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FEATURE ARTICLE

Climate change from an Antarctic perspective

Dr Julian Paren, Director's Assistant, British Antarctic Survey (BAS)

The Antarctic ozone hole was an early warning of worldwide thinning of the ozone layer. Its discovery precipitated international action to curtail the use of CFCs. Some believe that disintegrating ice shelves in Antarctica will be a corresponding stimulus in the debate on climate change. 'Science bites' from the Antarctic seem to leave a deep impression on the media and public alike. But like icebergs, nine-tenths of the science remains below the surface, unrecognised and unreported.

'Science bites' and images from Antarctica

On the basis of scientific advice, the UK Government has already set aggressive targets for reduced CFC production and the emission of greenhouse gases. It is now grappling to produce a parallel energy and transport policy. Perhaps this is more difficult to sell, since every sector of the community will be affected and the essence of contemporary life-style will come under attack. Public opinion and perhaps these Government commitments owe much to 'science bites' – news-worthy nuggets of science that reach the press and, for good or ill, linger in the imagination. Some are well reported, while others are inevitably hijacked

and misinterpreted. However, they share a common feature: each can be evoked by simple images. Visually attractive and uniquely evocative, Antarctica has produced some of the most memorable of recent science bites:

- British Antarctic Survey discovers the Antarctic ozone hole.
 - High-altitude NASA aircraft shows that chlorine monoxide (a breakdown product of CFCs) destroys ozone.
 - Greenhouse gases extracted from a 3,000m-long ice core confirm the direct link between global temperatures and the atmospheric concentration of greenhouse gases.
 - British Antarctic Survey shows that ice shelves around the Antarctic Peninsula are disintegrating as the regional climate warms.
- And the images that linger:
- Armadas of icebergs leaving ice-free conditions in their wakes.
 - Penguins migrating as their preferred icy ocean domain slips away.
 - A lonely plant, the first coloniser of an increasingly hospitable Antarctic island.
 - The view from a helicopter flying through gaping fissures in ice shelves.

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- Maps which show that the loss of ice has already changed the outline of a continent larger than Europe.

The hardcore science underlying the science bites may be less glamorous and less clear-cut, but this is the pursuit of our research teams; consolidating the foundations of understanding for future decision making. In this article I look beyond the science bites, and describe from a scientist's perspective the importance of Antarctic research in the climate change debate.

The polar regions in the global climate system

In the past the study of the meteorology of the polar regions was neglected in favour of the tropics and mid latitudes. Today, it is clear that the global climate system must be understood in its entirety. Polar processes must be understood and represented correctly in physical models before even UK weather forecasts can be optimised. Considerable progress has undoubtedly been made in weather and climate prediction, as faster computers have allowed higher spatial resolution. Nonetheless, real problems remain for climate prediction, in the way that sea ice and ocean processes are mathematically described. Collaboration between BAS and the Met Office's Hadley Centre for Climate Prediction and Research has contributed to improvements in the Unified Climate Model, the UK's prime numerical General Circulation Model (GCM), and model outputs are validated using an archive of climate and glaciological data from the Antarctic.

A future polar world?

Unfortunately the different GCMs do not yet agree on the rate Antarctic climate should be changing in response to the atmospheric changes since the Industrial Revolution. Nevertheless, the Unified Climate Model and other GCMs do predict that in 40 years' time the poles will have warmed faster than anywhere else on Earth in the winter season, and sea ice will be less prevalent. It is therefore natural for scientists to look to the polar regions for decisive evidence of climate change. Unique features of the local climate ensure that the continent is susceptible to change, especially in winter when sea ice is close to its maximum extent. For example, one local feedback process relies on the fact that ice and snow surfaces absorb so little solar energy. If the extent or duration of sea ice or snow-covered ground were to diminish, enhanced heating of the lower atmosphere should result, and more ice could then melt.

Apart from the Antarctic Peninsula, statisticians maintain that the Antarctic has experienced no 'significant' change in climate in the last 40 years. However, in general, coastal sites have tended to be warmer while the interior has cooled, albeit insignificantly.

Remarkable warming

Although there is large interannual variability, fitting a straight line through data from the Antarctic

Peninsula shows that, already the warmest sector of Antarctica, it has warmed by 2.5°C since continuous records began in the 1940s. The warming is greatest in the winter season. The earliest measurements were made by the Royal Navy Operation Tabarin expedition and these were continued by the Falkland Islands Dependencies Survey which finally became BAS. The warming has been accompanied by the retreat of ice shelves, the recession of small glaciers, an extended period of summer melting and absence of lying snow, an increasing incidence of winter snowfall and summer rainfall, and even a ten-fold increase in the numbers of a flowering Antarctic plant. The most likely cause of warming is that in recent decades an increasing number of storms originating to the west of the Antarctic Peninsula have brought in milder air masses from mid latitudes. But the current generation of GCMs fail to reproduce the Antarctic Peninsula warming convincingly.

The meteorological records show that the Antarctic Peninsula experiences Antarctica's greatest year to year variability of temperature. Most pronounced in the winter months, this is associated with striking variations in the extent of sea ice and in the direction and character of the prevailing winds. BAS is trying to fathom why the so-called 'pole of variability' lies to the west of the Antarctic Peninsula rather than spread in a ring around the Antarctic, the favoured tracks of the most energetic weather systems. BAS meteorologists suspect a link – a teleconnection – from the tropical Pacific Ocean, where the vagaries of El Niño have such a profound influence on the whole climate system, through the mid latitudes to the Antarctic Peninsula.

Disintegrating ice shelves: why so fast?

Floating extensions of glaciers are called ice shelves; they have an interface with both the ocean beneath and the atmosphere above. They were once thought to be permanent features of the Antarctic landscape but since the 1940s ice shelves have systematically disintegrated from around the Antarctic Peninsula. The discovery confirmed that the viability of ice shelves was climatically controlled, and the limit of viability was being pushed southwards by the regional warming. Why are the ice shelves disintegrating so fast? Three features unique to the area are implicated. First, the speed of regional climate change which has ensured that summer temperatures exceed 0°C. Secondly, the disintegrating ice shelves have an internal temperature close to 0°C and so further warming causes melt. Thirdly, the extended melting season has allowed meltwater to trickle down into the heart of the ice shelves reducing the strength of the ice, precipitating an ice shelf to collapse. Computer models have confirmed that ice shelves that were stable in the previous climate can no longer sustain themselves. If the climate were to warm at the present rate, other ice shelves along the Antarctic Peninsula would disappear, but the implications of these events should not be exaggerated.

Good news for sea level

While the Intergovernmental Panel on Climate Change (IPCC) has calculated that sea-level is set to rise by 13-94 cm in the next 100 years, the calculation has ignored any contribution from the Antarctic Ice Sheet because too little is known to make a useful estimate.

The loss of all the Antarctic Peninsula ice shelves would have a negligible effect on sea level. As Archimedes would happily have explained, when an already floating ice shelf melts, it has no impact on sea level. And for these ice shelves their catchment basins contain so little ice that their loss – the ocean's gain – would be insignificant.

