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FEATURE ARTICLES

Sustainable energy

Professor John H. Lawton CBE FRS

Setting the scene

Floods, storms, heatwaves and droughts have created headlines in the UK over recent years. Global-average surface temperatures and global average sea levels are rising. On average, glaciers and the extent and thickness of polar ice are decreasing. These are some of the headline messages from the January 2001 report of the Intergovernmental Panel on Climate Change. Climate scientists meeting in Shanghai in February warned that the world is warming faster than we thought, projecting a rise of between 1.4 and 5.8°C by 2100. President Bush aside, there is now widespread acceptance that human activities will severely affect our climate in the future, and are almost certainly doing so now.

The main villain is the greenhouse gas carbon dioxide (CO₂), generated by burning fossil fuels. Fossil fuels account for 85 per cent of the world's energy supply (38 per cent from oil, 25 per cent from coal and 22 per cent from natural gas). The Earth system took 500 million years to generate and accumulate all existing carbon and hydrocarbon resources – resources that we are now using in the blink of a geological eye.

A secure future?

The European Union is dependent on external energy supplies. The EU currently imports some 50 per cent of its energy, and imports are forecast to rise to about 70 per cent in 2030 if current trends persist. The European Commission's November 2000 Green Paper *Towards a European strategy for the security of energy supply* draws two further conclusions: the EU has very limited scope to influence energy supply conditions; and at present the EU is not in a position to respond to the challenge of climate change and to meet its commitments, notably under the Kyoto Protocol.

Nor are world oil markets very stable. Prices collapsed to around \$10 a barrel two years ago, and soared to a ten-year high (over \$35) last year. It was

those peaks that set off political protests over petrol prices and shortages, and which paralysed several European countries, including the UK, last September.

In sum, politically, economically and environmentally, it makes great sense to take a hard look at continuing down a 'business as usual scenario' for energy use, acting as though tomorrow will never come. Business as usual is not an option if we seek a sustainable future.

That said, sustainability and energy make an uncomfortable marriage. However, this should not deter us from looking at alternative ways of doing things. History shows that most vanished civilisations failed because they depleted their energy sources, or destroyed their environment, or both! Working with engineers, economists and others, scientists need to find sustainable solutions to prevent history from repeating itself. That is why, following the Government's 2000 spending review, the Natural Environment Research Council was asked to take the lead in working with the other Research

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Councils to promote collaboration in the area of technology for sustainability and energy. How can science help? I will focus on three key areas: carbon management, renewable energy, and nuclear power.

Carbon management

The biggest scientific challenge raised by the continuing use of fossil fuels is carbon management, specifically CO₂. Although some governments (with the UK in the lead) are setting demanding targets to reduce CO₂ emissions, other bodies have indicated that these will not be sufficient. The Royal Commission on Environmental Pollution, for example, has indicated that the UK may need to achieve a 60 per cent reduction on current annual CO₂ emissions by 2050 and perhaps 80 per cent by 2100, if we are to stabilise atmospheric concentrations of the gas and avoid catastrophic changes in climate.

The challenge is how to achieve such deep cuts in carbon emissions. Some of the biggest rewards lie in capturing CO₂ generated by point-sources (particularly power stations) before it enters the atmosphere. In particular, scientists and engineers are looking at ways of transporting and storing CO₂ by compressing and injecting it into the Earth's subsurface or into the deep ocean. Oil and gas fields that have been exploited make excellent CO₂ traps. Theoretically, the UK sector of the North Sea has porous formations (saline aquifers) with a capacity to receive all UK CO₂ emissions from power generation for a period of 1000 years. However, considerable research challenges remain before we can fully exploit this solution.

Ironically, one alternative method of CO₂ sequestration caused the collapse of the Hague conference on delivering the Kyoto protocol. The arguments centred on the ability of terrestrial vegetation to take up CO₂ and retain it in the form of wood, roots and soil carbon. The terrestrial biosphere is, indeed, a vast natural carbon store, but its capacity to take up substantially increased quantities of CO₂ is severely limited. The Hague talks collapsed because of wrangling over a solution that can never make more than a minor contribution to the scale of the real problem.

Renewables

Renewable sources (excluding big dams) still make up less than 1 per cent of the world's commercial energy. The UK government's aim of achieving 10 per cent of electricity supply from renewables by 2010 is a stretching target, even though the UK may have some of the best off-shore opportunities in the world in the form of wind and wave energy, and tidal power.

The world market for wind energy is growing at over 30 per cent a year, albeit from a small base. In large parts of Denmark, Spain and Germany wind makes up a quarter of the electricity supply. The trouble with wind and other intermittent sources of energy is that they are tricky to connect to the grid and because there are few cheap and efficient ways to store electricity, renewable electricity cannot readily be despatched on demand. A recent report in *The Economist* suggests that it should be possible to fix

most of these problems with new technologies, although the environmental issues and questions of public acceptability raised by these new technologies remain largely unexplored.

However, these are not the main concerns about renewables, valuable as they are. The main concerns again turn on the scale of the reductions in CO₂ emissions necessary to prevent major climate change. Renewables will be part of the solution, but alone they are extremely unlikely to deliver reductions in greenhouse gas emissions of 60 per cent or more.

Nuclear energy

Is nuclear energy part of the solution in trying to balance the delicate energy/environment equation?

