meets the needs of business;
- simplify and streamline delivery of programmes;
- invest in some areas with a higher level of risk, as part of a balanced portfolio;
- evaluate investments to keep them effective.

Three main themes

Challenge-led innovation

The Technology Strategy Board believes that major societal challenges – such as climate change and an ageing population – can be used to stimulate responses that both enhance the quality of life and increase wealth.

The principal way in which the Board will support challenge-led innovation is through Innovation Platforms. Targeting one of today's challenges, each platform brings businesses together with relevant academic and research organisations, and with the government departments that control policy, regulation and procurement. Working together, they research, develop and deliver innovative technological solutions.

There are currently five Innovation Platforms:

- *Assisted Living*: developing technology to enable people who suffer from chronic long term conditions to live independently;
- *Low Carbon Vehicles*: responding to the growing demand for lower carbon vehicles;
- *Intelligent Transport Systems and Services*: overcoming issues associated with travel and traffic related issues;
- *Low Impact Buildings*, responding to the Government's targets for improving sustainability, including for all new homes to be zero carbon by 2016, and new non-domestic buildings by 2019;
- *Network Security*: concerned with the confidentiality, integrity and availability of network communications infrastructure.

Over the next three years five more Innovation Platforms will be introduced, in areas which address other major societal challenges.

Technology-inspired innovation

It is vital that the UK maintains core expertise in leading edge technologies to underpin sustainable business growth, and maintains a pipeline of new advances, to keep UK businesses at the leading edge. So the Board will invest in innovative research and development in areas where the UK is strong, and in the next generation of technologies and industries. The following have been identified as key technology areas:

- Advanced materials;
- Biosciences;
- Electronics, photonics and electrical systems;
- Nanotechnology;
- High value manufacturing;
- Information and communication technology.

The innovation climate

To accelerate innovation, the UK needs a culture that enables, attracts, retains, celebrates and rewards talent and innovation – a welcoming innovation climate. The Board will invest in networks and knowledge exchange. Two key investment areas will be:

- Knowledge Transfer Networks, which are national networks in a specific technology or business application, bringing together people from businesses, universities, research, finance and technology organisations to stimulate innovation through knowledge exchange. There are currently 24 KTNs, with a total membership of over 30,000;
- Knowledge Transfer Partnerships, which place high-calibre, recently-qualified individuals into a business to work on innovation projects. KTPs deliver real benefits for the business, increase business interaction with the university and provide excellent experience for the graduate. There are currently 1000 KTP placements and this figure will be doubled by 2011.

In conclusion, the Technology Strategy Board's strategic plan states that innovation and the application of technology are vital for the UK – both for our economy and to address social and environmental challenges. To innovate, businesses need inspiration, investment and breakthrough thinking. They need to join forces with experts and business partners. And they need to operate in an environment that is open to new ideas and which supports them.

This is the mission of the Technology Strategy Board over the coming years. ❐

www.innovateuk.org

Carbon trading is presented as a key weapon in fighting climate change. But how effective is it really? A dinner/discussion on 2 April 2008 considered the issue.

Can carbon trading help meet carbon emissions targets?

Bob Watson

The UK Government perspective on carbon trading is almost identical to that of the World Bank and very similar to the views outlined by the Intergovernmental Panel on Climate Change (IPCC) in its Fourth Assessment Report.

Carbon trading is essential if we are to adopt a cost-effective transition to a low carbon economy. However, we need to exploit and strengthen *all* the Kyoto mechanisms. These also have to be consistent with national priorities in developing countries and with sustainable development. They represent an opportunity to increase financial flows significantly and are a potential vehicle for the transfer of clean technologies.

It is also clear that the formal markets being established could and should be complemented by a voluntary market but one with strict criteria and standards. The challenge to the private sector is to devise a system as foolproof as the one we are trying to develop under the Kyoto Protocol. It needs to be self-regulating but with independent verification and certification. A voluntary market can do things that are not allowed under the Kyoto Protocol, such as addressing avoided deforestation.