Further south lies the West Antarctic Ice Sheet (WAIS) which rests on rock below sea level and so may well be unstable. The disintegration of the ice shelves around WAIS could ultimately unleash the ice sheet and contribute to a rise in sea level of the scale not seen since the demise of the Northern Hemisphere ice sheets at the end of the last ice age. There is, however, confidence that these ice shelves will be slow to follow the behaviour seen in the Antarctic Peninsula. More than 10°C of warming is needed before summer melt water could start to permeate the ice, well outside expected bounds for centuries to come. And perhaps, long before then, another process will come into play which could actually thicken the ice shelves and prolong their life. BAS scientists have shown recently that sea-ice formation drives the ocean circulation beneath Ronne Ice Shelf and controls the extent of melting at its base. As the Southern Ocean warms, less sea ice will be produced and melting at the base could actually diminish – a surprising result that is the subject of much ongoing work.

Increasing Antarctic snowfall is a future prediction of GCMs which could help to slow the rate of future sea level rise. But at present there is no consensus on whether the Antarctic ice sheet beyond the Antarctic Peninsula is growing or decaying. Both ground surveys and data from satellite altimeters, such as deployed on the European ERS-1 satellite, are used, but no substantial changes in the flow of the ice have been detected. In places the ice sheet appears to be thickening by a few centimetres each year, but in others thinning by a similar amount. Sea level rise prediction will always carry a major uncertainty until the Antarctic Ice Sheet is better understood.

A longer climate view: the ice core detectives

Extending the Antarctic climate record back beyond the observational era is the rationale for drilling ice cores. Several dozen have been drilled that embrace the last century and several cores go back thousands of years. By studying a range of constituents in the ice, glaciologists are steadily improving their overall view of climate and climate change.

Ice cores have provided the only direct evidence that carbon dioxide and methane have increased substantially since the start of the Industrial Revolution. This comes from the analysis of air bubbles trapped in

ice cores taken from the coldest parts of Antarctica. Compared to the previous 160,000 years, the greenhouse gases in today's atmosphere are at unprecedented high levels and increasing unnaturally fast. Atmospheric composition is now beyond the natural range seen in ice cores, confirming that never has there been so great a potential for rapid climate change.

A clear distinction has emerged between the data gleaned from ice cores drilled in the interior of Antarctica, where today's climate lies within the natural variability of the last millennium, and the coastal fringes. The coastal climate is sensitive to variations in sea ice and there is a substantial variability from one location to another. At the coasts three of the important indicators of climate are now at extreme values. Air temperatures and snowfall at some sites are at their highest values for many centuries, and dust, blown from rock and ice-free ground, is at the highest level for 1,500 years in the Antarctic Peninsula. The hunt is on to identify a 'fingerprint' in ice-core composition that can be associated with massive breakouts of ice. If this is successful, recent events in the Antarctic Peninsula could be put into better perspective.

Over even longer time periods, the Earth experienced very large climate shifts as ice ages came and went. Until we can understand the causes of these changes, climate models must be incomplete, and they could miss important processes. Ice cores drilled through several kilometres of ice can provide the longer perspective. BAS is a major participant of the multinational EPICA project, which will retrieve 250,000 years of climate history from the Antarctic ice sheet.

Impacts in the Southern Ocean ecosystem

Some important research seldom attracts the media and never becomes a science bite. One example is the impact of climate change on the marine ecosystem of the Southern Ocean. Observation of sea-ice extent, based both on twenty years of circum-Antarctic satellite data and ninety years of observation in a single island group, shows wide extremes. For parts of the ninety year record the variability is periodic and is associated with a 'wave' propagating around the sea ice zone. The whole behaviour is probably a complex response to this local wave and periodical forcing by El Niño. Overall, sea ice here has not declined in the last 25 years.

The impacts of the variability on the Southern Ocean ecosystem are large. Interplay between ocean circulation and sea ice extent determines the breeding success of some key plankton populations. These in turn are the food for predators, and at some locations the changes in food supply give rise to dramatic changes in population dynamics. These changes can be traced back to the 1920s, again suggesting that the observed changes are natural.

The year-to-year differences in plankton composition and abundance cause variation in the success of


some key Southern Ocean fisheries. One of the plankton species affected by the sea-ice variability is the Antarctic krill. This is the subject of one of the largest Southern Ocean fisheries but also forms the food supply for several other exploited species.

Plankton also play a role in regulating the carbon dioxide concentration in the atmosphere. Minute algae remove carbon dioxide, converting it to 'harmless' organic material. A fraction of this is removed permanently as it sinks to the seabed but the rest is recycled and the carbon dioxide returns to the atmosphere. The composition of the plankton community ultimately regulates how much of this carbon is recycled, but could itself be regulated by changing environmental factors such as the alterations in incident ultra-violet light.

BAS today

The public image of the British Antarctic Survey (BAS) during its early days may have been akin to that now reserved for explorers who visit Antarctica solely for adventure. The science bites that have emerged from BAS since then have radically altered this public perception. BAS is now well known to be a world leader in environmental research. But behind each newsworthy science story, a team of scientists labour for the insight from which a science bite is distilled. The public are becoming increasingly familiar

with images of some of them: the chemists dressed like surgeons examining ice cores from the cleanest environment on Earth; statisticians sifting evidence of change from archives and historical records; mathematicians slowly building the software to help us predict the dynamics of ice, ocean and the atmosphere. And in the Antarctic, by day and night, meteorologists make weather observations that feed into global models of weather and climate, and ozone scientists continue to take measurements which, we believe, in 50 years will show that prompt action to curb CFCs has healed the Antarctic ozone hole.

It seems increasingly likely that media-based green lobbyists have already peaked in their potency to sway public opinion and urge Governments to pursue what they see as environmentally-friendly policies. However, BAS and its parent body, the Natural Environment Research Council (NERC), will continue to be influential by providing information distilled from hardcore science, without hype or spin. All of NERC is squaring up to the challenge to promote, not just the science bites, but all the science behind them, that will inform public debate and allow decision makers to lead us into the future. 

■ *Dr Julian G Paren, Address to Parliamentary Scientific Committee, Part II, 24.11.97.*

British Antarctic Survey, High Cross, Madingley Road, Cambridge CB3 0ET. E-mail: j.paren@bas.ac.uk

IES INFORMATION

New IES address

The Institution's new postal address is:

**PO Box 16,
Bourne, PE10 9FB**

The telephone/fax number is unchanged: 01778 394846.

IES Web Site:
<http://www.greenchannel.com/ies>

Email: ies@greenchannel.com

The 1998 Burntwood Memorial Lecture which was due to take place on 12 November 1998 has been rearranged for Monday 8 March 1999. This is due to a necessary change of plans by our speaker, the Rt Hon John Gummer MP. Further details will be published shortly. We apologise for any inconvenience this may cause.

The Ralph Brown Expedition Award 1999

This annual research award is worth £15,000 and will be made to the leader of a multi-disciplinary research expedition associated with the study of rivers, wetlands or shallow (less than 200m) marine environments. The project may be located anywhere in the world and should be of potential benefit to the host country and local community.

Applicants should be over 25, of any nationality, and preference will be given to teams involving host country nationals. Applicants proposing to spend less than six weeks in the field are unlikely to be successful. Undergraduate expedi-

tions are not eligible.

The deadline for applications is 30 November 1998, and the award will be made in early 1999.

