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sustainable approach



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Strengthen role of scientific advisers says Committee

The Science and Technology Committee is calling for a strengthening of the role of Government Scientific Advisers (GSAs) so that Government can be sure of getting the best scientific advice possible when making policy.

In its report *Scientific Advice, Risk and Evidence Based Policy Making*, the Committee welcomes the steps that the current Chief GSA Sir David King has taken to secure the establishment of GSAs in most departments and the commitment from Government to improve the risk advice the public receives.

However, the Committee says that more still needs to be done to ensure the level of scientific support required to consistently provide evidence based policy. Where that evidence base is not available, then that should be made clear.

The Committee recommends that the role of Government Chief Scientific Adviser be split from that of Head of the Office of Science and Innovation, and would like to see the incumbent based in the Cabinet Office. The position of the GCSA should be further strengthened by giving him a seat on the board of the Treasury.

The Committee also recommends that all future departmental Chief Scientific Advisers be external appointments of individuals who have occupied senior positions in their scientific communities and command the respect of their peers.

A Government Scientific Service should also be set up to guarantee a high level of scientific expertise within the civil service. Specialist skills should not be seen as a hindrance to promotion within the civil service. The misconception that scientists in the civil service should be "on tap, not on top" must be laid to rest once and for all, says the report.

The MPs want horizon scanning to be a fundamental part of the policy making process and they say a change of attitude is needed so that changing policy in the light of evidence should be regarded as a strength rather than a weakness. □

www.parliament.uk/parliamentary_committees/science_and_technology_committee/scitech081106.cfm

See also the summary of the discussion on *Scientific Advice, Risk and Evidence Based Policy Making on the Foundation's website*

Government 'not listening' to independent advice on flu

The Government is not making best use of independent scientific advice when making critical decisions, such as stockpiling antiviral drugs in preparation for an influenza pandemic, warns a report by the Royal Society and the Academy of Medical Sciences, published on 20 November.

Sir John Skehel, chair of the report's working group, said: "We are concerned that decisions are being made, as the UK prepares for a possible pandemic, that fail to take account of expert advice. For example, the decision to continue to stockpile just one antiviral drug is a major concern. This needs to be reconsidered. New evidence that H5N1 can develop resistance to Tamiflu indicates that a combination of antivirals should be stockpiled by the UK for the most effective management of a pandemic."

"The Government was right to order Tamiflu in early 2005. However, we are concerned that it is not updating its plans as the landscape of what we know about influenza changes."

The report recommends the appointment of a leading influenza specialist as a high-level independent adviser to government. This individual would feed the latest scientific information from academic researchers, industry and government departments into the ministerial committee which is responsible for preparing for a pandemic.

Sir John said: "This specialist would sit alongside the Government's Chief Medical Officer and Chief Scientific Adviser to

complement their roles and contribute relevant expertise. We hope that this could be a model for how the UK responds to other future emergencies."

The report also calls on the Department of Health to bring together academic researchers and those in pharmaceutical companies to develop and improve vaccines which will be a fundamental measure to control the scale of an influenza pandemic.

The report highlights that it would not be possible to manufacture enough influenza vaccines globally in a pandemic. However, limited vaccine supplies can go further if combined with compounds known as 'adjuvants' which increase the effectiveness of a vaccine. Improving vaccine performance with these compounds will help overcome the challenges of producing sufficient H5N1 vaccine against the particular virus that may hit the UK. □

www.royalsoc.ac.uk/displaypagedoc.asp?id=22825

The large facilities council

The Office of Science and Innovation has confirmed that the new large facilities council will be called the Science and Technology Facilities Council. The new name reflects the broad nature of the new Council's responsibilities, says the Government, which encompass a wide range of science and technology activities.

The Council will bring together the work of the Particle Physics and Astronomy Research Council (PPARC), the Council of the Central Laboratory of the Research Councils (CCLRC) and the nuclear physics work of the Engineering and Physical Sciences Research Council (EPSRC). It will have a budget of around £530 million per annum and employ more than 2,000 staff.

The decision on the name addresses concerns, raised by some respondents to the consultation which ended last June, that the name 'large facilities council' did not refer directly to the scientific remit of the new Council. Respondents felt that this could make it more difficult for stakeholders, both in the United Kingdom and internationally, to recognise immediately the role of the Council.

Professor Keith Mason has been appointed Chief Executive designate and Professor John Wood is to be Director, International Affairs designate. □

Physics department closures continue

Reading University became the latest university to announce the closure of its Physics department after a meeting of the university council on 20 November. The department will close in 2010. The vote was 18 for closure and five against with one abstention.

The Higher Education Funding Council for England (HEFCE) had agreed additional short term funding (£75 million over three years) to support science teaching. But the vice-chancellor of Reading, Professor Gordon Marshall, argued that this was not nearly enough. "This University's share of the new money, as best we can determine in consultation with HEFCE, will be in the order of £180,000. Against the background of a recurrent loss in the order of £500,000-£600,000, and the requirement to recruit a research team of three new posts with on-costs and equipment (a further £250,000-£300,000), I do not see that the modest share of new money that would come to the Reading Department changes the funding landscape significantly," he concluded.

See also the summary of the discussion on *Science Education on the Foundation website*.

A summary of Sir Nicholas Stern's presentation to the Foundation for Science and Technology, and responses to it, will be published in the next edition of FST Journal. It can also be found on the Foundation website at: www.foundation.org.uk.

Water shortages and the threat of drought are often in the news. So how should water supply be effectively managed in the UK? The Foundation's meeting on 6 June 2006 examined the issues.

The Lords report on water management

John Selborne



The Earl of Selborne KBE FRS was Chairman of the House of Lords Select Committee Inquiry into Water Management. He has farmed 1,000 hectares in Hampshire for many years and has chaired a wide range of Select Committees and other bodies, including the Royal Botanic Gardens at Kew and the Royal Geographical Society. He is a Fellow of The Royal Society and is chairman of the Society's Science and Society committee. He was recently elected Chairman of the Foundation for Science and Technology.

The problem with water management in a small country like the UK is that the issues vary regionally. There will never be a national solution, yet governments think in national terms. The public, however, lack confidence in the forward planning being made for water. They believe that there is a lack of transparency in the process and resent the suggestion that they have a part to play in managing water conservation. Chronic under-investment in capital expenditure before privatisation led to a demoralised sector and by the 1980s investment had fallen to a third of its level, in real terms, just a decade earlier. Privatisation in 1989 enabled the industry to fund service and environmental improvements on a previously impossible scale. As a result, the level of indebtedness of the companies increased and is still increasing rapidly – and water bills have risen faster than inflation. In the media, the fact that water companies report increased profits is presented as reprehensible, but if you ask people to put more money into the business (either in equity or as a loan) they are right to expect a return.

A negative consequence of privatisation was that it exacerbated the lack of public engagement and the regulator recognised that the pricing mechanism would have to be revisited every five years in order to meet some of the concerns arising from privatisation. The regulatory framework now comprises Ofwat (the Water Services Regulatory Authority), the Environment Agency and the Drinking Water Inspectorate. Since October 2005, consumer interests in England and Wales have been represented by the Consumer Council for Water (a non-departmental public body, independent of the regulators). In the Select Committee report we welcomed this development because we felt the only way to get consumers engaged was to ensure that they had a role to play.

The European Union Water Framework Directive, adopted in 2000, must be implemented by 2010. We welcome the concept because it introduces a more integrated system of water management based on river basins (the

natural hydrological unit) rather than on administrative boundaries. The directive requires basin management plans to be produced by 2009 for each river basin district. Much discussion is required as to what is meant by good ecological status for water and if the Environment Agency does not resolve that quickly those first targets will not be met.

The Environment Agency published proposals for liaison panels based on each river basin district. We have adopted a similar approach in recommending that long-term integrated water management plans be drawn up by regional boards – one for each of the nine river basin districts – with each having representatives from Ofwat, the Environment Agency and the Consumer Council for Water.

Long-term involvement from consumers is also important if they are to share in the ownership of these problems. In addition, Ofwat and the Environment Agency, which approach issues from different directions in regulatory terms, could understand each other's points of view better if they were involved together in determining the balance between resource development and demand management – the twin track approach.

Unsurprisingly, a great deal of publicity has centred on leakage. Some companies have done well in reducing this and, overall, leakage has declined. But leakage levels of 25 per cent or more are clearly a matter of grave concern. The concept of an economic level of leakage (put by some at 24 per cent), is something that the public cannot be expected to understand or to have much patience for. What would replace an economic level of leakage? In a water-stress area it would be reasonable to expect leakage levels to be lower. Companies must take into account the social and environmental issues as well as economic considerations. We would like to see the regional boards having an input from a wider section of the interested stakeholders.

We have drawn attention to the payment of bills. Some people simply cannot pay. According to the Consumer Council for Water, the South West water and sewage bills represent up to 7 per cent of disposable income for a single pensioner.

There is help under the Vulnerable Groups regulation but these have tightly drawn criteria, and only 9,000 households qualify – an absurdly low figure. In Northern Ireland conditions are different and the Government guarantees that those on low incomes pay no more than 3 per cent of their income. But until there is a generally accessible, cheap and simple scheme to compensate those in the vulnerable group, we will have difficulty achieving the level of investment, and therefore the costs, which are realistic for the problems in hand.

Then there are those who can pay but will not. The total outstanding revenue for 2004-5 was £962 million, an increase of £38 million over the previous year. According to South East Water, two thirds of those who owed the company money had a credit rating of over 400, so they were not in any financial difficulty. Their non-payment added £10 to every other customer's bill. In Melbourne, Australia, they use flow restrictions to reduce the water supply to non-paying households to a level sufficient only for basic health and safety needs. These can be installed in non-metered as well as metered properties. In Australia the water companies have no bad debt problem. This approach should be seriously considered in this country.

The Government's Sustainable

Communities Plan seeks to address the shortfall in housing supply in England. The demand for new housing stock tends to be in the South East, the driest region of the country. We would have expected the water companies to have been consulted at an early stage of the planning process, but Thames Water told us that initially there had been very little consultation with the industry. Regional planning bodies are now responsible for preparing regional strategies, and communication between the stakeholders is much improved. It appears that the consultation process is taking place now, but it is a matter of concern that the Government's belated attempts to consider the impact of increased housing growth on water use have taken so long. In addition, we found that the methodology used by the Government to calculate the increased water consumption was flawed, and we were unconvinced by the figures produced.

In most of Continental Europe metering is universal, but in England and Wales only 28 per cent of domestic households are metered. Metering is expensive to install but has advantages, particularly in water-stressed areas. It allows tariff management, where some water is available at a low unit price and extra water is supplied at progressively higher rates. Universal metering is not necessary, but it should be made easier for water companies in water-

stressed areas to obtain water scarcity status, with the option of imposing compulsory metering if necessary.

There are ways in which houses can be made more water-efficient, but house buyers show little interest in this. Accepting a continued lack of interest from the consumer, we should consider introducing incentives – such as reduced stamp duty or council tax for properties meeting high water conservation standards.