The Clean Development Mechanism

The financing model for the Clean Development Mechanism (CDM) is important, but needs to be redesigned. One of the weaknesses is that payments for reducing carbon emissions are only made after validation and independent certification. There is no 'front-end' financing and this imposes a limitation on the scale and type of project.

From a Defra point of view, the post-2012 carbon market needs to be strengthened. It needs to be based on capped emissions and to link different trading systems. At the moment the European trading system is not adequately linked to the UNFCCC structure.

The market will not work on its own. We need complementary and supplementary policies and financing for future technologies. We need to find a way to bring in those technologies that are pre-commercial today – carbon capture and storage, future generation biofuels, electric vehicles, etc. While we have many technologies today that can be used as a *transition* towards a low-carbon economy, it is clear that we need to invest aggressively, both in the public and private sector, in R&D for our low-carbon future.

Professor Bob Watson is Chief Scientific Adviser at the Department for Environment, Food and Rural Affairs (Defra). He is also Chair of Environmental Sciences at the University of East Anglia, Director for Strategic Development for the Tyndall Centre and Director of the International Assessment of Agricultural Science & Technology for Development (IAASTD).

We must have a policy environment which ensures that the carbon price stimulates the transition to a low-carbon economy. This must be a long-term, global, equitable, regulatory framework with intermediate targets. It clearly cannot just be 'Kyoto plus five years': that would not send the right signal to the market. The European trading system will have to be consistent with, and embedded within, a global framework. In the next few years, while the shape of the post-Kyoto world is being decided, the World Bank's Clean Energy investment framework – which addresses access to energy in developing countries – could play a very important role.

The market has to be much broader, with the participation of most countries – and certainly all major emitters. While we need much tougher targets for developed countries, developing countries need to be brought in gradually. We need a long-term global framework, predicated over 30 to 50 years, but we need intermediate targets as well. Without that 'long market' we will never have a robust carbon system nor the right investments.

It needs to involve all sectors, such as aviation and maritime, but within a truly international framework. Avoided deforestation is also important – one of the weaknesses of the Kyoto Protocol was its treatment of land-use, land-use change and forestry (LULUCF). I also thought it was a complete mistake not to bring in avoided deforestation. We have to deal with issues about baselines, leakage, permanence – all, in my opinion, quite manageable. It may not be possible to address avoided deforestation at a project level, though; baselines may have to be determined at national level, in order to minimise the problem of leakage.

Managing change

We have to manage change in a way that does not disrupt the existing carbon market, maintaining and developing it while protecting the current investment stream. Do we have the right instruments? We should move away from project-based offsetting. We have to look at complete sectors within a country – the whole energy system, the whole transportation sector.

The CDM is a good idea but it needs to evolve and there are some real challenges. To what degree are CDM projects truly additional to 'business as usual'? Are the baselines correct? Is the CDM Supervisory Board effective? Is it efficient? Are we happy with the pace of progress? Are we happy with the quality of implementation? I think there is significant room for improvement.

The UK, as well as the EU, wants to strengthen the Board's structures and we want more transparency in the decision-making process. The current Board has been reluctant to deliver consistent and comprehensive standards and guidelines, and with the growing number of projects we will need a much more strategic approach and a very different way of reviewing projects.

In summary, carbon trading is absolutely essential to tackling climate change. It is cost-effective, it is a way of stimulating investment from the private sector, but in order to have a robust carbon market, there are a number of essential components. These include: a long-term regulatory framework, intermediate targets, all major emitters have to be party to it and it has to become much more programmatic and sectoral. In addition, the CDM Supervisory Board has to become much more effective. ❐

The operation of the European Union Emissions Trading Scheme

Michael Grubb

The term 'emissions trading' can be used in two distinct ways. Economists use it to mean more precisely 'emissions cap-and-trade', an internally coherent system. More generally, it refers to 'offsets': this involves investments in projects elsewhere, estimating emissions reductions from them and generating credits from comparisons with what might have happened otherwise. My focus here is on the cap-and-trade dimension and particularly the European Emissions Trading Scheme.