For detailed guidelines and/or further information please contact:

The Ralph Brown Expedition Office,
Royal Geographical Society (with
the Institute of British Geographers),
1 Kensington Gore,
London SW7 2AR.
Tel: 0171 591 3073
Fax: 0171 591 3031
Email: grants@rgs.org
<http://www.rgs.org>

News of IES members

Steve Winter, a student member of the Institution and in his first year at the University of Lincolnshire and Humberside has been awarded the Barclays Bank Prize for best performance on year 1 of the BSc (Hons)

Environmental Science Course. A cash prize of £250 has also been awarded.

Our congratulations to Steve and encouragement for the remainder of the course (which is one accredited by the Institution).

The Hon. Secretary's news desk...

Change of address

After 26 years at 14 Princes Gate, the Institution is changing its address. Our long standing arrangement for a shared address with the Royal College of General Practitioners has come to an end due to increasing administrative pressures. For some time now the Secretariat has been operating from Bourne in Lincolnshire (to be close to the Honorary Secretary) but maintaining a presence in London through the shared address. In future all post should be addressed to:

**PO Box 16, Bourne, Lincolnshire,
PE10 9FB.**

We still expect to maintain a London presence through our registered company address which will also be changing. Further advice on this will be published in due course.

Consultation responses

A number of responses have been prepared and submitted since August and these are as follows:

- *Town & Country Planning: the Assessment of Environmental Effects*, to the DETR, prepared by Jim Whelan.
- *Recovery of Costs: Local Enquiries*,

to the DETR, prepared by Ian Smith.

- *Urban Task Force: Prospectus*, to the Urban Task Force, prepared by the Hon. Secretary.

The latter response was of some significance and is reproduced separately in the Journal. Several other responses are in the pipeline.

HDRA campaign

The Henry Doubleday Research Association has recently advised us of a new campaign that has been launched entitled 'Grow Your Own Organic Fruit and Vegetable Campaign'.

The Association is active in the promotion of organic gardening and farming methods and enjoys strong support (Professor David Bellamy, an IES Fellow, is prominent!). It operates Yalding Organic Gardens in Kent and Ryton Organic Gardens in Warwickshire (both open to the public) as well as being active in research work into organic farming methods both in the UK and abroad.

We would recommend the new campaign for your support. Further details of the campaign or the work of the Association can be obtained from: The Henry Doubleday Research Association, Ryton Organic Gardens, Coventry, CV8 3LG.

RGS awards

The Royal Geographical Society (with the Institution of British Geographers) has recently announced its latest programme of research grants and travel awards. These are quite varied and extensive and details appear on Page 4.

Further information is available from Louise Rettie or Mrs Shane Winsor at the RGS, Tel: 0171 591 3000.

Subscriptions

Council at its meeting on 7 October 1998 approved new subscription rates for 1999. These are as follows:

Fellow	£60
Member	£50
Other grades	£40
Student	£13
Associates (eg, colleges)	£50

Nominations for Council 1999

We are now approaching the time of year when advance arrangements are put in hand for the next Annual General Meeting, in March 1999. Below you will find a nomination form for membership of Council. All corporate members are eligible to serve and may become candidates once proposed and seconded by two other corporate members. (Membership subscriptions for 1998 should have been paid.)

There are currently a number of vacancies on Council and a number of present Council members will be retiring at the end of their three-year period.

In order to allow adequate time to prepare voting lists (if necessary) for issue with the AGM papers all nomination forms must be returned to the Hon. Secretary no later than 6 January 1999.

A healthy organisation always has room for new ideas and new initiatives and the Institution would welcome applicants. A number of programmes are already in prospect for the future but to realise these within a reasonable time-scale requires a full complement of energetic Council members.

If you have the interest, the time and the enthusiasm, the opportunity exists for you now. Please use the form on the left.

Election of members to Council 1999

I Membership No
(PRINT NAME)

nominate
for election to Council of the Institution of Environmental Sciences.

Signature (proposer)

Seconded by **Membership No**
(PRINT NAME)

Signature (seconder)

I **hereby confirm that**
I am willing to stand for election to Council as proposed.

To be returned to: The Hon. Secretary, IES,
PO Box 16, Bourne, PE10 9FB.

RAF

Forthcoming events and conferences

5-6 November: Expanding Hong Kong – a dredging record

One Great George Street Conference Centre, London. Dredging works in Hong Kong have included some of the most complex, demanding urban reclamations ever undertaken, including Hong Kong Airport. The conference includes papers describing how these projects were successfully completed, including environmental assessments and monitoring of the projects. Details: Carol Chin, Thomas Telford Conferences, Institution of Civil Engineers, One Great George Street, London, SW1P 3AA. Tel: 0171 665 2316

6 November: British Library environmental training courses:

sources of environmental information. Venue: BLT Training Suite 2, Shereton Street, Soho, London W1V 4BH.

12-14 November: Coastal and ocean modelling. International Conference, Valletta, Malta.

Covers current research, advances in modelling techniques with particular reference to Princeton Ocean Model (POM). Details: The Secretary, International Conference: Coastal &

Ocean Modelling, Foundation for International Studies, University Building, St Paul Street, Valletta, Malta. (356) 248 218, 234121/2

17-20 November: Contaminated land: site investigation and assessment

Loughbrough University. £833.95 Details: Rachel Lindley, Centre for Hazard & Risk Management, Loughbrough University, Loughbrough, Leics LE11 3TU. Tel: 01509 222 161

24-25 November: Waste to energy.

The Grand Westin Demeure Hotel, Amsterdam. £849 Details: The booking department, IBC UK Conferences Ltd, Gilmoora House, 57-61 Mortimer Street, London, W1N 8JX. Tel: 0171 453 5491

25-27 November and 3-5 February 1999: Initiating and sustaining stakeholder dialogue:

a foundation course in facilitation & mediation for the environment, Derbyshire. Six-day sandwich course. Details: Freya Levy, The Environment Council. Tel: 0171 632 0112

3 December: Environmental information on the Internet

Venue: British Library Science Reference Information Service, 25 Southampton Buildings, Holborn, London WC2A 1AW. A further information contact: Maureen Heath 0171 412 7470.

3 December: An introduction to facilitation for biodiversity action planners.

One day workshop. Details: Freya Levy, The Environment Council. Tel: 0171 632 0112

2-5 March 1999: Urban air quality, measurement, modelling & management.

International Conference. Technical University of Madrid. Details: Lucy Hamilton, The Institute of Physics, 76 Portland Place, London W1N 3DH. Tel: 0171 470 4800

17 March 1988. I ChemE Meeting on VOCs from Batch Processing at Silsoe Research Institute, Wrest Park, Silsoe. Details: Clive Hadfield, Box 8, Sandbach CW11 3FB. Tel: 01270 762 630.

BOOK REVIEW

Risk assessment and risk management

This is No. 9 in the series *Issues in Environmental Science and Technology* published by the Royal Society of Chemistry. Risk Management techniques are being used increasingly in policy formation both in government and in industry. When applied in an environmental context it is of particular relevance.

This set of papers is therefore both topical and relevant. As with environmental assessment and environmental management, risk assessment and risk management interact and interweave. The seven papers in this publication provide a good balance between theory and principles, policy, technical analysis and practical application in varying situations.