Finally, the Select Committee took the view that a national grid for water is unrealistic, but there will be opportunities for regional grids. Increasing infrastructure requires more reservoirs. Desalination has been rejected because of the energy requirements, but desalination plants powered by renewable energy might become a realistic proposition. We referred to the importance of some form of treatment for storm water discharges; for example, why do we need potable water to clean cars? We have a very poor record compared to countries like Australia where we saw excellent water systems for preventing storm water from mixing with sewage and instead being used for irrigation in parks. There are, however, some excellent pilot schemes in the UK which simply need to be rolled out nationally. We must all take this subject more seriously. □

Water management and the environment

David King



Dr David King is Director of Water Management for the Environment Agency and is responsible for the water management functions of flood defence, water resources, fisheries, conservation, recreation and navigation. Prior to his appointment, Dr King was Regional Director of the Environment Agency, Midlands. He is a member of HRH The Prince of Wales Business and the Environment Programme and Special Adviser to the East Midlands Regional Assembly.

The South East of England has less water per capita than parts of the Sudan. Water must be managed carefully if we are to ensure that there is sufficient for our homes, industry and agriculture. The environment needs water too and we must find a sustainable balance between these needs.

The review undertaken by the House of Lords Science and Technology Committee is comprehensive and thorough. The Agency would endorse many of the principal recommendations on leakage, resource development, water efficiency and metering.

Few people in Britain can be unaware that we are in a drought situation. There are 13 million people in the South East with hosepipe restrictions. While drought is a short-term issue it gives a valuable signal for the long term. In dealing with drought today, we continue to give serious consideration to the long-term supply/

demand situation: indeed, that is where the value of the Lords' Committee report lies.

The pressures we face are clear: there is housing growth and population increase (particularly in the South East); there is increased per capita consumption; we need to see some environmental clawback on resources (with much of that in the South East where resources are already under pressure); and there are uncertainties surrounding climate change. The overall challenge is to deal with these factors according to the principles of sustainable development. Government must work harder to integrate environmental, social and economic interests in the management of our water resources.

The report also recognises the pressure on our water resources, particularly in the South East. It is predicted that by 2025 there will be a deficit in supply (compared with demand) in London equivalent to

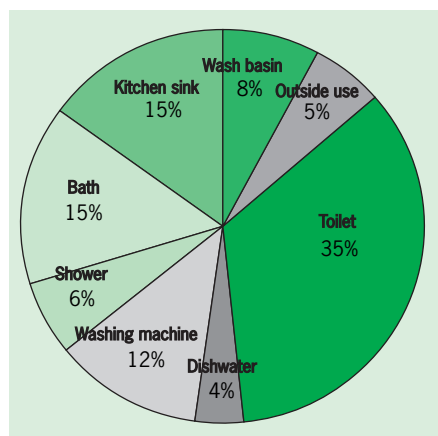


Figure 1. Average household water consumption.

between 200 and 300 megalitres a day, or the amount of water needed to supply 1.5 million people. Thames Water suggests that desalination is the way to close that gap. The Lords' Committee report is lukewarm about desalination and so is the Environment Agency.

Water companies' current 25-year water resource plans are based mainly on the development of new resources. New or enlarged reservoirs will take 15 to 20 years to construct; they are inflexible, high-impact and high-cost. There is a clear need for new reservoirs in the South East, but we should not adopt the Victorian strategy of building to meet demand. We should take a twin-track

approach, as highlighted in the report.

The question of leakage, particularly the concept of economic levels of leakage, has been in the public spotlight. Leakage was reduced between the mid-1990s and 2003 but has increased since, with current levels of leakage predicted to persist to 2010 and beyond. The report suggests that a broader definition of 'economic level of leakage' is needed.

England and Wales are almost alone in the developed world in not having payment-by-volume as the norm for water. The Agency agrees that metering is the fairest way to pay for water and a strong incentive for water efficiency, yet our progress to date has been quite slow. We advocate universal water metering in water-scarce areas.

The introduction of metering in an area of water stress, such as the South East, could save 10 per cent on water usage. That is equivalent to a demand reduction of some 240 megalitres a day, more than the projected output from Broad Oak reservoir and the raising of Bewl and Clay Hill reservoirs combined.

Water metering alone will not solve the problem, however. There must be a more effective dialogue between the customer and the water company. Bills produced by the Australian company Yarra Valley Water show what can be done: these provide information on the amount of water used on the various tariffs, a comparison with the water used in the previous year,

and a comparison with similar households in other areas. Providing that type of information can make customers think, and generate the appropriate response of reducing the water consumption and using it more wisely.

Half of the water put into supply goes into homes: of that a third is flushed down the lavatory and about a third each is used either for baths or showers or in washing clothes and dishes. The average use is about 150 litres per household per day. In the South East it is over 180 litres. There is a real need to reduce demand. This can be done with water-efficient fixtures: fittings and appliances could be hard-wired into homes without affecting the quality of life, and could reduce consumption to 125 litres per household per day, or even less.

The Agency would like to see leadership from the Government over the need for a sustainable industry and we believe we are seeing signs of that now. We advocate metering in the areas of water stress. We need to see more focus on demand management and mandatory standards for new homes.

Finally, while there is a need for new resources, no water company has yet made a persuasive case. All of the Agency's aspirations are reflected in the Select Committee's report and all are needed if we are to achieve rational management and wise utilisation of a precious and scarce resource. □

Water management: the regulatory framework

Philip Fletcher



Philip Fletcher CBE is Chairman of the Water Services Regulation Authority (Ofwat). He became the inaugural Chairman of Ofwat on 1 April 2006, having been the Director General of Water Services since 2000. His previous career was based mainly in central government public service, with an emphasis on financial issues.

The Select Committee's report could not have been more timely in terms of commanding public attention, coming as it does after two dry winters and a dry spring. Government, the public and industry face the challenge of deciding how far we want to be dependent on wet winters, and how far we want to spend our way out of the possibility of hosepipe bans or worse. Research by MORI before the last price review indicated that customers were not demanding a big improvement in the level of service. They did not want to pay a great deal more, they were happy to contemplate the possibility of hosepipe bans on average once in 10 years or so, and more severe measures on average once in 40 years or so. If the same survey were to be carried out today, it would probably produce

rather different answers.

Ofwat must enable efficient water companies to carry out and finance their functions. We recognise that companies need to deliver profits if they are to perform the necessary services. We aim to ensure they only make those profits if they deliver services efficiently. Ensuring customers get value for money is a key part of our job, but I am concerned about the Committee's conclusion that Ofwat is allowing price to get in the way of doing the job properly. Ofwat will, of course, carefully consider that criticism and challenge.

The Committee suggested that Ofwat does not look far enough ahead. We are not just looking five years ahead, though; we have taken a longer term view. The Government tried in 1989, and Ofwat in

1995, to set price limits looking 10 years ahead. It proved impossible on both occasions. The unforeseeable changes that occurred would quickly have invalidated a limit looking 10 years ahead.

But we accept the suggestion of the Committee, which is "do not look only five years ahead. This is a long-term industry, requiring long-term planning." At present we are focussing on 25-year water resource plans and the prospect of river basin management plans under the Water Framework Directive. The Environment Agency has a key role here in monitoring and assessing the plans prepared by companies. Ofwat is also involved, together with the Consumer Council for Water and others.

We already have the potential for six new reservoirs, but these will not come on stream until around 2020 or later. The work is in hand and we believe the system can make it happen. But new supply alone, though important, is not the solution. Demand is an important factor, estimated to stay almost constant into the future, up to 2015. There is a trade-off between household demand which is increasing overall, and industrial demand which is falling. It is in the areas of greatest population pressure and hous-

ing development that the situation looks critical. That is where we see the increase in demand: this must be curbed by water conservation on the one hand and, where necessary, met by greater supply on the other. Only Thames Water is seriously adrift from its security of supply targets. It does not have a clear way of achieving full security of supply by 2010. Every other company is on track. Folkestone & Dover already has approval to meter wherever necessary (universal metering). It is expected this will reach 90 per cent of its customers by 2015, which will help put them in a much more secure position.

Ofwat is interested in value. Ground water, where available, is the cheapest source of drinking water because it requires little treatment. The Environment Agency regulates abstractors' rights to draw on aquifers. Other countries (Spain for example) with extensive, illegal abstraction are laying up problems that will last well into the future: controls are needed.

Of the other options for enhancing supplies, desalination has many disadvantages, especially energy costs. It may sometimes be the least bad option and we take a similar view to the Environment Agency in relation to the exceptional

case of the desalination plant proposed by Thames Water for East London. The 'National Water Grid' (or, putting it crudely, a pipe from Northern England) is unlikely to prove feasible, in cost or environmental terms. What is feasible and practical is the system of regional grids which help ensure that even after the driest period for 80 to 100 years, we are still only at the hosepipe ban stage in the worst-affected areas.

Immediate universal metering is not the answer, but companies in water-stressed areas, at least in the South East, would benefit from higher proportions of meters.

Since its peak in the mid-'90s (coinciding with the last drought), leakage is down by 30 per cent, and customers have not seen their bills going up to reduce leakage figures. That is what the industry needed to do to get to an efficient position; and there is more to do. The ratchet effect of better technology and constraints on abstraction will drive down the economic level of leakage.

We welcome the Select Committee's report and will respond in due time in a carefully considered way, but for now I acknowledge that it has examined crucial issues and I welcome the opportunity to take part in a vigorous debate. □

An industry view on water management

Paul Butler



Paul Butler was Managing Director of Mid-Kent Water from May 2001 until the end of September 2006, when he became Managing Director of South East Water. A chartered accountant, he joined Mid Kent in 1994 as Group Financial Controller. He is currently Chairman of UKWIR, a water industry research organisation, and a member of the South East Regional Council of the CBI.

The publication of the Select Committee report is timely. We have experienced two dry winters and rainfall for the past 18 months has been the lowest for 80 years. Hosepipe bans affect 13 million people and non-essential use of water is prohibited in some areas.