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Emissions trading

Why has this emerged as the economic instrument of choice? In emissions trading, a limit is set on the total allowed emissions in a given period; this is allocated between participating companies and the allowances freely traded. In other words, the scheme imposes a direct cap on aggregate emissions. Companies have the freedom to seek out the cheapest way to cut emissions. If it is more expensive to cut emissions then the aim is to find someone who can cut back by more and is willing to sell some of their surplus. From the devolved trading market a price of carbon emerges. Now as governments do not know as much as they would like about the cost of cutting emissions, they can set up a cap-and-trade system and find out.

Economists like the idea of carbon trading, but they also like the idea of a carbon tax. While a carbon tax is equally good at setting a price in theory, in practice it also extracts a huge amount of money from industry and transfers it to Government. That tends to generate a degree of political opposition. Emissions trading gives an additional degree of freedom in terms of the allocation of free allowances – at least at the beginning – which can help overcome the political hurdles in getting a serious economic incentive in place. Moreover, in terms of a political economy, far from extracting money from industry you have created an allowance which becomes an asset on their balance books and thereby on paper adds to the value of the companies participating.

The EU Scheme

The Emissions Trading Scheme (ETS) covers all 27 EU countries, all emissions from electricity, ferrous metals, cement refineries - half a dozen energy-intensive industrial sectors in all, and a 'catch-all' in terms of large combustion facilities above 20MW. In total that means it sets an absolute cap on about 45 per cent of EU emissions. Aviation will be included from 2012.

At the beginning, the market was designed at a European level but member states retained power over the allocation of these valuable allowances in National Allocation Plans. Each state decided who gets these allowances in the first place, but you then have a free European trading market.

The price of carbon did not start at zero: there was already some futures trading (Figure 1). For the first six months of the scheme everyone watched with an element of disbelief as the price rose higher and higher. Rising gas prices meant that the mitigation option of switching away from coal power to gas power generation actually became more and more expensive – so the price of allowances had to follow it. This link was broken as gas prices continued to soar in 2005, the carbon price then remained relatively steady for about a year and subsequently collapsed. In the spring of 2006, when verification reports were finally delivered and published, it transpired that quite a few companies had been keeping surplus allowances from 2005 in the expectation that everyone else was short of allowances. Unfortunately for them most other companies were in the same position and the system was actually in surplus. Phase One of the ETS simply had more allowances than emissions, so they were worthless and the price reflected that.

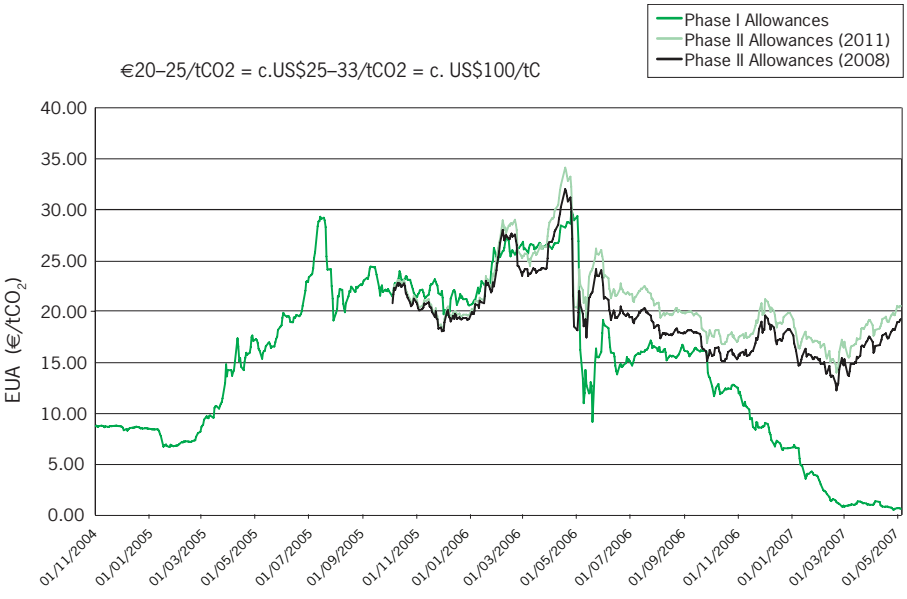

Figure 1. Actual carbon prices for Phase One of the ETS and forward prices for Phase Two (in 2008 and 2011).