The inter-relationships of risk assessment, risk evaluation, risk analysis and risk management are examined in the

Title:	Risk Assessment and Risk Management
Edited by:	R. E. Hestor and R. M. Harrison
Publisher:	The Royal Society of Chemistry, 1998
ISBN No.	0-85404-240-7
Price:	£19.50 168pp, paperback

context of the siting of waste incinerators and the management of contaminated land in both the UK and the USA.

The regulation of risk based on techniques developed by the HSE is related to the public demand for a cleaner environment, better housing and safer food. Environment Agency policies for the control of water pollution illustrate the

use of computer modelling in risk assessment.

In a somewhat different context is a study of quantitative cancer risk assessment related to carcinogens in the environment. Risk to health associated with landfilling of household wastes provides another quantitative case study in risk evaluation.

Environmental risk assessment as applied in the management of chemicals is the subject of a technical study and this is extended in an aquatic risk assessment and management for pesticides.

The set of articles provide a wide-ranging view of the many aspects of risk assessment and risk management and is recommended reading for environmental practitioners in both the public and private sectors.

Dr R. A. Fuller

New members

The IES is pleased to welcome the following to membership of the Institution:

Mr G. Brown	Environmental Scientist Vectra Technologies Ltd	Mr M.J.R. Lattughi	Analytical Chemist Environment Resource Technology Ltd
Mr S.T.S. Cheung	Environmental Management Consultant, Federal-Mogul	Miss S.L. Mackenzie-Ross	Environmental Engineer Golder Associates
Mr R.E. Cowell	Environmental Protection Officer Redcar & Cleveland Council	Mr A.D. McConkey	Recent Graduate University of St Andrews
Mr J. Ford	Analyst Thames Water Utilities Ltd	Miss T.A. Matthews	Recent Graduate University of Bradford
Mr G.C. Graham	Senior Environmental Scientist CES Ltd	Mr A. Pearson	Technical Assistant Shanks & McEwan
Mr I.D. Hodson	Recent Graduate University of Sunderland	Mr M. Proffitt	Student
Miss E.C. Hollingsworth	Environmental Scientist Terence O'Rourke Plc	Mr D.J. Richards	Recent Graduate Staffordshire University
Mr H. Hussain	Recent Graduate Coventry University	Mr M.G. Smith	Assistant Environmental Consultant, ERT Ltd. Orkney
Mr G.L.M. Jambor	Student	Mr D.J. Watkin	Environmental Geologist Ministry of Defence
Mrs L. Kennedy	Environmental Engineer Mitchell McFarlane & Partners Ltd	Mr P.J. Workman	Environmental Scientist Risk Management Centre Ltd
Mr A.I. Knight	Student		

GreenBytes spreads the environmental message

A low-cost computer program designed to promote environmental awareness among the public has just been launched in the UK.

Aimed initially at office workers and home computer operators, GreenBytes has the backing of Going for Green, Britain's biggest environmental awareness campaign aimed at the general public.

The program has been developed by the Bureau for Environmental Education and Training in conjunction with Generation Software.

'We believe GreenBytes will get the message across while helping to

improve business for the companies who take it up,' said John Baines of BEET.

'Many environmentally-aware companies nowadays refuse to deal with those who do not have a similar policy in place. Using GreenBytes shows they do have a commitment to the environment.'

The GreenBytes program displays an on-screen environmental tip or fact every time the computer is switched on. There are currently more than 600 tips in the program and new ones are being added all the time.

GreenBytes has a low single-user

price of £10 (plus delivery and VAT). Designed to be entertaining and thought-provoking rather than didactic, the tips come under a range of headings such as *In the office*, *Travelling*, *At home*, *In the garden* and *Good news*.

Users have the choice of selecting the next screen for further information, choosing a new tip or simply cancelling the screen and carrying on with their work.

For further information, please contact: John Baines, BEET, 17 Hillside Road, Chorleywood, Herts WD3 5AP.
Tel/fax: 01923 282815
Email: 100535.1275@compuserve.com

ENVIRONMENTAL NEWS

Urban Task Force prospectus

A response by the Institution of Environmental Sciences – September 1998

This response is based on the collective knowledge and views of a group of environmental practitioners which in turn are derived from a varied experience of work carried out in separate organisations. They are therefore a synthesis of opinions on particular issues rather than individual pieces of recorded research.

Comments have been generally concentrated around a central theme relat-

ing to the scale, nature and importance of individual communities although the consultation obviously covers other considerations and other details.

Why is there a problem?

The underlying reasons for the movement away from urban areas is varied and complex. However, we perceive that amongst the most significant of these is

the breakdown of the sense of community. Belonging to and taking part in the activities of a living community is fundamental to civilised life. The lack of this sense leads, in the extreme, to feelings of isolation, loss of safety and security and growth in crime rates.

These more extreme situations have been exacerbated by the deterioration in family structures and have a particular

effect on the elderly. This is a social, rather than a physical, problem and can only be ameliorated by improved facilities.

What sort of places do people want to live in?

Following on from the comments above, obviously one of the most important things that people are seeking is the physical closeness of an active community life to which they can relate. This is most likely to occur in small-scale areas – the ‘village’ or, in urban terms, the ‘neighbourhood’. These must be large enough to support reasonable self-sufficiency in terms of employment, education, shopping, and recreation but still retain geographical compactness and short travel distances.

Modern trends in development have been to separate residential areas from employment centres, expanded schools, recreational facilities and most of all shopping. Together with the social influences noted above, these are destructive influences.

The post-war era saw the development of new planning principles (New Towns, neighbourhood – Radburn – planning, etc) and strong support for good innovative design at local planning levels. Through the 1980s and ’90s this initiative has largely been lost. Positive planning initiatives by county and district authorities have been singularly lacking and commercial considerations have been paramount. The only marked advance has been the abandonment of the ‘high-rise’ housing solutions which have been self-evidently a failure (both socially and structurally!)

We need a positive return to good planning principles of well designed, traffic segregated, low rise mixed-use housing; clearly identified neighbourhood units with adequate support infrastructures of local employment, education, shopping and leisure; and good local public transport. These principles need re-application in the existing urban context with the development of techniques for re-utilising brownfield and/or contaminated sites. (A very large number of urban areas all have derelict gas holder sites, for example, which need re-developing.) Cost of re-development is high, but new thinking in terms of social costs and benefits needs to be applied to demonstrate long term viability.

In terms of management for urban

communities (or any community for that matter) the solution can only lie in devolvement of responsibility. The district council system does not work in this context, being too remote and not sufficiently involved or caring. The old demographic areas covered by parish councils should be revived as neighbourhood units with considerable delegated powers to manage their own local affairs and promote local initiatives. Again, the economic thinking and rationale will be difficult, even painful, as significant financial investment will be required.

How can we achieve our goal?

The current planning system is reasonably structured, albeit with the fundamental flaw of the missing tier at grass roots – the neighbourhood level. Initiatives to promote voluntary involvement, such as LEAPS, are excellent but these lack administrative functions and responsibility and tend to be advisory

❶ *The district council system does not work... being too remote and not sufficiently involved or caring. The old demographic areas covered by parish councils should be revived as neighbourhood units with considerable delegated powers to manage their own local affairs...❹*

rather than predominantly functional in their own right.