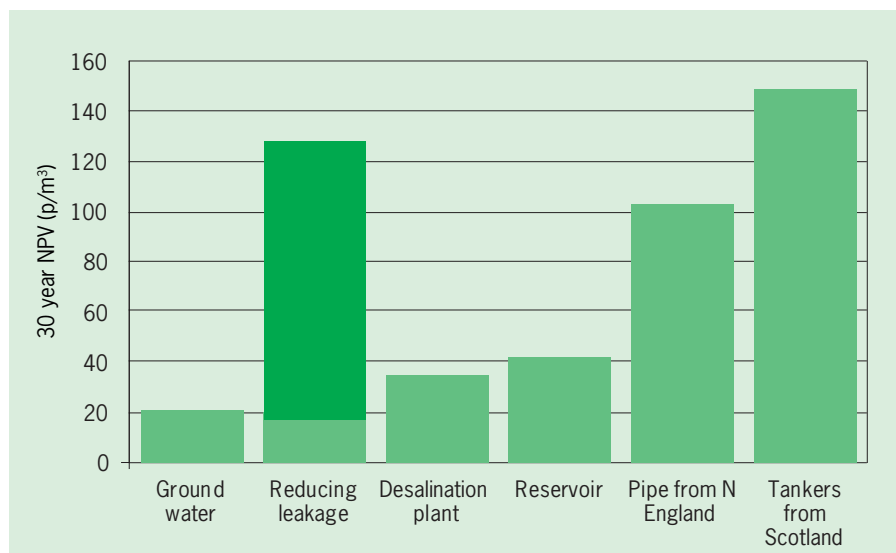
As part of the price-setting process, all parties try to find out what their customers want. Most of the time our customers express limited interest in the activities of the water industry. However, a drought

increases communication with customers. The restrictions imposed on water use increase customer interest.

When planning future resource requirements, the industry assumes a 1-in-10 likelihood of a hosepipe ban in any year. To date, this has been viewed as acceptable for customers, offering a cost-effective solution to what should be a short-term problem. But in the wake of this drought, we may conclude that customers would like companies to plan

Leakage in London. The opinion was expressed that the Committee was "probably right" to say that that the public would not tolerate existing rates of leakage in London, if it were required to undergo restrictions. The 'sustainable level of leakage' concept must take account of the practical problems of increasing the rate of repair of pipes, and the traditional high pressure in the London area. The Victorian iron pipes are badly corroded from contact with London clay, and the current pace of renewal cannot be increased without causing much greater disruption on roads, and getting and training more contractors and technicians.

discussion



Indicative cost of resource options.

for less frequent restrictions (say 1 in 50 years). In addition, climate change is starting to make current assumptions obsolete. The Committee recommends that the potential consequences of climate change should be more transparent and open to scrutiny.

The law defining what a hosepipe ban covers (for example, you cannot wash your car or water your lawn but you can use a hosepipe to fill your swimming pool) must be changed. Domestic customers are intolerant of restrictions that affect them but leave commercial activities – golf courses for example – intact. Once we are out of this drought, the range of restrictions and the process for implementation should be subject to review.

It is easy to criticise the industry for allowing 23 per cent of supply to be lost. Customers challenge the validity of imposing a hosepipe ban when they can see a leak in a street nearby. In fact the industry has reduced leakage by a third over the past decade. All companies bar two are operating at, or below, their economic level of leakage (ELL). Leakage is likely to be further reduced by 2010, but even then the loss from supply will still be around 20 per cent. The ELL is up for review in 2007 and the Committee recommends that Ofwat replace it with a broader concept of a 'sustainable level of leakage' embracing appropriate environmental considerations.

Lord Selborne has referred to the media's tendency to attack water companies for making profits. Two points arise from this: first, to look at a water company's reported profit alone is inappropriate. The results are not like those of normal trading companies. Taking Mid Kent Water's figures as an example, the most recent report showed that turnover (sales) increased by 11 per cent: this is predominately the 9 per cent increase resulting from the price determination plus

inflation, which is required to cover operating costs, investment and return. The figure is not directly linked to operating cost and as such we see a large part of that increased turnover flowing through to profit before tax, which has increased by 75 per cent. At the same time, investment of £26 million was a company record and cash outflow of £9 million gives rise to gearing of 77 per cent. Mid Kent Water and the industry as a whole will be cash-negative throughout 2005-10: reported profit figures do not reflect the true story.

The capital investment programme of the industry needs to be better understood. The industry has invested £50 billion since privatisation and has a programme of investment of £16.8 billion in the 2005-10 period. The Committee's report highlights the lack of investment in the 1980s and the inability of the industry at that time to meet European Standards. It is pleasing to note the success of the industry some 17 years after privatisation.

Development in the South East is a concern that has been heightened by

this drought. For Mid Kent the 30,000 planned new houses in Ashford by 2030 means that the demand for water will increase by about 30 per cent. This increase can be met through 75 per cent meter penetration, reducing leakage and introducing new resources, including the raising of Bewl reservoir by 2014 and the commissioning of Broad Oak by 2019.

We welcome the report's recommendation that the Government should make it easier for companies in water-stressed areas to impose compulsory metering. As the only company funded for smart meters at the last price review, we also welcome the report's support for the implementation of such technology.

Although we support the need to introduce tariffs, we must consider whether the best way forward is raising block tariffs as a formal prerequisite of being allowed to introduce compulsory metering.

With a significant programme of resource development planned, we are pleased that the Committee supports the need for such developments as part of a twin track approach, supplied as sustainably as possible. Furthermore, we welcome the report's recommendation that Ofwat allows sufficient funding, combined with long-term financial assurances, to enable water companies to undertake this resource development over several price-setting periods.

Water affordability is becoming an increasingly serious issue but no form of means-tested tariffs managed by individual water companies can possibly be the correct way forward. The report urges the Government to help the most vulnerable households with their water bills through the benefits and tax credit system, and we agree. The report also raises the thorny issue of limiting flows for those customers not willing to pay. This is a difficult social issue, but the fact that significant numbers of customers can pay, but will not, cannot be ignored. The problem is getting worse, and we need a solution. □

Controlling water consumption. Metering

is an obvious way forward, together with a tariff system that bears down on heavy users. However, it would be unreasonable to expect water companies to set tariffs which involved them in, for example, determining how many people lived in a house. Meters should be readable, and sited in the house. This could mean that the water company would become responsible for pipes that are currently the householders' responsibility (and where a third of the leakage takes place). Although this could be done, prices would have to rise to take account of the company's extra liability. Mandatory labelling of the consumption of appliances and fixtures is highly desirable if it does not happen voluntarily: the Government should encourage both the industry and the appliance makers to undertake research into more efficiency, including greater use of grey water. There should be economic incentives to install water tanks, and to restrict hard paving.

discussion

Broadcasting technology is changing rapidly and so is the way in which consumers use the media. What are the implications for the broadcasters themselves, and particularly the BBC? A meeting of the Foundation on 21 June 2006 considered the issues raised by the new technologies.

The impact of technology on public broadcasting

John Dickie



John Dickie is Head of Corporate Affairs at the BBC. He is responsible for the BBC's corporate relationship with Government, Parliament and politicians. This includes developing and communicating the BBC's position over legislation, such as the recent Communications Act, and the Charter Review. He previously spent two years as Regulatory Affairs Director of the European Competitive Telecommunications Association.

This summer the House of Commons debated the *Future of the BBC* with much of the discussion focussing on the role that the BBC should – or should not – play in developing services based on new technology.

The BBC's commitment to Public Service Broadcasting is concerned with sustaining citizenship and civil society; promoting education and learning; stimulating creativity and cultural excellence; representing the UK, its nations and regions; and bringing the UK to the world – and the world to the UK. All of our activities should seek to meet at least one of these six purposes, agreed with the Government, and based on the traditional Reithian trinity of education, information and entertainment.

In addition, we are developing a measurement framework to assess our programming, based on reach, quality and distinctiveness, audience impact and value for money. But putting measurement and metrics aside for a moment, the central public service purpose of the BBC can be summed up in one word: content. The content has to be creative, innovative and enriching. The key difference between the BBC and any other broadcaster is that — thanks to the

licence fee — we can take real creative risks which would never make sense for a company focused on its bottom line.

So how does technological change affect our mission? On the supply side, technological change makes some things (like editing or video journalism) cheaper, but other things become more expensive, because viewers and listeners expect higher quality. Contrast an episode of *Doctor Who* today with that of 20 years ago...

Change on the demand side, however, has had a bigger effect. New technologies have altered the structure of the market. We no longer live in a world of three, four or five TV channels and a limited number of radio stations. There is much greater freedom of entry and choice. And of course the internet has created an entirely new channel to market for the BBC and for others.

Yet so far, the impact of new technology on the traditional media has been incremental. The television broadcasters have launched new linear channels. Like the newspapers, the broadcasters have set up primarily text-based websites. Tentatively, we have looked at new distribution platforms, such as mobile phones. These developments have been

Impacts on social participation. There

were calls for the BBC to do more to stimulate participation in civil society. The Action Network, which enables individuals and groups to exchange experiences of community action, was an excellent example. The Make Poverty History campaign had used mobiles and other new technology to deliver its message. Marginalised groups, such as Islamic terrorists, also used the internet as a communication tool, though not necessarily to the benefit of wider civil society. There were risks that the new technologies would remove opportunities to introduce socially useful material between popular scheduled programmes, and that more choice would remove the 'critical mass' audiences required to justify investment in new and different material. However, new technology could be used proactively to offer personalised choice, based on shared information about preferences. Many felt it was impossible to say what changes would have come from these technologies in 10 years time.

discussion

Finding truth with new technology.

A proposal was put forward that there is a dark side to the new interactivity: if anyone can upload and alter content, everything has apparently equal value, making it more difficult to find the truth. Citizen journalists may not be bound by professional codes of conduct which ensure published material is factually based. There was a call for an independent warrant of the truth of material posted on the internet. But the point was made that this is not a new issue: it has never been safe to believe everything you read in the papers, and there is no such thing as 'neutral news'. There is an urgent need for improved levels of critical literacy. Media studies courses, though often derided, do provide the necessary skills. It is important that the scientific community should become even more proactive in getting its messages across.

discussion

an effective response to the first wave of technological change.

However, a second wave is starting to reach audiences and this really will shake things up. This wave will require radical, dislocative change. On-demand technologies mean that *all* media will be available on *all* devices... *all* of the time. Media will be searchable, moveable and shareable. For example, it will be possible to create your own virtual TV and radio stations: mixing new schedules from broadcasters with content from their archives and other sources, such as user-generated content. You will be able to do this yourself or it can be auto-generated from your preferences and previous viewing patterns. You will be able to watch at home or on the move.

Audience behaviour accentuates these technological innovations. Traditionally, it takes years for innovations to shift from the lab, through early adaptors, into mass-market living rooms. As sales pick up, prices slowly drop. This is no longer the case. Contrast, for example, the speed of take-up of video recorders with that of DVDs; or the speed of digital take-up.

Imagine a household with a personal video recorder (PVR), which automatically finds and digitally records all their favourite shows. In this family, the mother has set the machine to record a range of children's programmes and this is how her daughter routinely watches TV. But when they visit granny on a Sunday afternoon, and the child turns on the TV, her familiar programmes are not there. Her mother, in vain, attempts to explain how granny can only watch what is currently 'being broadcast'. She sometimes shortens this explanation to "This TV is broken". For the child it is. It does not do what she expects it to do. New technology is not new when you have grown up with it.

Technological change of this kind cre-

ates an extraordinary opportunity for the BBC. Our ambition – to give our audiences great content – has been hampered by logistical and information difficulties: we might have had a programme perfect for you at 6.30 on Thursday evening – but you were busy, or out, or perhaps you just did not know it was on. So how do we seize this opportunity? Around 95 per cent of the population use our services on radio, TV or online every month. But as we move to the second wave of the digital revolution, what do we need to do to maintain or increase that reach?