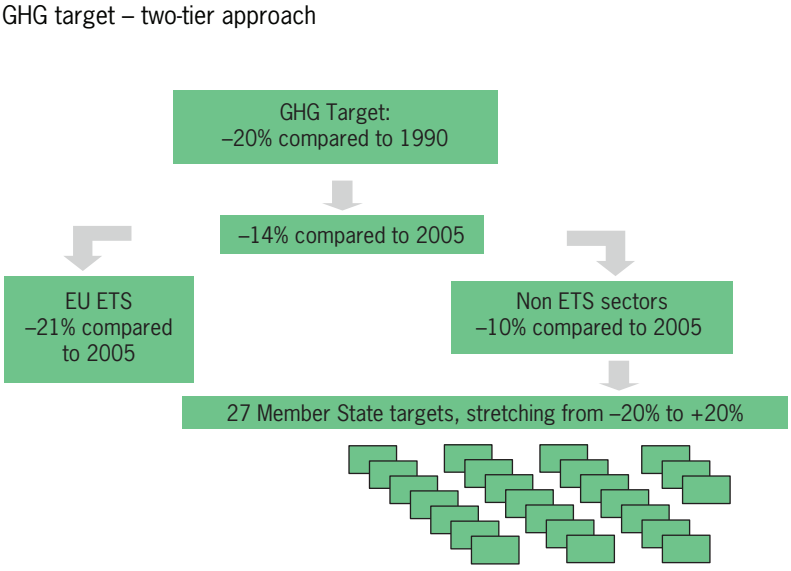

Figure 2. Achieving the emissions reduction target in Phase Two.

There are a few lessons here. The conclusions from Phase One are not all bad. There was a credible EU-wide market and market mechanics worked fairly well. The price drop was an extremely effective and efficient market response to the realisation that there were too many allowances around.

Disputes continue over the exact reason for the surplus in 2005: it could be that too many allowances were allocated or it could be that industry cut emissions by much more than expected (after the initial shock there was a strong reaction from business saying 'Why is everybody complaining? We are more successful in cutting emissions than you expected. What was wrong with that?'). Analytically it is hard to disentangle. Most of the studies suggest that Phase One cut between 50 and 100 million tonnes of carbon, which represented (very roughly) 25 to 75 per cent of the resulting surplus, the rest being genuine over-allocation.

Phase Two

The UK was one of the very few countries whose original proposal for Phase Two allocations survived scathing intervention by the European Commission. The discussions over this phase were taking place at the same time as the Phase One market was collapsing. Most Western European countries had to cut back below 2005 levels to reach their Kyoto targets. Spain, for example, proposed quite a severe cutback in its emissions, roughly consistent with what was needed to meet its Kyoto target, and the European Commission said 'That's fair enough. That was the deal.' A number of other countries were told that their allocation plans were too weak and did not represent a reasonable interpretation of the rules.

The final outcome of this political battle was, very roughly, that the Phase Two allocation was a little more than 5 per cent below 2005 verified emission levels in those sectors whereas projections suggested an increase of between 5 and 10 per cent without intervention. This a significant cut; potentially around about 1 billion tonnes of carbon dioxide over the five year period. Reflecting that, carbon prices for Phase Two are in the region of €20-25 per tonne.

The whole process has resulted in a remarkable centralisation of powers at European level. Governments have proved incapable of the collective action required, so the European Commission has stepped in.

Post-2012

The European Council agreed in Spring 2007 to set targets in nice simple numbers - 20, 20, 20 by 2020. A 20 per cent cut in greenhouse gas emissions below 1990 levels, a 20 per cent improvement in energy efficiency and 20 per cent of final energy consumption to come from renewables – it is actually quite a package. The ministers then handed the problem back to the European Commission saying, in effect, 'These are the targets, tell us how to deliver them.' The Commission's January proposals included the Phase Three design of the ETS, national CO_2 targets for the rest of the economy and a renewables directive that hands obligations to member states, again with an element of trading flexibility.