Ensuring that the right skills are available to carry forward good development or redevelopment should *not* be a difficult task. Any major planning scheme, however, requires a team effort comprising the skills of town planning, economics, architecture, engineering, surveying, environmental science, sociology and management (not necessarily an exhaustive list). Other contributing specialisms will also be needed, encompassing traffic engineering, landscape design, acoustics, graphics, etc – the list is extendable! The selection and briefing of an adequate and integrated team is the function of the relevant planning authority and success in this area is rare. Often it is not attempted, a reduced number of un-related professional

appointments being made. Cut-price competitive fees from independent and uncoordinated consultants are now the norm rather than the exception, leading to inadequate performance.

When attempted, the selection process is often uninformed and faulty and lacking in one essential component – the right leader. Individuals with the wider range of knowledge of the varying skills involved, leadership qualities, management ability and relevant experience, are hard to find. Such appointments are, however, a key to successful implementation. Areas commonly neglected in major scheme plans are a proper attention to environmental issues and an appropriate consideration of the economic rather than purely financial implications.

How do we finance this?

As noted above, financial considerations, ie, capital cost, are the normal criteria applied to decision making in the public (and private) sector. Urban re-development is, by its nature, capital cost intensive. Economic justification and validation of schemes have therefore to look wider and take into account social benefits, life cycle and long term costs, cost benefit (ie, alternative cost scenarios) and accrued long term value (asset growth). Techniques of this nature were developed and applied in isolated cases during the ’70s but have largely lapsed or been abandoned. We would propose the revival and application of these principles. The demonstration of economic viability can be a strong factor in the attraction of enabling finance, whether from public or private sources. The Institution is working on the creation of suitable economic models based on previous work in this field but this is still in an early stage of development.

Note

The above is the text of a response to the Government Task Force chaired by Lord Rogers of Riverside. A working group is responsible for this response but shortage of numbers is inhibiting further development of the ideas and adequate participation in the future initiatives of the Task Force (seminars, round table conferences, further written submissions, etc). Would any member with relevant skill and interest and some time and enthusiasm wish to participate? If so, please write to Dr R. A. Fuller, Hon. Secretary, at the Institution.

Evidence of current urban air quality management practices in England

Clare Beattie, Alex Newton and Professor Jim Longhurst,

Air Quality Management Research Group, University of the West of England, Bristol

1. Introduction

A project currently underway at the University of the West of England is investigating urban air quality management (AQM) practices in England. The initial phase of the project involved a comprehensive questionnaire survey of district and county authorities, involving departments that the researchers identified as part of the problem or solution of urban air pollution.

The impact of air pollution, particularly on human health, is an issue of significant public and governmental concern. The UK has addressed these concerns through the Environment Act, 1995, resulting in the UK National Air Quality Strategy (1997). The Air Quality Regulations subsequently gave legal weight to standards and objectives for seven pollutants, which local authorities are obliged to reach by 2005.

The aim of this article is to give early indications of how these legislative changes are being implemented by local authorities in England. It should be noted that these are very much preliminary results in an ongoing project. Further details are available on request from the authors.

2. Evidence of current AQM practice

The results presented in this article are primarily from a survey of Environmental Health Officers carried out in April 1998. They represent a 56% response rate. Some results have been presented from the surveys of planning, economic development and transportation departments of local authorities carried out in June 1998 (30-50% response rates). All English authorities considered by the authors as 'urban' were included in the survey.

Monitoring air quality

All authorities except one were doing some form of monitoring, although this varied from a few NO₂ diffusion tubes to a comprehensive monitoring strategy for all seven pollutants covered by the Air Quality Regulations. Many authori-

ties (60%) were also planning to expand their networks in the next 12 months. A similar survey was carried out in 1994 (Crabbe & Elsom, 1995). Although not directly comparable, this previous study had a similar sampling strategy and found that 55% of major urban authorities did not have permanent real-time monitors. Four years on, 33% of author-

There is evidence that professions other than environmental health are participating but, particularly in regional groups, the environmental health profession still predominates. Economic development officers in particular are under-represented... 9

ities do not have real-time monitors of any sort. This represents a significant expansion of the local authority network in a relatively short space of time. In parallel, the national monitoring network (AWN) has also expanded rapidly, with 96 automatic sites now in operation in the UK.

Modelling air quality

Modelling is one of the more complex aspects of AQM, requiring skilled technical staff and substantial resource input. 42% of authorities surveyed had used some sort of dispersion model, which is in stark contrast to the situation in 1994 when only 5% of authorities had used any modelling techniques (although 19% had plans to do so) (Crabbe & Elsom, 1995). This is an area rapidly expanding with 54% of local authorities intending to undertake some modelling activity in the next 12 months, 51% of these for the first time.

Air pollution groupings

For any long-term air quality strategy, air pollution groupings are essential (particularly involving environmental health officers, economic development officers,

planning officers and transport planners), both within local authorities and between neighbouring local authorities. It is vital for the success of AQM that air quality implications are considered at the outset of any planning processes (for example transport, land use or strategic economic plans), and that due to its transboundary nature regional collaborations are formed. There is evidence that professions other than environmental health are participating but, particularly in regional groups, the environmental health profession still predominates. Economic development officers in particular are under-represented. This is further demonstrated by many economic development respondents indicating that they did not know enough about AQM to answer certain parts of the questionnaire. Many of these groups are only just forming, with many authorities commenting that they have only had one or two meetings. As changes in planning policy are likely to take some years before an impact on air quality is apparent, the issue of involving different professions must be addressed as soon as possible.

Dissemination of information

The effective dissemination of information is central to the AQM process as it is generally believed that public attitudes and behaviour will have to change, particularly with regard to transport choices, if the air quality objectives will be achieved by 2005. Public information strategies appear to be one of the elements of the process most lacking. Few authorities have effective, tested measures in place for disseminating up to date information, except in regular (mainly annual) air quality reports. Many authorities commented that they are only just beginning to address the issue of how to disseminate air quality information, particularly as more monitoring information becomes available.

Progress with the 'review and assessment of air quality' process

Local authorities are required to undertake a review and assessment of air

quality in their area by December 1999. This is a three-stage process of which all local authorities should complete the first stage, the results of which will indicate whether it is necessary to go on to a second, more complicated, stage, and similarly the third stage. Where any of the objectives set out in the Air Quality Regulations are not likely to be achieved within the local authority area by 2005, the authority will have to designate an Air Quality Management Area (AQMA). An action plan covering the designated area will then have to be prepared, setting out how the authority intends to achieve the objectives.

At present, 73% of urban authority respondents were at the first stage, with 12% on the second and 5% on the third stage. 10% of local authorities had not yet started. When asked what stage they envisaged reaching, 4% thought only a first stage would be necessary, 27% thought a second stage would be sufficient and 63% envisaged reaching a third stage. 6% were unsure. 38% of local authorities questioned thought they would have to designate an air quality management area, with 18% thinking this would be unnecessary and 44% unsure.