To begin with, it is vital for us to understand audience expectations, so we have undertaken substantial audience research. As a consequence, we have identified areas – from news through to programmes for teenagers – where we think we need to raise our game. Mark Thompson, the BBC Director-General, recently set out these conclusions in detail. He also sought to map some of the big themes. The key is that the BBC should no longer think of itself as a broadcaster of TV and radio (with some new media on the side). Instead – as the Government's White Paper makes clear – we need to aim to deliver public service content to our audiences in whatever media and on whatever device makes sense for them, wherever they are.

Second, we need to put in place the tools to make this new relationship with audiences work. The centrepiece is something we call the 'iplayer': software you can put on your PC which will allow you to download BBC programmes. Like any innovation, there are details to be worked out, but the core proposition is that you will be able to download programmes for the forthcoming week, watch them once they have been transmitted, and download and watch programmes that you missed over the past week. The iplayer is based on peer-to-peer technology, so

that instead of having to unicast each programme file to each PC, the iplayer will be able to meet requests for a programme file from other PCs on the network.

Each file – indeed each packet of data – will have a digital rights management wrapper around it. That means that, once downloaded, there will be a period of time when the file can be opened and, once opened, there will be seven days when it can be viewed. Then, as in *Mission Impossible*, the file will self-destruct. The rights management technology will do that, as well as preventing unauthorised further distribution, access or copying.

Another component, the 'open archive', will unlock the content that the BBC has in its archives, once commercial exploitation has largely ceased, so that licence-fee payers can watch again content they have already paid for. Further, the 'creative archive' will allow users to manipulate content for their own personal purposes under a non-commercial licence. These will be complemented by search tools to help people find specific content.

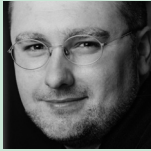
One of the great challenges of the digital age is finding the programme you want – let alone the programme you do not know you want – amongst all the choices. 'Discoverability' will involve powerful search algorithms so that you can interrogate the archives whether by text, voice or other pattern recognition.

In terms of governance, the BBC will have a much more transparent and robust framework than ever before. All existing services will receive a licence from the BBC Trust which will set down clear aims and objectives. New proposals – such as the iplayer, open archive and creative archive – will be subject to a public value test by the Trust. This will involve a public value assessment by management of the likely consumer and citizen benefits, which the Trust scrutinises, and a market impact assessment by Ofcom. The BBC Trust must be satisfied that the public value added by a new service outweighs any likely negative market impact.

But while we need radical change in all these ways, the mission of the BBC remains essentially unchanged. The deal remains a very simple one: the public give us the licence fee and we strive to give them great content which informs, educates and entertains. As markets fragment, the case for a broadcaster that is funded by all and free at the point of delivery grows rather than weakens. Broadcasting remains a public good and the economic case for public intervention – externalities, increasing returns to scale and information deficiencies – remains. □

Meeting human needs through technology

Anthony Lilley



Anthony Lilley is Chief Executive of Magic Lantern Productions, an award-winning interactive media production company specialising in content for broadband and multiplatform media. He is Vice-Chairman of the Producers Alliance for Cinema and Television (PACT) and he chairs its Interactive Media Policy Group. A prominent member of industry bodies, he has advised the Cabinet Office, DCMS, DTI and Ofcom on the creative industries.

My career has been spent close to the leading edge of media technology and yet my company does not consider itself to be a technology company. We consider technology to be a raw material for us as a creative production company. We help existing companies develop new ways of exploiting the materials that they produce, for the media they are most at home in.

Most, if not all, of the technologies that I have ever worked with have turned out to be interim, but the things that we work in (stories, human experience and communication of ideas) turn out to be rather more persistent.

Media tend not to die; they turn into slightly better versions of themselves. At root, my contention is that broadcasting will become better at broadcasting and will let go of lots of things that it is not very good at. There are five major trends in the media environment, but basically there is just a lot more media around and we have to find ways of addressing that.

Choice is the first major trend: we have to deal with expansion, with all the changes and implications that brings.

The second is a change in the contexts in which we use media. A medium which would once have been locked away in a heavy brown wooden box in the corner of the room, and for which you would have closed the curtains, is now conceivably in your top pocket. What actually happens when the medium changes context so radically? That is part of a broader trend which is the loosening the content from the device. You do not have to watch a film on a TV or cinema screen: in DVD form it can be played on a laptop, it can be viewed on a flat screen or through a projector; as a tiny disc it may be played on a PlayStation Portable – it could even be viewed on a mobile phone. The film is the same, but the experience is not necessarily the same in those different contexts.

The third trend is perhaps the most exciting. It is the increasing personal control of media; interactivity if you like. This goes beyond controlling your linear media experience, beyond flicking channels or selecting a video-on-demand; it goes into forms of media which are actually designed to be con-

trolled by the people using them. There is a new soap opera in Britain, in fact in the world, called 'The Sims'. This is a computer game, a soap opera made by the people who play it. There are multi-

Media tend not to die: they turn into slightly better versions of themselves.

player online games in this world now with millions of users (or players) collaborating together to have social, narrative experiences. These are not what we are used to, but they progress story telling and social experience in interesting new ways. Control is a key factor.

The fourth trend is 'user-generated content'. I am responsible for a project called 'FourDocs' at Channel 4, which is their first user-generated content project. In the first few months, we have over a hundred really beautifully made films, made by normal people. These are not those little videos you may have seen of somebody's cat skateboarding; these are properly made slices of life in the documentary tradition, and we created the architecture for that because we were aware of a need for it. It blurs the line between 'professional' and 'amateur' creativity.

Other examples of this are podcasting and the blogging phenomenon. It is easy to dismiss blogging, and I am as guilty as anybody of doing so. I saw a wonderful card in a shop yesterday which had two dogs talking to each other, and one said, "Well I did have a blog, but I have gone back to incessant barking; it seems to get me further." However, there are wonderfully exciting things happening in blogs.

You will hear a lot in the press at the moment about "teenage social networking sites" like MySpace, a thing called Beebo.com and another one called faceparty.com:

these are essentially systems for self-expression. If the blog is a sort of public version of a diary, MySpace is a bit like having an enormous pencil case which you can use to write about your favourite bands and put it on your desk – but your desk can be seen by hundreds of thousands, if not millions, of people. There are deep social needs here, which are more prevalent and much more long-lasting than the technologies.

When you give people choice, it turns out that we do not want what we were given quite as much as people thought we did. The reason Morecambe and Wise got 27 million viewers at Christmas 1977 was because there was nothing else on! They were great, but were they that great? This opening-up of opportunity is proving that we are a bit more interesting than the mass-marketeers thought.

One great example of what is called the ‘long tail’ phenomenon is the book and the film of the mountaineering story *Touching the Void*. A book had been released (I do not know its name) about a different mountaineering disaster and in the reviews on the Amazon.com website, several people made the point that: “This is OK, but if you actually want a book about a mountaineering disaster you should read *Touching the Void*.” Amazon took so many orders

as a result of this self-recommending system that the book rose rapidly up the charts and then became a film, and now a bestseller. And all because there was a latent demand, but it had not managed to get through the noise caused by Harry Potter, or all kinds of other high-profile major hits. That is encouraging for the public service landscape.

There is a DVD rental service in the USA called *Net Flicks*, and its second most popular genre is the documentary. Documentaries, by the way, are being marginalised by mainstream television channels the world over, because ‘apparently’ nobody wants to watch them. Actually, not enough people want to watch them *at the same time*. If the BBC and Channel 4 are releasing wonderful content into the market, the issue is how you measure its success – and how you fund it in the first place, when most funding systems suppose that you can measure success on the night it goes out and you can then tell the advertisers how much it was worth. So these evolving models are very, very complex.

To close, there is one set of people, the people formerly known as the audience, that we tend to forget in these conversations. Media literacy is increasingly, for me, an essential skill in our

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society: the impact of technology is concerned with empowerment of citizens and helping them to personalise their media experience at least as much as the effects on our big media players. □

Digital media and the human dimension

Philip Esler



Professor Philip Esler is Chief Executive of the Arts and Humanities Research Council. He has previously been the Vice-Principal for Research at St Andrew's University, and a litigation solicitor and barrister. His academic interests include the reading of biblical texts using the tools provided by social-scientific research.

He also co-founded a successful Christian news magazine in Australia.

The Arts and Humanities Research Council (AHRC) was established by Royal Charter in April 2005. We are one of the eight Research Councils funded by the UK Government from the Science Budget. We are spending some £50 million this year on research in UK universities. One of our central responsibilities is to encourage the dissemination of research findings. We want researchers to transfer the knowledge they produce into new contexts outside academia where it will have a demonstrable impact. The creative industries form an important such context. These industries constitute 8 per cent of the UK economy and are growing at 6 per cent a year. The population of the UK spends more per head on culture and leisure activities than any other country.

Arts and humanities academics teach many thousands of young people who each year enter the creative industries.

There can be no more powerful example or driver of knowledge transfer than this. Our researchers are also the custodians and, increasingly, the impresarios of the UK's fantastically rich literary, historical, philosophical, theological, musical and artistic traditions and works, without which a vibrant creative industry sector would be impossible. To give one example, think of those recent cinematic triumphs *The Lord of the Rings* and *The Lion, the Witch and the Wardrobe* and you see superlative knowledge transfer by medievalists from UK universities.

We are considering how technology is changing the way in which the BBC operates as a broadcaster. But it is not simply the changing technology that is having an impact. What is causing the tectonic plates to move so dramatically beneath our feet is the interaction between changing technology in broadcasting and

changing ways in which people engage with it. In reality, the BBC finds itself part of the much larger convergence now underway between digital media and new forms of human interaction with them. While science and business applications occupied computer experts in the 1980s and 1990s, the leisure and entertainment industries are now at the heart of this convergence – just as cinema and then radio drove technological innovation in the first three decades of the twentieth century.

Think of Apple Macintosh moving into music via the iPod and you will see a powerful example of this convergence. Or again, consider computer games which are just on the verge of incorporating complex narrative structures, emotional depth and artificial intelligence. There is also the case of our world-leading animation specialists. To imagine that the story is just about technology is to make a mistake which, if carried into policy, could have tragic consequences for the economic competitiveness of Great Britain. This is the first of the three main points I wish to make.

The BBC is at the very heart of this convergence. The AHRC is jointly running with the Corporation a series of four Collaborative Inquiry Summits that bring together BBC personnel working in New Media and a large number of arts and humanities academics. We want to see what the two communities have to offer each other, how we can best support collaborative working and how to begin a conversation between academic researchers and BBC personnel. This natural alliance between the BBC and the AHRC is my second major theme.