The proposals on the Emissions Trading Scheme are based on a thorough review of the system. A number of sectors have been added. For example, 'ferrous' has been deleted from the metals category so that aluminium and copper and so forth can be included. The chemical industry is the big addition, though. The chemical industry lobbied furiously (and in the initial phases successfully) against being included. In Phase Three, though, those parts of this sector which the Commission considered appropriate have been included. Yet while there is significant expansion, the system is approaching its limits. It is basically a system designed for big industrial emissions sources. It will continue to cover maybe 45 per cent of European emissions. Other instruments have to be brought to bear for the rest.

Harmonised allocations

National allocation plans will become history. A strong shift to auctioning is expected and the European Commission has proposed that there should be no free allocations to the power sector. The right to auction these allowances remain with member states but with some degree of internal European distribution. In terms of the carbon targets, the overall target is for a 14 per cent reduction, but the EC now have proposed a 21 per cent cut by 2020 relative to 2005.

Phase Three covers an eight year period and sets a trend-line saying in effect: 'Expect these reductions to continue at the same pace, although we will review this in 2025'. It therefore sends a signal to business that we are on a long term path to decarbonisation.

I want to emphasise that this is an evolutionary approach. It is not possible to get everything right at the beginning. So we have had a first phase, learned from it and built in the capacity to evolve and improve. This capacity to evolve is essential. ❐

discussion

All major players need to be involved.

Present targets are achievable only if the United States can be brought into the process, together with other countries as India, Japan and China. It was noted that some scientists already believe that the existing targets are too modest. European leadership will be important to success. Global agreements on energy and carbon caps are also essential. There have to be long term incentives which encourage innovation and investment.

What future for the CDM?

Marc Stuart

The Clean Development Mechanism (CDM) is a radical experiment, something never tried before. It links technology, markets and capital to make greenhouse gas emission cuts. In effect, it is the economics of past technologies subsidising the economics of future technologies.

I am a practitioner: my company does not approach this subject from an academic or analytic perspective, but from the perspective of making money. Therefore the actual operation of the system is vital to us. So let us look at the positives: we have a complex system up and running. We have almost a thousand projects around the world already registered and over 3,000 reportedly in the pipeline with around 2.5 billion tonnes of CO_2 reductions among them.

Marc Stuart co-founded EcoSecurities in 1997 and has 15 years experience of international carbon markets. Marc is Director of New Business Development and also leads the firm's Government and Regulatory Affairs Group. He sits on the Board of the International Emissions Trading Associations (IETA). Outside the compliance carbon market, he is on the Board of the Voluntary Carbon Standard Association. He was one of the founders of the US based Coalition for Emission Reduction Projects.

Problems

On the negative side, the successes are extraordinarily concentrated. Of 950 registered projects by late March 2008, just 16 had produced 75 per cent of the credits issued so far. HFC and N_2O projects dominate this market. It is very difficult for small projects and small developers to access the system. A 10,000 tonne per year project is almost as administratively complex as one for 500,000 tonnes. This is ludicrous and completely unfair: it has to be fixed.

On many projects, the criteria are extraordinarily opaque and unpredictable. Two projects with exactly the same system, exactly the same rationale, were put forward and one got through while the other did not. It was absurd. There has to be predictability in order to stimulate investment.

The delay in linking the CDM with the EU trading system is potentially a nightmare, because it impacts the cashflows of all these projects and of the intermediaries that have used the capital markets to create emissions reductions. It should be very simple little thing and we were promised that it would not be a problem. But it has become one, though if the target of the end of 2008 is met, it should be all right in the end.

We do not have any certainty post-2012, so any emission reduction projects that begin now may only receive credits for three or four years according to many bankers' perceptions.

Lastly, there is the macro-policy environment. Despite the successes, the EU is proposing extraordinary limitations on the use of CDM post 2012. In California we are seeing what might be called 'carbon-protectionism', with virtually no outside credits coming into California. Most proposed US legislation is devoid of linkages to the international system, though we expect that to shift over the coming months as the scale of the challenge come better into focus.