3. Conclusions

From the results of the questionnaire survey, it is clear that urban authorities in England are still at a very early stage of the AQM process. However, elements indicative of more advanced air quality management practices are increasing. It is therefore difficult to estimate how rapidly progress will be made with the AQM process, in order that the objectives set out in the Air Quality Regulations will be achieved by 2005. The next two years will be critical in the implementation of AQM with all local authorities having to undertake a review and assessment of air quality in their area. The authors intend to continue to monitor the process as it evolves.

Possible obstacles to the implementation of AQM include a lack of collaboration between different professions involved in the process. This study has illustrated that the involvement of other professions is vital and at present environmental health departments dominate. Land use and transport planners appear to be more involved at the present time than economic development officers.

Lack of funding is widely perceived within local authorities to be the main obstacle to an improvement in air quality.

This may in time change, with an increase in funding for many of these measures through supplementary credit approval, and also in the July 1998 integrated Transport White Paper.

One of the areas that is lacking in the process is the dissemination of information to the public. The dissemination of information is necessary for two main reasons. The first is to disseminate day to day air quality information and the second to make people more aware of the issues and policy choices, particularly with regard to their transport choices. Few authorities are publishing daily reports/forecasts, but this may in some part be due to the lack of real-time monitoring equipment in some areas. 43% of authorities were said to have policy measures in place to increase the awareness of the implications of transport policy.

From the results of the questionnaire survey, it is clear that urban authorities in England are still at a very early stage of the AQM process. However, elements indicative of more advanced air quality management practices are increasing. It is therefore difficult to estimate how rapidly progress will be made with the AQM process...

and choices. At the present time it is unknown whether this will significantly change behaviour or attitudes. What is clear is the need to rigorously test the effectiveness and efficiency of these policies and measures.

There is still a great deal of uncertainty surrounding many of the parameters, for example the impact on air quality of many traffic management measures, the best ways of disseminating information and procedures for accurately quantifying emissions. More research is required, not only within these areas, but also epidemiology, modelling techniques and the role of technology (such as cleaner fuels) in the process.

The study will continue to investigate in more depth the levels of integration and co-operation within and between district and county authorities, between neighbouring authorities and also between other participants involved in the AQM

process, for example the environment agency and air quality consultants. An analysis of these results will be available over the coming months. The project will also attempt to investigate the development of the process as it moves from the domain of environmental health departments to planning, highways and economic development departments, which will be absolutely vital in providing long term solutions to poor air quality.

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This section of the Journal is in response to the growth of news, information and activities which underpin the Education Committee of the IES.

Special prominence will be given to student activities and projects, national and international initiatives, campus developments and research in order to capture the diversity, wealth and vitality of

modern environmental education.

Readers are invited to send articles and letters to:

■ **Derek Blair, School of the Environment, University of Sunderland. Benedict Building, Sunderland SR2 7BW.**

■ **Tel: 0191 515 2737.**

■ **Fax: 0191 515 2741.**

■ **E-mail: derek.blair@sunderland.ac.uk**

Popularity of environmental studies/science

New figures from UCAS show that many university and college subjects have attracted more students than last year, but Environmental Studies/Science is not one of them.

According to recent UCAS figures (23/9/98) the total number of applicants accepted (including those deferring entry) for the past three years were:

Applicants	1998	1997	1996
Applicants having had conditional offers confirmed	274,486	274,140	242,156
Applicants having found a place in Clearing	44,959	46,725	39,959
Total number of accepted applicants	319,445	320,875	282,115

In addition there were over 100,000 applications with outcomes pending, eligible for clearing or withdrawn, so final figures cannot yet be confirmed. If we concentrate only on those that have already accepted places at the time of writing, however, 1998 figures are narrowly (-0.5%) down on the year before, due mainly to slight decreases in males and over 21 year olds on the previous year.

In the case of Environmental Science/Studies, as defined in the UCAS F9 category, the decline is about 15%. Environmental courses are notoriously diverse in type and it is not always easy to disentangle them from traditional disciplines using the prevailing UCAS categories. Interestingly, UCAS claim that there has been an increase in multidisciplinary courses, such as science with an arts subject or physical science with social science, a trend which inexplicably has not benefited Environmental Science which often features such multi- or inter-disciplinarity. Nor is it clear why the growth in the

popularity of some more vocational degrees has not been reflected in Environmental Science/Studies.

Comparing subject areas is still provisional but it is clear from Table 1 below that some important shifts are occurring. Biology and Chemistry as two traditional and relevant science A levels for environmental courses have

registered serious decline whilst Geography has held its popularity.

The decline in the F9 category has been detectable for several years (see Table 2 overleaf). If we accept the provisional figures for 1998 there has been a decline of 26.2% in accepted applications since 1995. The F9 category has slipped to below 40th in the numerical popularity of UCAS subjects for the first time this year. To environmentalists this decline is disappointing but reflects the bald facts that, despite Kyoto, BSE and transport, for example, environmental topics have slipped down the political and public perception scales. Furthermore, career data on environmental students remain unexceptional. A recent Higher Education Statistics Agency report shows that

on average 6% of graduates for 1996-97 were unemployed 6 months after graduation. Students in environmental, biological and physical sciences, planning and social and economic studies continue to perform worse than the national average. The figure for biological sciences, an academic field closely allied to environmental science/studies, is 8%.

Paradoxically, there is a continued, if slower, growth in the supply of Environmental Science and other physical science. CRAC Guides indicate that numbers of first year places available on courses such as Environmental Sciences, Environmental Studies, Environmental Management and Environmental Protection (ie, corresponding to UCAS course codes F9 and K3) have increased from about 3,500 in 1994-95 to about 4,700 in 1996-97, an increase of 32%. The number of institutions offering programmes in these areas increased from 83 in 1994-95 to 95 in 1996-97 especially in traditional universities. Now virtually every HE institution offers some sort of environmental course. Sometimes these are related to traditional disciplines, eg, Environmental Physics (Hull), or

Table 1: Comparison of accepted applicants for selected subjects, 1997 and 1998

Subject	1998*	1997*	% change
C1 Biology	5393	6176	-12.7
F8 Geography	5145	5058	+1.1
F1 Chemistry	4026	4456	-9.7
F9 Environmental and other physical science	2541	2992	-15.1

* 1997 figures are final, 1998 are latest as at 23/9/98 (Source: UCAS)

Environmental Chemistry (Surrey) or other amalgams such as Environmental Geosciences (Edinburgh) or even Environmental Biogeochemistry (Glasgow). Some try to convey a vocational or applied stance such as Environmental Control (Greenwich), Assessment (Portsmouth), Monitoring (Plymouth) or Pollution Science (Bradford). Links with Countryside Recreation (Sheffield Hallam) Management (Wye) and Planning (Cheltenham & Gloucester) are common as are those with Wastes Management (Nene), Water Resources (Oxford Brookes) and Energy (Napier).

Some of the emphases of new courses are unclear from their titles. The market has become saturated and complicated by overlapping and fragmented specialisms, a problem identified five years ago in the Toyne Report. Since the pioneer days of new environmental courses such as at Lancaster, Plymouth, Sunderland or UEA a quarter of a century ago, the average punter has a real problem in selection now, notwithstanding the changing fashionability of different and competing courses. Good quality environmental courses are, however, still in demand. Interestingly, those environmental courses accredited by the IES since 1995, such as at Manchester Metropolitan University, have generally maintained their numbers in comparison to last year, a satisfying fact for the professional body which has championed environmental education in HE for more than a quarter of a century.