We should recall that we are having this discussion when the Government has confirmed that the BBC's Charter will be renewed but that its governance and funding from the public purse, in particular the level of the licence fee, are under review. The daunting challenge that the BBC now faces is to determine what the Reithian commitment to delivering public value and augmenting social capital means in our current transition to new modalities of broadcasting. This is my third theme. The BBC has clearly begun to address this issue in documents such as *Delivering Public Value* and *Creative Futures*, but I would like to explore some of its ramifications.

The technological shift that gives rise to these questions goes beyond a proliferation of channels and webstreaming. Perhaps the biggest change is that programmes are no longer locked to schedules. The nation does not view/listen as one and the BBC can therefore no longer

speak to the nation as one and know that everyone is receiving those messages within a shared timeframe. This innovation is known as 'on demand' or 'third age' broadcasting.

The next biggest shift – which is not yet well understood – is that the 'audience' is no longer merely a consumer but is potentially a creator of content that is mediated by the broadcaster. Does this mean that the BBC is no longer a broadcaster but rather a facilitator? If so, what is the nature of this role?

Some key questions have emerged from our Collaborative Inquiry Summits (and let me reiterate that these all involve human motivation and human creativity in addition to the technological platforms):

- do people perceive interactivity as a good thing and passivity as bad?
- what assumptions are made about participation and engagement?
- what is – and what is not – active engagement or passive consumption?
- what is the point and purpose of active engagement?
- how do users make decisions to buy/remix/share/steal content?
- how is 'iPod-inisation' going to impact on our way of interacting?
- what are the social inhibitions against, and steps towards, participation?
- do we want to live in a world where everyone is creating content?
- lastly, and most critically, what does public service, the traditional role of the BBC to produce public value and augment social capital, mean to active users in an age of interaction?

Just as significant is to determine what the BBC brand means and how it maintains public interest, let alone public loyalty, in what it is producing. This is the issue of mobile worlds. Some of the key questions here are (and once again note the importance of human motivation and creativity):

- how do the new media affect the way we access information and news, music, games, services (bus services, film times, restaurant bookings)?

The technological shift that gives rise to these questions goes beyond a proliferation of channels and webstreaming.

- how does mobile access to broadcasting impact upon and reflect social trends, inter-personal interactivity (as in chat), inter-generational relationships, gender differences, status, and new forms of social interaction and entertainment?
- what does it mean to be in a location? For example, what information do people want when the physical world meets the network?
- how does mobile access to digital media bear upon my sense of presence? How does it shape the way I answer questions such as 'Where am I?' 'What am I doing?' 'How occupied/interruptible am I?' and even 'Who am I?'

The really big question is how, in this changing digital world, the BBC can enable interaction with its audiences while remaining true to its commitment to providing public value and promoting social value.

One aspect of this must be that the BBC needs to think small, think local, think community. It is one of the few major organisations in the UK that has roots deep within communities around the UK. It will need to strike an appropriate balance between commissioned material and unpaid contributions. □

Technology and creative spirit. It was

argued that the BBC's role was to use technology to create opportunities to meet the needs of audiences, not to be in the vanguard of technical change itself. It was also suggested that there was no essential difference between the current interaction of creative artists and the new technologies, and that of seventeenth-century artists with their tools: it was the human creative spirit which found new ways of using available media. Anyway, it was certain that there would always be a need for people to meet face to face in order to debate, enjoy good food and wine, and turn off their mobile phones!

discussion

How should the Government and business plan for future pension liabilities? This issue was examined at a dinner/discussion held at the Royal Society on 11 July 2006.

The impact of demographic change

Adair Turner



Lord Turner of Ecchinswell has combined careers in business, public policy and academia. He is currently a non executive director of Standard Chartered PLC, Siemens Holdings plc, United Business Media plc and Paternoster Ltd. He was, until recently, chair of the UK Pensions Commission. Lord Turner is also a visiting professor at the London School of Economics and CASS Business School, City of London, and was appointed an independent cross-bench peer in the House of Lords in 2005.

What future liabilities will pensions bring? In order to find the answer, we need to step back and try to understand the scale of the different types of claim that people have for future pension receipt. We also need to consider who has made the promise to them and what is the likelihood of that being met.

The assets of the personal sector, with the exception of houses, are the liabilities of somebody else. So if we look at the assets of the personal sector, we will see the liabilities in question. At the end of 2003, individual assets totalled £7,300 billion, while liabilities amounted to £900 billion. A not inconsiderable £650 billion is held in cash deposits, £350 billion in securities (equity and bonds), £300 billion in insurance company policies (excluding pensions) and about £100 billion in unquoted equity (holdings in individual companies). However, these amounts are dwarfed by the assets held in residential housing – £3 trillion.

The state has a liability of £1,100 billion to all citizens in the state pension system, plus £500 billion to public sector employees in unfunded pensions. In addition, various insurance companies and pension funds have liabilities amounting to £1,300 billion. These figures are typical of a country with a gross domestic product (GDP) of about £1,300 billion.

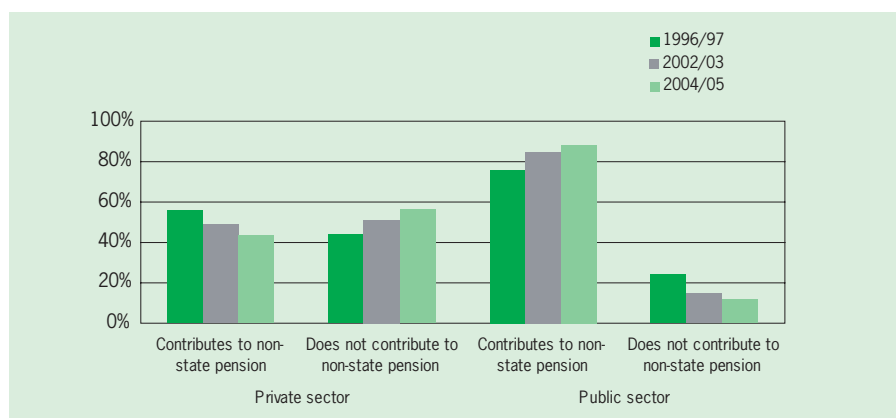
However, there is another very significant variable: changing demographics. The

number of people who expect to enjoy the benefit of these assets is rising faster than the number who are contributing the productive resources needed to support the assets. Assuming a retirement age of 65, the old-age dependency ratio in the UK is forecast to increase from around 28 per cent today to nearly 50 per cent by the year 2050.

The effect of these figures on an unfunded 'pay as you go' pension scheme is obvious. In this system pensions are paid for out of the taxes of the current working generation. When the number of pensioners increases relative to the number of workers, one of three choices must be made: raising the retirement age; reducing the size of the pensions paid relative to average earnings; or increasing the rate of tax (in the form of National Insurance contributions). Less obvious, however, is the effect of this changing demographic on funded systems. Essentially, the value of assets will be affected by the fact that a larger generation will have to sell all its assets on to a smaller, following generation.

The Government's response has been to make the state pension system less generous and increase reliance on privately funded pension contributions. Pensioners today receive, on average, about 60 per cent of their income from the state and 40 per cent from privately funded pensions. By the year 2050, though, the Government's plan has been that only 40 per cent of pen-

Figure 1. Participation in public and private sector non-state pension schemes: percentage of workforce. Source: Government Actuary's Quinquennial Review of the National Insurance Fund as at April 2000, GAD.



Savings incentives. A number of participants raised concerns about the likely success of the Pensions Commission's proposals to increase the level of private saving. Some doubted whether the Government had adequately considered that the opt-out rate among young people could be considerably higher than expected. The case for saving can only be made successfully if it shows earlier results, is easy to understand, involves trusted institutions and has no detrimental effect on later state provision.

discussion

sion income will be from state pensions, with 60 per cent coming from privately funded pension provision. The declining role of the state is to a significant extent driven by the fact that the basic state pension is linked to prices, not earnings, and so will fall relentlessly as a percentage of average national wages.

The problem with this approach is that, rather than growing to fill the gap left by a retreating state, the average amount of private pension provision is decreasing very significantly with the decline of final salary pension schemes. In 1995 there were about 5.2 million people in defined benefits schemes. By 2004 this number had fallen to 3.6 million, and of that number about 1.8 million were in schemes that had already been closed to new members. The number of private sector employees in final salary or other types of defined benefit pension schemes is unlikely to exceed

a million by 2015 or 2020. In addition, the proportion of employees who do not contribute (and whose employers to not contribute) to any private pension plan is growing, from 44 per cent in 1996 to 56 per cent today.

Housing wealth is increasingly seen as a major element of retirement savings. However, the people who lack a good pension scheme are often the same people who do not have large housing assets. Furthermore, there may be other claims on those assets, such as the need to provide children with a means of entering the housing market.

All pension schemes carry inherent risks. The question is, who should bear the risk? In a defined benefits scheme, the employer takes on a large part of the risk, including uncertainties in investment performance and increases in life expectancy. In a defined contributions system, the risk

resides with the individual prior to his or her retirement, but typically moves to the annuity provider post retirement. In a state system, the risks posed by investment returns and post-retirement longevity are borne by the state. But individuals in a state pension system face the risk that the Government might change its promised provision. I suspect that very few employers will continue to absorb a large amount of pension risk. In future, this risk will be borne by the state or by annuity providers, if not handed to individuals.

It is instructive to look at the approaches to pension provision taken in other countries. Some provide simple, flat-rate pensions that are aimed at preventing poverty in retirement; a typical figure might be 30 per cent of average earnings in the country. Other governments pay earnings-related pensions. The Netherlands, Sweden and Spain have strongly proportional pension schemes that cost 10-12 per cent of GDP, compared with 6-7 per cent in the UK.

For the past 25 years we have been trying to add an earnings-related pension to a basic UK state pension without increasing taxes to Scandinavian levels. The conclusion of the Pensions Commission is that we should move to a basic-rate state pension system aimed at providing a simple anti-poverty pension, and concentrate on doing that well, rather than doing two things badly. □

www.pensionscommission.org.uk

Uncertain outcomes from the White Paper

Alison O'Connell



Alison O'Connell is director of the Pensions Policy Institute (PPI). She has led the development of the PPI into an authoritative voice on pension policy in the UK. The PPI is a non-political, independent research organisation providing comment and analysis on retirement income policy. Before turning to pension policy, Alison O'Connell spent 15 years working in the financial services industry.

The Pensions Policy Institute (PPI) has carried out a detailed economic analysis of the proposals contained in the Government's White Paper on pensions reform, *Security in Retirement: Towards a new pensions system*, which was published in May 2006. Our overall conclusion is that the Government is storing up both financial and political liabilities for its taxpayers. The subject of pensions is complicated, so I am mainly concerned here with the state pension, which is made up of a basic state pension, state second pension and, for those with very modest savings, the pension credit.