Stable policy needed

Given these successes and these policy responses, we are bewildered! Billions of dollars have been invested in these projects on the assumption of stable policy. But if we do not have the policy issues resolved reasonably soon, the financial markets will simply shut down. We have to find a way to reward innovation and determination.

So why the very negative interpretations of the CDM? When I go to Capitol Hill in Washington and talk to senators I am told that the CDM is merely a subsidy for China. Now China accounts for almost half of the developing world's emissions. So to expect to have an emissions trading system based on project mechanisms and not include China is just unrealistic.

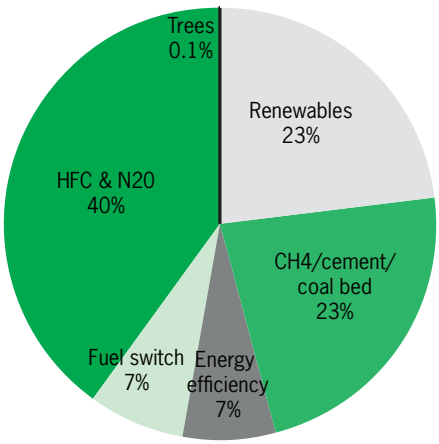

Figure 1. Expected 2012 Certified Emissions Reductions (CER) from the CDM.

As I mentioned, 16 projects have provided 75 per cent of the emission reductions under the CDM and this proves that markets work. Today, there is barely an HFC byproduct being emitted in the developing world – and that is due to this market. There is far less N_2O being emitted, again due to the emissions markets.

There are issues with the so-called 'voluntary market' – with websites that proclaim 'send me $100 and I'll plant five trees in Costa Rica to make you carbon neutral' – but we should not tar the compliance markets with the same brush as the voluntary markets which are virtually unregulated. First of all, in terms of volume and value, the voluntary market is probably less than one-twentieth of the size of the compliance market. Secondly, now that this area is growing rapidly, industry is making strong efforts to ensure quality through initiatives such as the Voluntary Carbon Standard – on whose Board I sit.

Additionality

Additionality – the stipulation that any savings from these projects would not have been achieved through 'business as usual' – is the most challenging aspect of our business. To change the world's carbon economy we have to scale up renewables and energy efficiency massively: not just the technology, but also the delivery systems. For that we have to obtain real value for the fact that these assets are not emitting carbon. So I can support the idea of top-down baselines, set by policymakers, instead of bottom up baselines created by project developers. If somebody was willing to say to me 'for every wind project that you put into China, I'll give you half a tonne of carbon allowances' (for example) I can work with that because I can count on those credits for the financing model from the very outset. Right now, because of the unpredictability of the system, I cannot move capital remotely efficiently into the many asset types which we all know are good for the global emissions profile.

Timelines are also important. We need long-term commitment: give me 20 years' guaranteed carbon price and this tool will help change the world! If we can bank 20 years of carbon value, I am not too worried about the issue of upfront financing. As long as I have certainty about the future, I can find finance – people do not provide up-front financing for a gold mine, do they? The problem is that my commodity is short-lived – at present just until 2012. Power plants are not financed on four years of electricity sales, but on 20 years. So why should this be different? ❐

Scrutinising policy

The two Parliamentary select committees charged with examining Government policy on science-related issues have considered a number of subjects of keen interest to the scientific community in this Parliamentary session.

The House of Commons

www.parliament.uk/parliamentary_committees/ius.cfm

The Committee set up to examine the policies advanced by the Department for Innovation, Universities and Skills (DIUS) scored an early victory for science when, as a result of lobbying from members (and others) and following the last report from its predecessor, the Science and Technology Select Committee, the Government agreed to include science in its title – as well as just its remit. This also gives it the ability to examine science as it affects policy-making across Government, and not just the Department it technically 'shadows'. This was a key concern when the creation of DIUS caused the change in the Select Committees.

One of the Government decisions following the creation of the new Department – and one which has generated some degree of controversy – was the allocation of the Science Budget. The Committee's Report on Science Budget Allocations concluded: "We welcome the Government's decision to maintain its commitment to increase the science budget by 2.5% per annum in real terms; but the first Science Budget Allocations of the new Department for Innovation, Universities and Skills has been marred by a few poor decisions, which have turned the Government's PR fanfare into a PR disaster."