Forthcoming events in environmental education

October 24-25

1998 Human rights and environment
Third World First, 4a East Avenue,
Oxford OX4 1XW
Tel: 01865 245678
E-mail: twf@gn.apc.org

March 14-20 1999: Environmental education: from policy to practice

British Council international seminar,
London. Contact: International
Seminars, British Council, 1 Beaumont

Table 2: Applications accepted 1995-97

1995	Men	Women	Total
HND	142	78	220
Environmental science/studies	923	751	1,674
Applied environmental science	448	344	792
Earth Resources	134	72	206
Pollution Control	88	63	151
Other environmental and physical sciences	213	187	400
Total	1,948	1,495	3,443
1996	Men	Women	Total
HND	123	61	184
Environmental science/studies	746	710	1,456
Applied environmental science	427	335	762
Earth Resources	73	64	137
Pollution Control	104	64	168
Other environmental and physical sciences	159	181	340
Total	1,632	1,415	3,047
1997	Men	Women	Total
HND	118	64	182
Environmental science/studies	813	659	1,472
Applied environmental science	438	299	737
Earth Resources	78	56	134
Pollution Control	82	60	142
Other environmental and physical sciences	174	151	325
Total	1,703	1,289	2,992

(Source: UCAS Dept of Research and Statistics)

Place, Oxford OX1 2PJ.

Tel: 01865 316636

E-mail: international.seminars@britcoun.org

April 15-17 1999

Environmental Education

Association of University Departments
of Environmental Sciences in Europe
(AUDES),
Organising Committee,
Haldenbachstrasse 44,
CH-8044 Zurich
Tel: ++41-1-6325892
E-mail:
audes-conference@umnw.ethz.ch

'Third World First'

Lecturers in over 65 universities across the country are bringing Third World First's annual conference to the attention of their students.

This provides excellent educational opportunities to students on a wide range of global issues. Third World First (3W1) is the national organisation that runs educational campaigns aimed at raising students' awareness of poverty, human rights and environmental degradation.

Third World First's annual conference is the largest student campaign event in Europe. It provides excellent educational opportunities for students to become informed on a range of global issues by top speakers.

Speakers at recent conferences have included Clare Short MP, Susan George, David Bull, Director of Amnesty International British Section and Charles Secrett, Director of Friends of the Earth. Workshops held by over 50 NGOs provide in-depth understanding of issues, and train students in the skills of active citizenship.

Lecturers are being asked to become part of their Lecturers' Network, by promoting this and other events to their students. This ultimately serves to increase their students' awareness and involvement in global issues.

If you would like further information, or would be happy to bring Third World First events and activities to your students, please do not hesitate to get in contact:

Nicola Allsop,
Third World First,
4a East Avenue,
Oxford,
OX4 1XW.

Tel: 01865 245678

Fax: 01865 200179

E-mail: twf@gn.apc.org

Homepage: <http://www.oneworld.org/twf/>

Meeting the UK's carbon dioxide reduction commitment for 2010

Ian Fells, Professor of Energy Conversion, Newcastle University

The problem of the greenhouse effect and global climate change is dominated by carbon dioxide emissions. Since the beginning of the industrial revolution the atmospheric concentrations of carbon dioxide have increased from 280ppmv to about 350ppmv in 1990. The addition of manmade emissions to the much larger natural emissions exceeds the rate of absorption by the world's oceans and forests by about 6 GtCy⁻¹. There is considerable evidence that this small imbalance is already causing climate changes, resulting in a temperature rise of around half a degree since 1900 and sea level rise of about 15cm. But worse is the possibility of increasing instability of the weather machine leading to storm surges and the like which have profound effects on island and coastal economies.

The Prime Minister of the UK has made an heroic commitment to reduce carbon dioxide emissions by 20 per cent in the year 2010 over the 1990 base which was 158 million tonnes of carbon (mtC). By good fortune the UK will be one of the few countries to meet the original commitment made in Rio de Janeiro in 1992 to stabilise CO₂ emissions by the year 2000 at 1990 figures. This has almost entirely arisen in the UK because the newly privatised electricity industry has switched out of coal-fired power stations to gas-fired power stations and nuclear power generation has improved dramatically providing well over 30 per cent of UK electricity in the last quarter for which there are results in 1997. In every other respect the attempt to curb greenhouse emissions by improved energy efficiency has failed. In Germany too, the 2000 commitment will be met, but largely because of the absorption of East Germany into West Germany making possible the wholesale closure of inefficient energy intensive industry in the east. Other countries have been conspicuously unsuccessful; for example the United States will miss the mark by more than 10 per cent. It remains to be seen what the outcome of the Kyoto Conference will be; the European Union is committed to a 15 per cent reduction in CO₂ emissions, unevenly balanced among its various constituent members, but the UK commitment of 20 per cent is the largest proposed and will be difficult to achieve although it points very much in the right direction. The developed industrialised countries must give a lead if developing countries are to follow suit. The current US stance is for the industrialised countries to reduce their CO₂ emissions to 1990 levels by 2012, a very much watered down version of the Rio agreement of 1992 and one which could lead to an overall rise in world emissions of 30 per cent in the next 15 years.

So how is it to be done? The 1990 CO₂ emissions figure for the UK is 158 mtC. This is projected to fall to 149 mtC by 2000 but rise again to 163 mtC by 2010. This implies savings of 37 mtC must be

achieved by 2010 if we are to reduce emissions to 126 mtC, that is a 20 per cent reduction over 1990. The Socialist Environment and Resources Association (SERA) has made some suggestions and the following table indicates the cuts in carbon emissions that it believes to be possible:

SERA solution to saving 35.4mtC Carbon Dioxide emissions by 2010		
	CO₂ reduction in 2010 in mtC	% contribution VAT reduction
	-0.3	-1
10% renewables	3.5	10
10GW of CHP	2.0	6
Home energy efficiency	5.8	16
Improved lighting	0.9	3
Business energy efficiency	8.0	23
Increased road vehicle efficiency	8.5	24
Reduced road traffic	7.0	20
	35.4	

Electricity supply industry (ESI)

During the last decade, the ESI has made it possible for us to meet our commitments by switching out of coal and into gas and relying heavily on nuclear power which puts practically no carbon dioxide into the atmosphere, neither does it put acid gases into the atmosphere. If the nuclear industry is allowed to steadily decline with the closure of first the Magnox power stations and later the advanced gas-cooled reactors, by 2020 there will be only one nuclear power station remaining and as early as 2010 all the Magnox stations will have closed down and possibly two of the Advanced Gas-Cooled Reactors (AGR) which will result in an additional burden of 4 mtC from Magnox closures alone if they are replaced by gas-fired stations and 8 mtC if they are replaced by clean coal technology stations. Further closures by 2020 will add 10 mtC altogether to the carbon dioxide burden.

Renewables only account for about 2 per cent of electricity generation of which most comes from hydroelectric power or the burning of land-fill gas. Wind power provides only 2 per cent of the 2 per cent! If renewable energy is to increase to 10 per cent of electricity supply it will mean a five-fold increase in just over ten years, which is a formidable task indeed; for example, to meet the increase with wind power alone would require 25,000, 60m high wind generators spread across Scotland, Wales and the South Downs.