In its White Paper, the Government stated its intention to improve the coverage of the basic and second pensions. However, its policy analysts seem to assume that everyone has average earnings and accrues 40 years of unbroken contributions. This is not the case. People move in and out of the labour market, which means that in some

years they make no contributions. This has been the case particularly for women who, for obvious reasons, have very flexible working patterns if they are in the workforce at all. Yet one of the stated aims of the Government is to equalise state pension outcomes for men and women and boost the number of women who qualify for both basic and second state pensions.

How well is the Government doing? The percentage of people who will not qualify for the basic state pension rises from 13 per cent (4.7 million) to 14 per cent (5 million) each year under the White Paper proposals. However, although fewer people will qualify each year, eventually almost everyone becomes eligible because they will need only 30 years of contributions, rather than 44 years as previously. It is questionable whether this can be accurately described as "strengthening the contributory principle", as stated by the Government.

The basic state pension will be around £75 per week and will be indexed to earnings; all to the good, but £75 is not a large sum, so the second state pension will be very important. A person who has accrued the full 44 years would receive the maximum state second pension of £60 per week, which yields a total of £135. However, most people will not qualify for that amount and, furthermore, its value will decline relative to average earnings.

To illustrate this, take the example of an average man and an average woman who both reach state pension age in 2012. Both will have had periods out of the labour market that reflect those of their gender group. Median annual earnings at present are around £25,000 for men and £18,000 for women. In the system proposed, which remains strongly linked to annual earnings and the number of years in the labour force, the man will receive a state pension of just over £150 per week, whereas the woman will receive a weekly sum of only around £100.

Both the man and the woman would be among the 50 per cent of the population whose savings are sufficiently low to qualify them for the means-tested pension credit. To receive this, they have to go through a separate application process, and we know that about one-third of those eligible do not claim.

Extrapolating this scenario to 2030 and 2050, the White Paper reforms will succeed in equalising the pension outcomes for the man and the woman, albeit over a fairly long timescale. However, there will be a squeeze on pension credit as the threshold is lowered. In 2003, the proportion of

Life expectancy. There is a large degree of uncertainty about life expectancy in the future and any pension scheme must be sufficiently flexible to deal with this. However, death is not the only problem of old age. There is also the question of how long people should be expected to work. This raises difficult issues of inequality, as the poor have a lower life expectancy than the rich. How can they be expected to work for longer?

discussion

pensioner households eligible for pension credit was around 50 per cent. Precise data have not been made available, but our best estimates suggest that this proportion will rise to 60 per cent in 2030 and 70 per cent in 2050. The Government, however, estimates it at 31 per cent in 2030 and 29 per cent in 2050 (we do not know what assumptions the Government has used to make these calculations).

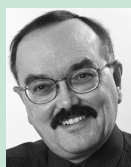
These uncertainties have important implications for both Government liabilities and the probable success of the main strand of the White Paper reforms – the creation of personal accounts, or a national pensions saving scheme. This scheme has been described as offering low-cost pension saving for low- to middle-income earners, who will be automatically enrolled (with the choice of opting out) and whose employers will be required to make a contribution. The future of the pension credit is clearly of paramount importance for working-age people, who will have to decide whether saving in one of these personal accounts will be worth their while, or whether such savings will be subject to clawback in the form of means-testing and subsequent withdrawal

of pension credits.

In New Zealand they have taken a different approach. There is a fairly generous guaranteed state pension – at least 33 per cent of national average earnings, commonly nearer 40 per cent. Any savings that people have on top of these amounts are discretionary. Means testing is uncommon, at less than 5 per cent. This system is practically guaranteed to prevent poverty. This universal state pension system means that the New Zealand Government knows what its liability will be. By contrast, in the UK we hope that people will receive the maximum pension of £135 per week, which is about 27 per cent of national earnings, but we know that many will not.

The UK thus seems to be pursuing a uniquely difficult policy. The state pension certainly has not become any simpler, and we now have the complexity of personal accounts to add to that. We have achieved better outcomes for the future, but these will not come into effect for some time. The messages that we need to work for longer and save more have gone out, but the outcome remains questionable. □

What is the real 'deal' for UK citizens?



Reg Hinkley is Chief Executive of the BP Pension Fund. Dr Hinkley joined HM Treasury in 1972 after study and research in chemistry at Oxford. His career in Whitehall included a post as private secretary to the then chancellor of the exchequer, Denis Healey, and a number of posts overseeing public expenditure. He joined BP in 1981 and has worked for the company in both the UK and Australia.

The pension scheme at BP has around 70,000 members, of whom nearly 20 per cent are current employees. With assets of some £12 billion, the scheme is more than fully funded on the basis of FRS (Financial Reporting Standard) 17. This makes the BP scheme unusual, because many schemes are in deficit and, as a consequence, there has been a trend away from final salary schemes over the past 10 years.

In Chapter 3 of the first report of the Pensions Commission there is an excellent annex that details the rise and fall of final salary schemes. Among the many factors cited are:

- statutory improvements in benefits;
- real improvements in life expectancy;

- the economy in general, including trends in inflation;
- the investment cycle in particular, notably asset values and interest rates;
- developments in actuarial and accounting practice, which arguably are engendering greater caution;
- regulation.

These changes have had the cumulative effect of imposing real economic costs on pension schemes. Cash outflows have increased as improved benefits are being paid for longer. Administrative and regulatory costs have also risen. Finally, there are very real indirect costs imposed by the loss of flexibility.

In BP's case, the impact of all these changes is illustrated by the valuation of

Reg Hinkley

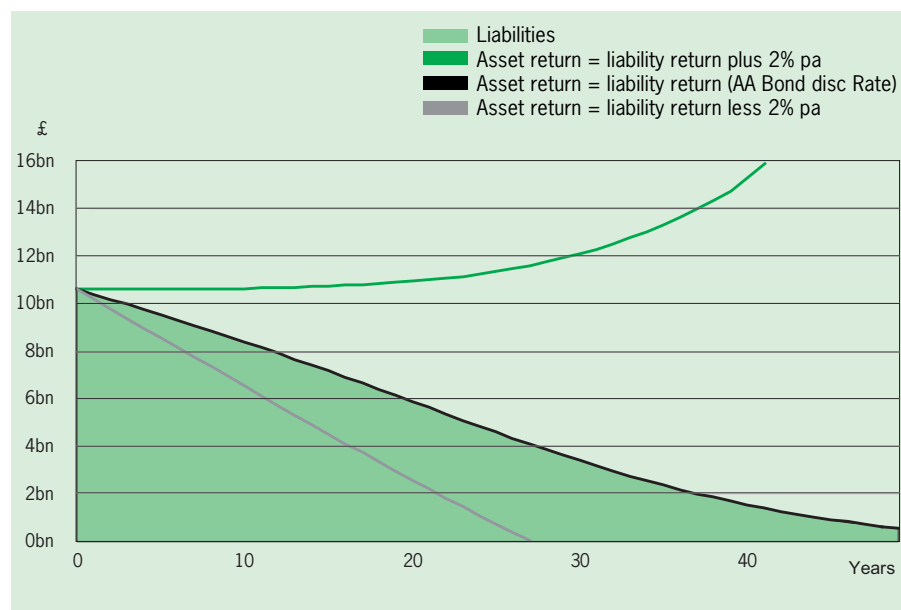


Figure 1. Projected assets and liabilities of the BP Pension Fund

our liabilities over the past eight years. At the end of 1997, our liabilities were valued at just over £6 billion; by the end of 2005 they had more than doubled, to around £13 billion. Although assets also rose over that time period – from around £9.5 billion to over £12 billion – asset cover fell by 50 per cent. The BPs of this world can stand the strain because the liabilities are a relatively small proportion (10 per cent) of market capitalisation. However, as we all know, the liabilities are more significant for small and medium-sized companies.

But is this a fair representation of the problem? Although pension obligations resemble inflation-linked debt, they have some characteristics that are clearly not debt-like. There is also a buffer provided by the assets for the management of volatility. By reducing the discretion to manage such volatility, for example by leading and lagging contributions, we create the risk of over-funding – tying up corporate assets that could be used for investment. Flexibility has real economic value. Taking it away destroys this value.

We also need to be wary of the impact of our measurement approach. Pension models are the foundations of corporate scheme valuations, accounting representations of pensions obligations, and regulatory policy. By collapsing what is a sophisticated problem of risk assessment into a single number, in the way present models do, we lose critical information and thereby create an outcome that is likely to overstate the problem and produce an unstable result.

Consider cash flow projections – both assets and liabilities – and the dimensions of risk that influence them. Figure 1 shows the value of future cash flows from accrued liabilities within the BP scheme,

using the FRS17 accounting basis – the standard companies now use in reporting their statutory accounts. The projection does not include future liabilities, so the value declines as members age until eventually, of course, there are no more obligations to meet. I have compared this projection with the values of assets and with different overall return assumptions, assuming that cash is transferred each year to meet annual outflows.

What conclusions can we draw? First, the lifetime of the fund, even if we accrue no new obligations, is 50 years. How many companies are able to incur debt-like obligations of that longevity, in other contexts? Second, if assets earn returns consistent with AA bonds, which is the yardstick used in the FRS17 basis, their value tracks the liabilities, as one would expect. Third, if assets earn 2 per cent per annum less than AA bonds, the scheme still has cover for over 25 years – that provides a lot of flexibility to recover. Fourth, if assets earn 2 per cent more than AA bonds – and here I should point out that many schemes are invested in equities, which, on average, earn more than corporate bonds – we end up with assets of over £10 billion after the scheme is paid out, such is the impact of compounding.

A further consideration is the volatility of stock market indices and index-linked bond yields, which some argue are the right reference for liabilities. Whereas stock markets were rising very strongly over the past year, bond yields were falling, thus raising the value of liabilities. Trustees saw limited improvement in their funding positions. Note that this sensitivity to interest rates is a function of discount rates and not of real increases in

liabilities. Nevertheless, it led some commentators to propose hedging solutions that match this exposure. I do not believe that many trustees have adopted such a policy, but there was speculation that they might, and this had the consequence of driving yields lower and liabilities higher – a self-defeating spiral. Subsequently, yields reversed and the stock market continued to rise. This led *The Times*, in a slightly tongue-in-cheek article on its business page, to conclude that the pensions crisis was over – even though the liabilities were still the same. Finally, markets fell back by 10 per cent while yields fluctuated, suggesting that, at least in part, the crisis had returned. Such perceptions are an outcome of the way we have chosen to measure at different points in time, rather than a robust view of the longer term.

Ultimately, the question we should ask is how we judge costs and benefits – the trade-off between competitiveness on the one hand and the protection of beneficiaries that the Pensions Regulator has been designed to facilitate on the other. Despite the increasing costs, responsible companies continue to believe that contributing towards employee pensions is an important part of their remuneration and benefits package. If circumstances are supportive they will continue to do so. Companies that are financially strong will sustain their final salary schemes for a good while yet, and will honour accrued entitlements.

Many companies, however, will reconsider their pension schemes and this, together with changes in employment patterns, competitive pressures and employee preferences, will lead to a further decline in employer commitment to final salary schemes. Schemes will be closed to new entrants, benefits modified, employee contributions increased, future accruals modified or closed and transfers to the financial market place may occur.