It continued: "We are concerned that the Government has failed to protect the existing and planned research base, and we have reservations about the influence Government appears to have on the use of the budget and the extent to which the Haldane Principle [that allocations should be made by the science community via the funding councils] has been upheld. Regarding the Science and Technology Facilities Council (STFC), we conclude that its formation was untimely and poorly conceived. First, the Government's expectation that STFC, having been formed in April 2007, would be ready for the 2007 CSR was overly ambitious. Second, in merging two Research Councils, one research community has been saddled with the debt of another, despite assurances from the Government that STFC would be formed without any legacy issues."

The new funding council was not spared criticism either: "In STFC itself, we found weaknesses in its peer review system, its communications and its management," said the report in April.

The Government response, published in June, stated that: "The Government is working with STFC to review the way in which this allocation was handled and to ensure all the relevant lessons are learnt for the future. In particular, STFC have recognised that it could have communicated its plans better, and is taking steps to address this. STFC will take account of these lessons as it takes forward an organisational review."

The Government's response to the former Science and Technology Committee's report *Investigating the Oceans*, was published in May. The original report was the subject of a dinner/discussion at the Foundation in November 2007 and was a major review of the policy surrounding the development of a new Marine Bill. However, one of the Committee's key recommendations, the setting up of a marine agency with executive powers to replace the current Inter-Agency Committee for Marine Science and Technology, was rejected by the Government in favour of a new Marine Science Coordination Committee "which will bring together the principal public investors in marine science to tackle cross-Departmental issues identified in the [Select Committee] report."

A report on renewable energy generation technologies was published in January. The Committee noted: "the European Commission proposed national renewable energy targets for each Member State. It was suggested that 15 per cent of UK energy be derived from renewables by 2020. In order to meet the EU Mandated Target of 15 per cent renewable energies by 2020, it will be necessary to generate approximately 35-40 per cent of electricity from renewable sources. This represents a considerable challenge, and one for which the Government's targets for renewable electricity generation are wholly inadequate." Indeed the Committee found that "throughout this inquiry, however, we have been consistently disappointed by the lack of urgency expressed by the Government – and at times by the electricity industry – in relation to the challenge ahead."

Other reports included one into the proposed UK Centre for Medical Research and Innovation, the work and operation of the Copyright Tribunal, and an investigation into biosecurity in UK research laboratories.

The House of Lords

www.parliament.uk/parliamentary_committees/lords_s_t_select.cfm

The House of Lords Science and Technology Committee published its follow-up report on Personal Internet Security on 8 July, calling on the Government to do more to protect the public from e-crime.

The follow-up report renews the Committee's calls, made initially in its report last year, for:

- Legislation to establish the principle that banks be held responsible for losses incurred by electronic fraud;
- Procedures to be reviewed to allow the public to report e-crime direct to the police rather than having to go through their bank;
- A data security breach notification law to be introduced.

Lord Sutherland of Houndwood, Chairman of the Lords Science and Technology Committee, said: "We are pleased that the Government has taken on board more of the recommendations in our report than they did in their initial response. The catastrophic loss of data by HMRC in November 2007 seems to have concentrated minds on the importance of data protection both by Government and the private sector."

The Committee also published a follow up report in December to its earlier investigation on *Air Travel and Health*. Returning to the subject it initially reported on in 2000, the Committee argued that the Government was wrong to tax 'premium economy' services on long haul flights at the same £80 rate as first class travel rather than the standard £40 charge. It pointed out that premium economy was intended to represent a small extra charge to guarantee extra leg room for those who required it. The Committee felt that an extra tax on those who may have a medical need for extra leg room was unfair.

The Committee also called on the Civil Aviation Authority to implement the recommendation of their own research and increase the regulatory minimum distance between seats on commercial aircraft from 26 inches to at least 28.2 inches. This is equivalent to a seat pitch of around 30 inches depending on the type of seat. ❐

The Foundation is grateful to the following companies, departments, research bodies and charities for their support for the dinner/discussion programme.

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