Transport

The SERA programme relies for some 45 per cent of the

savings in carbon dioxide emissions on improvements in the transport sector; that is, reduced road traffic and increased vehicle efficiency contributing 15.5 mtC to the savings. However, Government projections suggest that the number of vehicles on UK roads will increase by 30 per cent and possibly more by the year 2010 (38 per cent by 2016 and 60 per cent by 2031) and it is hard to see how improved engine efficiency technology can make much impact on this anticipated increase.

Home energy efficiency

The Energy Savings Trust is confident that savings amounting to 5.8 mtC can be made but it will require a significant increase in the energy efficiency industry to around £800m per annum and a consequent increase in public funding to £170m per year.

Business efficiency

British industry is notorious for demanding very short payback times for the introduction of energy saving measures; two years is the maximum that most industrialists will tolerate and they often require even shorter times. (This mounts to 40 per cent return on capital!) In consequence, without some sort of incentive the prospect of saving 8 mtC by business seems to be optimistic. Business would also be largely responsible for the huge increase in combined heat and power operation which it is suggested could save as much as 2 mtC. The difficulty with CHP is matching heat and electricity loads, and industrial locations are often the best places for such developments rather than housing.

It must be said that the SERA plan does seem a little optimistic, but particular cause for concern in its projection is the rapid introduction of an energy saving transport policy which must be achieved within a decade to give the enormous savings which are anticipated. The other big question mark is over the five-fold increase in renewable energy.

Some DTI observation on meeting CO₂ commitments

The Energy Advisory Panel of DTI commented in the latest edition of the *Energy Report* (Vol 1, 1997) that the most serious challenge facing the energy sector world-wide is climate change. The panellists carried out a study using the DTI's energy model which suggest possible targets for reduction in greenhouse gas emissions could have very significant implications; for example, if reliance is placed solely on the carbon tax solution, price increases needed to achieve targets of 10 per cent reduction in CO₂ by 2010 would give a startling 87 per cent price increase for gas and 37 per cent for electricity; for a 20 per cent reduction the increase in the gas price would be 125 per cent and 41 per cent for electricity. The panel suggest that the power station sector is likely to continue to be the largest contributor to savings because of its ability to achieve fuel switching, but such is the behaviour of the model they used which gives lowest economic cost solutions, that in the 20 per cent case the model 'flips' and opts for nuclear rather than favouring gas, and for a 20 per cent reduction in carbon dioxide gives a new nuclear build of the order of 16 GW

or a dozen Sizewell Bs. It does admit, however, that this is not a realistic policy prescription. It goes on to propose a raft of measures which can be brought into play; price and/or taxation regulation; that is, higher efficiency standards for housing or equipment, emission limits for plant and vehicles, subsidies, negative pricing for energy efficiency and levies on energy use for redirection or cleaner technology such as CHP, but it does point to the conclusion that there are no easy answers. As transport is not part of DTI's brief it makes few observations about transport although it observes that the problems look particularly intractable. It does go on to say it seems generally sensible to tax things which are considered bad from an environmental standpoint, but that such taxes have a disproportionately large effect on people who are poor, live in substandard housing or remote areas and are in effect 'losers' in the energy stakes. As for renewables, they carry obvious environmental benefits but the enhancement of the deployment of renewables via the NFFO would have implications for electricity prices and a revised NFFO devised to stimulate the development of clean coal technology, although it would reduce sulphur emissions, would increase carbon dioxide emissions.

Different routes to success

The solutions suggested by SERA and the Energy Advisory Panel of DTI differ in some notable respects; whereas the DTI Panel rely on even more spectacular reductions in emissions from the electricity generating industry which requires, as well as a high renewable content, also a strong nuclear component, the SERA solution requires almost half the required savings of 35 mtC to come from the increased road vehicle efficiency and the reduced road traffic. It also requires a spectacular increase in renewable component of five times the present figure.

A solution


It seems clear that the electricity supply industry will have to continue its good work and provide a large slice of the required reduction in CO₂ emissions. This means that it will be essential to maintain the nuclear component of ESI and not let it dwindle away until post 2010 there is only a handful of nuclear stations remaining. It also means that there will have to be a spectacular increase in the renewable components in the ESI which almost certainly involves subsidy. Even so, this will be an unachievable task in terms of wind generation, solar photovoltaics and the like. The 10 per cent requirement could however be met by building the Severn Barrage. This adventurous idea has been around since 1923 when the first report on the feasibility of the Severn Barrage scheme was produced and every five years or so new reports have been issued which mostly suggested that it would not be economic now but had it been built five years before then it would be economic. Procrastination has been the order of the day. However, the Severn Barrage could provide around 7 per cent of UK electricity supply; the barrage would connect South Wales with the south west of England and provide a trunk road linking the two areas which contain some 7

per cent of the population of England and Wales, it would cost about £9 billion, consisting mostly of concrete casings with turbines embedded in them, and provide a peak of 35,000 jobs resulting in several thousand permanent jobs in the region once the barrage was completed. If constructed, it would be seen as a truly heroic solution to the British commitment on carbon dioxide reduction, but more importantly it is almost certainly the only way that we can raise the renewable component of the ESI to 10 per cent.

Prices play an important part in energy efficiency. Up to now the Electricity and Gas Regulators have concentrated on reducing price to consumers whether industrial or domestic and have been surprisingly successful, although it has almost certainly resulted in an increase in overall consumption in energy. Part of their brief, indeed a dominating component in any future brief, must be concentration on improving the efficiency of energy use.

Another important area will be a changed fiscal regime which could well give substantial energy savings; any taxation should, however, be neutral in that savings made from energy and or environmental taxation should lead to cuts in VAT or other taxes.

Perhaps the biggest problem of all is that of transport and, more specifically, cars. It seems unrealistic, to put it mildly, to rely on reduction in car usage to achieve energy savings. No doubt the technical fix of improving engine performance to give more miles to the gallon will play a part, but the huge savings flowing from the transport sector suggested by SERA do seem optimistic to

say the least. What is required is a huge build-up of public transport, almost certainly the abandonment of the company car and the strong encouragement of electric traction. Electric vehicles based on batteries and the new technology of fuel cells could make a striking improvement in air quality in urban areas but, more importantly, reduce carbon dioxide emissions, provided of course the electricity is generated by highly efficient gas-fired stations or, better, from renewable or nuclear sources. Finally the market place will not deliver reduced energy use; expansion is the order of the day. The energy supply industries are in the business of making money and satisfying shareholders; and that means higher sales. Improved energy efficiency runs almost countercurrent to their intentions. The environment is seen as free and emissions to the environment will only be restricted by legislation or international commitment; there is no compulsion from the market place to preserve or even restore the environment to its original clean condition. This must mean that developed countries like the UK will have to initiate a strategic energy supply framework which will have built into it fuel diversity for security of supply and a balance of primary fuels which will deliver the carbon dioxide reduction commitment made, entirely laudably, by the present government. 

■ *Address to P&SC (part II) on 24 November 1997.*

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Contributors

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