These conclusions should be considered in the context of the role that the corporate sector should play in the economy. Companies are not natural bearers of the risks created in sustaining the long-term living standards of their former employees. They have no natural sources of competitive advantage in so doing.

In looking forward, we need to consider the different roles of the various stakeholders in pensions provision. Certainly, we need to consider the role of companies. The state will play various roles – in underwriting or moderating risk in occupational schemes and in creating savings institutions. We also need to examine the role played by financial markets, given their sources of advantage. Finally, we need to ask where this leaves the individual – when employed and when retired. In short, what is the 'deal' for citizens of the UK, given what we have learned so far? □

If Government and business are committed to sustainable development, how can future policy choices be tested for their environmental impact? This was the subject of a dinner/discussion held at the Royal Society on 18 July 2006.

Quantifying ecosystem services and benefits

Barry Gardiner



Barry Gardiner MP is the Minister for Biodiversity, Landscape and Rural Affairs, Defra. In 1987, he entered business and ran a company of international maritime arbitrators for 10 years before entering parliament as MP for Brent North in 1997. He was Parliamentary Under-Secretary of State for Northern Ireland from April 2004 to May 2005. In May 2005 he became Parliamentary Under-Secretary of State for Competitiveness at the Department of Trade and Industry.

Globally, the Millennium Ecosystem Assessment has painted a bleak picture: in the second half of the 20th century we have changed the world's ecosystems more than at any other time in human history. The result is that 60 per cent of ecosystem services are being degraded or used unsustainably. And of course it is the poor that suffer the most: environmental degradation is a significant barrier to achieving the UN's 2015 Millennium Development Goals for poverty eradication.

Years ago there was a development agenda and there was a separate environment agenda. Now there must be only one agenda. They were like twins separated at birth who could not properly understand who they were until they were reunited.

Yet in some places that need for a single sustainable development agenda is still poorly understood. Governments and agencies around the world need a truly stereoscopic vision of development and environmental issues. This means amongst other things ensuring that our development investments are climate-change proofed: all too often they are not. Many of the poorest communities, the recipients of our development interventions, are also those most susceptible to climate change and we are literally building their house not just on sand but also below water level.

There are big gaps in our understanding of the functioning of ecosystems. We need to know more about the relationship between biodiversity and ecosystem services and also about the drivers of change that cause biodiversity loss and changes in ecosystem services.

The irony is that, in terms of pollution, our domestic environment has improved dramatically over the last 30 years. We have become very good at addressing point sources of pollution and specific environmental problems, but the nature of the challenge has moved on. Much of our pollution now comes from diffuse sources. Many of our current problems arise from cumulative pressures and cut across convenient areas of environmental policy. We tend to look at the environment on a com-

partmentalised 'single-issue' basis, but if we are to reverse the tide of environmental degradation we must take a much wider view. And just as Government departments must take a wider view, a strong working relationship between scientists and economists is key to turning this around – this lies at the heart of the challenge facing us.

The Millennium Ecosystem Assessment outlined the vital importance of 'ecosystem services'. Healthy ecosystems do not simply provide vital societal and economic benefits, such as the provisioning services of food, fresh water, fuel, natural medicines and fibres. They also provide the regulating services for water purification, flood and climate regulation, pollution and air quality that are much more difficult to quantify. Beyond that biodiversity and landscape provide recreational, aesthetic, educational and spiritual services. And which of us can put a price on these?

It is easy to quantify some of these services like the provision of food, but much harder to quantify water purification by soils. To ensure the future health of ecosystems – and by extension the provision of the ecosystem services on which we depend – we need to have a good understanding of how ecosystems function and respond to our demands on them.

Where do we look for a solution? I think we have to find some kind of objective system of measurement to help us make policy choices. We must be able to develop metrics that will enable us to work out the value of environmental goods and the incremental 'cost' of our use of ecosystems. Can we find ways to provide a more concrete measure of the value of ecosystem services that we can use to weigh alongside the value of a new development? Can we assess how depletion or enhancement of ecosystems, and the environmental assets within them, will affect our ability to enjoy these benefits in the future? If we can do this, then at least we know what is at stake when we make policy choices about, for example, investment in environmental protection, setting priorities for ecosystem improvements and deciding what changes in land use or commercial development are desirable.

Communicating with the public. The investing public and the electorate have to be taken into better account. Not everyone knows what 'ecosystem services' mean. A good way of conveying the message is to underline local circumstances. People are concerned about the degradation of their environment, and the prospects for future generations. There are no 'free goods'. Better public communication of the issues is essential. The scientific evidence is now obvious. Even the need for new and better methodologies is widely recognised. There is a clear need to get away from rhetoric about sustainability and move towards practical action. There is also a need, not least within government, to reconcile different interests.

discussion

These choices will then be better informed, more transparent and more accountable. Environment ministries will stand a better chance of speaking on equal terms to economic and development ministries.

I want to see Government departments having to bid not just for their revenue and capital budgets from the Treasury, but bidding for their resource consumption of ecosystem services. Then the true cost of policy to the environment will be accounted for, and not just the monetary cost to the public purse.

To address this challenge I have asked my officials to develop a more holistic approach to natural environment policy. This is not about 'joining-up' policies on an *ad-hoc* basis. We are taking a much more rigorous approach. The focus here is to develop a suite of methodologies, tools

and techniques to progressively integrate policy making around the conservation and enhancement of entire ecosystems.

It is all 'well and good' for Defra to talk about an ecosystems approach, but we need to translate this into action across the range of big development issues which affect our natural environment – such as housing development, transport and energy policy to mention but a few. We need to develop and communicate a clear and coherent story – that is relevant across Government – on the key planks of the ecosystems approach, environmental limits and environmental valuation.

In order to develop metrics that will enable us to work out the value of environmental goods and the incremental 'cost' of our use of ecosystems, my officials

are developing the supporting evidence base. We are conducting research on which valuation methodologies work best in addressing these questions – both in assessing individual ecosystems and in taking policy decisions on aggregate – and on how to use the valuation evidence that exists in policy making. We are discussing with the UK's research councils how to improve coherence and consistency across the large but fragmented evidence base on the condition and value of ecosystems (we face the challenging prospect of getting natural and social scientists to speak the same language and work jointly to seize this opportunity to inform policy).

We are exploring the linkages between environmental assets and economic performance – what do different sources of biodiversity contribute to the economy in alternative uses? Where, when, and how much should we protect them? Do we currently use them too much or too little? I am sure you can appreciate this is an ambitious, long-term agenda. Changes will not happen overnight, but the stakes could not be higher.

Effective dialogue between scientists and economists will be key to achieving our goal of one planet living. We must integrate the development and environment agenda. We must communicate the importance of our assessment. And we must calculate within a metric which can embrace both natural and social science. □

www.millenniumassessment.org

Increasing our understanding of ecosystems and their services

Alan Thorpe



Professor Alan Thorpe has been Chief Executive of the Natural Environment Research Council since 2005. His research involves the basic dynamics and predictability of weather and climate. From 1999 to 2001, Professor Thorpe was Director of the Met Office's Hadley Centre for climate prediction and research. In 2001 he became the first director of the NERC Centres for Atmospheric Science, a distributed NERC Collaborative Centre involving over 15 universities.

The Treasury outlined five public policy challenges for the Spending Review 2007, which it felt were going to be critical, not only for this review but over a longer period. One of these addressed "the increasing pressures on our natural resources and global climate", which come from rapid economic growth in the developing world and sustained demand for fossil fuels in the advanced economies. The challenge also acknowledges that "these changes will have fundamental and far-reaching implications for public services and will require innovative policy responses, coordination of activity across Departmental boundaries and sustained investment in key areas".

These issues are central to the research already identified as being of key importance for the Natural Environment

Research Council. In addition, the Economic and Social Research Council has identified a number of priorities for its research: de-couple economic growth from environmental damage; promote quality of life; support greater resilience, adaptation and social learning; manage our natural resources in a more sustainable way; frame and shape the environmental sustainable debate. These are actually questions that NERC could have written down as well so it shows that this policy challenge is one on which we need to work closely together.

We all know the drivers of environmental change. Over the last 150 years, there has been roughly a five-fold global population growth, and roughly a seven-fold growth in energy use. There has been a tremendous, almost exponential, increase in the carbon dioxide content of the atmosphere. There has been approximately

0.8°C warming globally, of which about 0.6°C has happened in the last 50 years.

I find the concept of ecosystem services very helpful here, in that it combines two very critical feedback loops. We know that society needs to use resources, but this use creates pressure on the way that society evolves and develops. That would be, perhaps, bad enough but the use of resources such as fossil fuels which add carbon dioxide to the atmosphere also changes climate. Climate change in turn affects resources and also society; so there are two very strong feedback loops here. The concept of ecosystem services incorporates both natural resources and global climate, and emphasises the fact that they are part and parcel of the same problem.

The Millennium Ecosystem Assessment (MA), published in 2005, was the first time that this concept came to the fore. That report sets out the areas where we actually use the planet to survive: we use goods that are produced or provided by ecosystems, like food and fresh water and fibre, etc, and we also have benefits from the regulating role that ecosystems play in, for example, air quality, climate, pest control and natural hazard mitigation.

The Assessment was a check on the health of the planet. In terms of global warming, there are three identified hotspots – in Siberia, in Alaska and in the West Antarctic Peninsula – where the average global warming (which we quote as 0.6°C over this period) has been in excess of 3°C.

Humanity is changing land use, and roughly a quarter of the planet's land surface is now cultivated. There are regions where there is insufficient fresh water to fully satisfy crop demands with 15-35 per cent of these irrigation withdrawals now unsustainable. Water scarcity affects a large number of people, maybe 1 to 2 billion people.

So there is the problem, but we are far from understanding it. We need to know more about the current and future states of ecosystem services. We need to develop 'scenarios', predictions of the state of the planet and its ecosystems over the coming years. For an environmental scientist, accurate prediction is the test of whether we really understand the system and have enough knowledge about it.

The current climate change scenarios that are produced, for example, by the Intergovernmental Panel on Climate Change (IPCC) are very coarse-grained in the way they describe these processes. They split the planet up into grid cells

Government policy. There were perceived to be contradictions in Government policy: on one hand it seeks, not always successfully, to reduce greenhouse gas emissions and promote energy efficiency; and on the other it encourages the development of the aviation industry and other transport policies inimical to the environment. It was also pointed out that the Government is seeking to include aviation within the European emissions trading scheme, and had to balance many conflicting considerations. It is not always easy to assess risks and judge likely outcomes. It was also suggested that there was something to be said for keeping politics out of these issues as much as possible, and instead promoting cooperation between the main political parties.

discussion

that are about 200km across and there are large uncertainties in those scenarios. But there is an opportunity now, as the science, our knowledge and the technology all advance, to develop these scenarios on a much finer scale than before. It is a realistic expectation that we will soon be able to explore many ecosystem services with grid cells of 10km with these predictive models and we can look at what is going to happen just hours or several decades ahead.

With such tools, we can say what the consequences of actions taken now – by Government, by policy makers, by business – will be. These predictions and scenarios are really critical in my view.

And we have new datasets. Real-time data is available now. The unprecedented detail that provides is in contrast to the rather coarse-grained picture that we have in our prediction models at the moment: there is a real opportunity here if we can resolve some of the outstanding details. To try to do this we have been working with the Hadley Centre and a group in Japan, using one of the world's best supercomputers, to generate scenarios at much higher resolution. For example, the recent tropical storm Bilis caused tremendous flooding in south China leaving 150 people dead. This is the scale of phenomenon that really affects people and we have to be able to describe how things will vary in the future on this human scale. It is no longer enough to describe the global average warming: what we now need is the detail on a local scale to help policy and business planning.

The Japanese Earth Simulator takes one day of computer time to run one year ahead. The idea is to let it run for 100 years into the future and look at what might happen. The resolution of this model is 60km, compared to the

climate models in the Third Assessment Report of the IPCC which had a resolution of about 200km.

Colin Prentice and a group in the Quest Project have been looking at the most recent IPCC predictions of fresh water supply; their work gathers together all the model predictions to look at the probability or risk of different outcomes. We can show where more runoff might be expected than at present – and where less may occur. There are some regions where the model is very uncertain. So, while we can predict and understand these processes on small scales, even within countries, we have to acknowledge that a substantial amount of uncertainty remains.

We are also looking at the amount of surface ozone, to find those areas where levels are predicted to rise to more than the World Health Organisation's safe level for deleterious effects on humans.

How are we going to address the challenge set out by the Treasury? What I have outlined are some of the possibilities arising from the science, but I want to stress how large the uncertainties still are. There is a great deal we do not know about this subject, yet a lot that we need to know quickly. We need to bring together natural, social, economic sciences together with policy and business. The UK is actually very good in a lot of these areas individually; it is bringing them together that is critical.

This new capability to look into the future is critical in enabling society to act and to live with environmental change. Martin Rees mentioned recently that this problem required an effort akin to the Manhattan Project or landing a man on the moon and I think that is an excellent analogy. We need a partnership of all who are really involved with this in the UK and worldwide, but particularly in the UK, in order to tackle it. □

The website of the Foundation for Science and Technology has now been completely re-designed. Summaries and presentations from all the Foundation's meetings can be found at: www.foundation.org.uk

How industry can achieve a more sustainable approach

Dorian Emmett



Dorian Emmett is Head of Sustainable Development at Anglo American plc. In 2001 he was appointed Chief Operating Officer of Anglo American Platinum Corporation. He moved to the Anglo American Corporate office in London in 2004. Dorian Emmett has responsibility for the strategy, structure and processes that Anglo American uses to deliver added value in regard to safety, health, environment, social and community issues as well as markets and economics agendas as they relate to sustainable development.

Anglo American is a mining company. We have a large footprint, therefore, and many employees all over the world. One of the fundamental drivers for our view of sustainable development is that we operate in a finite, non-renewable regime. That drives an approach that promotes a transition to more sustainable patterns of development, as opposed to sustainability *per se*. We focus, for example, on post-closure issues. However, without a long-term view, one does not get the right perspective, either in business or elsewhere, of the trade-offs one wishes to make.

So moving from a triple bottom line simplistic approach, we come to the 'five capitals' type of thinking, which involves trade-offs between various types of capital. The prime example of this is China where massive economic and social gains are offset by potentially very high natural capital cost.

To quantify trade-offs one has to be able to measure. Measuring and reporting what you are doing on the ground (rather than what you hope you are going to do) provides a number of very useful criteria for shaping trade-off thinking. One example of such quantification is the Global Reporting Initiative, the GRI. Second, organisations like the International Finance Corporation (IFC) and the Equator banks are publishing investment guidelines. These guidelines and reporting criteria help shape our thinking.

Bear in mind that some of these measures are qualitative: we are not always going to find exact numbers for these very, very challenging measurement issues, so qualitative measures have a role too.

At Anglo American we generate wealth which is then distributed – to Government, to employees and suppliers. We report this and at the same time we try to contrast the key input use that

went to create that wealth: energy, CO₂, water, air burden and so on. In our sustainability report, we have a section on a number of issues which have both quantitative and qualitative goals. Our stakeholders seem to find value even in the qualitative side of things because, I think, these show how we are improving our financial and non-financial margins within the business.

We operate both in the developed and the developing world and the value assigned to non-financial capital is often seen quite differently in developing and non-developed countries – which makes some of this measurement quite difficult. Non-financial benefits are more difficult to quantify than costs, so it is important to look carefully at how we can put a value on ecosystem benefits. And finally, given the fact that competitiveness is ever-present, good governance frameworks are always welcome; they tend to level the playing field for business.

The mining industry set some ground rules for sustainable patterns of development with the Global Mining Initiative in 1998. Later came the formation of the International Council on Mining and Metals (ICMM). It is unashamedly a leadership group: it is CEO-led and it requires adherence to 10 demanding principles (see Figure 1).

The Resource Endowment Project provides a good practical example, at industry level, of trade-off studies that have been carried out by the mining industry. It was set up to answer three questions: 'How does the mining sector contribute to national development and poverty reduction?'; secondly, 'What helps to achieve those goals?'; and thirdly, 'How do mining projects contribute at every level – national, regional and local?'

We had significant participation, particularly from governments. Four coun-

Measuring costs and benefits. The quantification of benefits, for example in human

health and wellbeing, is very tricky. Here case studies should help to make such issues clearer. But some things are beyond quantification and it is important to recognise the valuable role of qualitative assessments. Costs also have to be considered and measured: these are always easier to quantify than ecosystem benefits, but it is still important to ensure clarity here too.

discussion

tries (Ghana, Chile, Peru and Tanzania) took part in pilot projects. There were three phases: to find an analytical framework that everyone could understand and agree upon; to test this (and these four pilot projects did exactly that); and to identify how can we take the lessons from these pilots and apply them on the ground. There were clear links between mining investment and growth in these economies. Generally there was benefit to the economy, and non-mineral GDP growth was positive in all four cases.

How do we make some of those trade-offs sensible to our line management, the people who actually have to make these decisions? Clear policies and guidelines are absolutely critical, and can make some of the decisions much easier. If there is a good scientific basis, that makes them easier still. It is also very important to build the sustainable development trade-off issues into the normal processes of the business: in the way we put together projects, in the way we manage our risk processes, and the way we set targets. For example, the cost of carbon is integrated into all three of those.

As an example of a tool for line managers, take our policy on biodiversity (see Figure 2). In a particular project in an environmentally sensitive area, we tried to offset the high impact central footprint (that is the very high immediate mining footprint which we traditionally would focus on), by creating a socio-economic development zone, together with the local stakeholders, which also includes post-closure considerations. Although the science is not exact, these trade-offs intuitively seem to make sense as an approach.

Partnerships are increasingly necessary to facilitate these trade-offs and make them work, not the least in the energy area. The FutureGen project, which is concerned with future energy generation technologies, is funded predominantly by the US Department of Energy (Government's role in allowing business to move into areas where they would traditionally be very hesitant is very important). Energy and resource companies, together with Government, are involved in looking holistically not only at mining, but hydrogen generation, and then carbon-capture and sequestration. These are clearly going to be huge issues for us all.

The energy imperative is also promoting innovation. Yet we need to consider innovation, too, in terms of these trade-off decisions and business opportunities. In Victoria, Australia, we are investigating the mining of a high CO₂-burden coal deposit to generate high quality liquid fuels. This is not one

Figure 1. The 10 ICMM Principles

- Maintain ethical business practices and sound corporate governance.
- Recognise SD considerations in our corporate decisions
- Uphold fundamental human rights and respect cultures, customs and values
- Implement risk management strategies based on valid data and sound science.
- Seek continual improvement of our health and safety performance.
- Seek continual improvement of our environmental performance.
- Help conserve biodiversity and use land sensitively
- Encourage responsible product design, use, recycling and disposal.
- Contribute to the development of communities in which we operate.
- Engage in open and honest dialogue with our stakeholders.

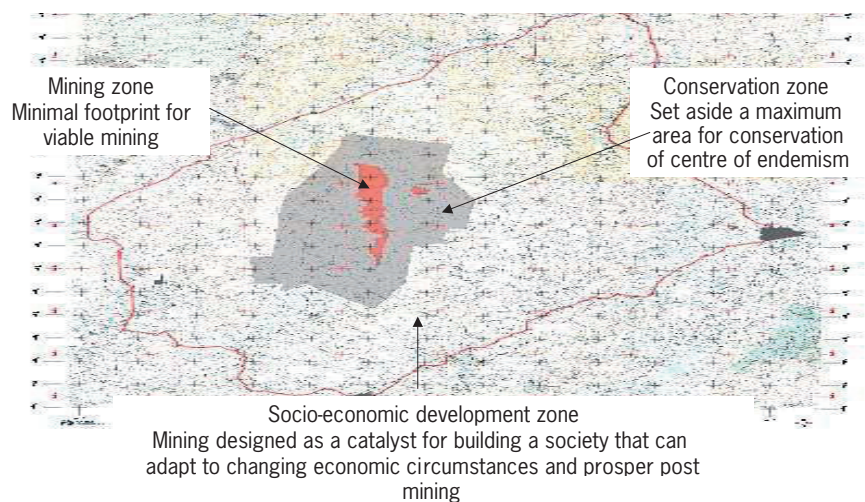


Figure 2. Integrated planning for a mine.

of our traditional fields of expertise, so we are bringing in partners to help us. This will involve sequestering carbon, but this time via oil wells in a depleting Gippsland Basin reserve. It is innovative, and once again business is moving into new areas which I do not think, traditionally, it would have considered.

Finally I should say that although it is important to have robust figures, and to be able to quantify the impact of the measures taken, sometimes one has to move ahead without this security. A case in point was a trade-off decision that the company made with very imperfect information in the early 2000s. Anglo American decided – despite significant financial and political sensitivities – to provide anti-retroviral therapy to our sub-Saharan African employees. Apart from some stunning health impacts which were wonderful to see, it proved to be a very

good business decision, particularly in reducing absenteeism and producing savings from reduced hospitalisation. The point, though, is that when the decision was made, none of those parameters was well understood or identified; in fact it would have been difficult to do so.

In summary, it is, first of all, very important to take a long-term view. Second, capital trade-off thinking, I think, helps all of us. Third, qualitative measures have a role as well as quantitative measures. Fourth, it is important to have good governance and tools available. Fifth, integrate sustainable development characteristics into the business. Sixth, it is very difficult to measure the value of some benefits and we need to collaborate and cooperate in trying to find effective ways of assessment. Finally, there are huge opportunities, I believe, that come with the challenges. □

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