The figures are stark. Nuclear power meets almost 30 per cent of the UK's electricity needs (Hollins 1999). Indeed it is the largest single source of electricity in Europe – around 35 per cent of the total; and globally, it accounts for 16 per cent of the electricity mix. Recognising that the long-term future of nuclear energy in the UK is uncertain, Peter Hollins recently summarises the environmental benefits. World wide, a total of 430 operating nuclear plants avoid annual emissions of 1.8 billion tonnes of CO₂. In 1998 the UK nuclear industry saved around 63 million tonnes of CO₂, the equivalent of nearly half the emissions from Britain's road vehicles. Yet on present policies, over the next twenty years or so, all Britain's existing nuclear stations (except Sizewell B) will close, reducing nuclear's contribution to national energy needs to a tiny 3 per cent. If we cannot make up this shortfall by burning more fossil fuel, and if we cannot increase renewable energy substantially beyond present targets, how do we prevent the lights from going out?

Not surprisingly, there is growing pressure to reappraise nuclear power. The UK Foresight programme (Energy and Natural Environment Panel report, 2000), the Royal Society (2000) and the Royal Commission on Environmental Pollution (2000) identify nuclear energy as potentially essential to meet targets to reduce CO₂ emissions. But as we are all aware, the environmental impact of disposing of nuclear waste remains one of the main factors preventing nuclear power from being publicly acceptable.

Starkly, there is a choice to be made on environmental grounds between a nuclear power station such as Sizewell B which will produce 1600 tonnes of spent fuel in its operating lifetime, and the corresponding coal-fired station which would produce 250 million tonnes of CO₂ during the same period.

In the 1999 report of the House of Lords Science and Technology Select Committee on the Management of Nuclear Waste, the committee called for an integrated approach to nuclear waste management, and concluded that underground storage continues to be the best option for long-term disposal. Nevertheless, considerable scientific, engineering and socio-economic problems remain in going down this route. Safety and public acceptance are the key issues, and many politicians would rather not talk about them. Ignoring the problem will not, however, make it go away.

Conclusion

There is no quick or easy fix to finding a sustainable energy solution. I suspect that we will be using a basket of energies and solutions for some time to come. What policy-makers need to recognise is the sheer scale of the problem. Solutions do not lie in tinkering with the system, fiddling while Earth burns. Big issues demand big solutions: developing and building CO₂ sequestration technologies; developing, manufacturing and implementing renewable energy technologies; and conducting a serious reappraisal of nuclear power.

■ Professor John Lawton is the Chief Executive of the Natural Environment Research Council (NERC). NERC provides independent research and training in the environmental sciences. By integrating all components of the earth system including the atmosphere, oceans and freshwaters, the land and the biosphere, NERC is unique in being able to tackle complex environmental research issues in a comprehensive way.

We use our science to help find sustainable solutions.

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Earth Centre's buildings – taking the past into the future

An internationally renowned builder has turned its hand to new techniques in its choice of design, materials and building methods to further the cause of the Earth Centre, near Doncaster.

Taylor Woodrow and Bill Dunster Architects have created a Welcome and Castle View Conference Centre from recycled materials, both striking and unusual buildings which blend happily with the newly greened landscape of the former Denaby Main and Cadeby pits.

They have been made of old telegraph poles, recycled crushed concrete and old cast-iron radiators forged from all over South Yorkshire and yet designed to be as environmentally friendly as possible, using alternative energy sources to reduce dependence on the national grid.

The conference building design, an echo of Conisbrough Castle just up the road, is a circular main hall with three smaller satellite meeting rooms. It is sunk partly in the ground and super insulation is sandwiched within the gabion frame. Local workers hand-filled the gabion cages with crushed concrete salvaged from the Grimethorpe colliery, acting as a supermass to slow temperature just like a castle to ensure it stays warm in winter and cool in summer.

It is heated by warm water from solar collectors in the roof which is circulated through an insulated water tank buried under the floor of the building. The water will be heated in the summer and stored until winter, when it will circulate through gravity fed radiators. A wood fired stove will be on stand-by if the heated water runs out before the end of winter.

A wind generator will provide part of the building's electric power needed for lighting and audio visual equipment.

There are re-cycled floor boards, striking re-cycled poles forming struts in the roof and old radiators which

came from a demolished NHS hospital in Sheffield. On the roof is a turf of the rock plant sedum to slow rain-water run-off.

The building will take a couple of years to reach a settled environment, during which time the ground will warm and the building will dry out.

The Welcome Hall is largely made of wood, perched on wooden pylons found in a local lorry park and supporting a frame of glued and laminated wood which forms the roof's dramatic curves. Concern over the structural integrity of second hand wood meant that the beams had to be made from new wood but most of the building is constructed either of re-cycled timber or wood from sources certified under the Forestry Stewardship scheme. Ground granulated blast furnace slag, which normally ends up in landfill sites, has been used to replace up to 70 per cent of the cement in the building's concrete ground beams.

It, too, is well insulated and it will be heated using a wood burning stove. Inside there will be pay points, a shop and a cafe.

The recycled materials can be more difficult to work with but the finished building is not necessarily more expensive. Bought new, the wooden pylons for the Welcome building, for example, would have cost £20,000 but instead cost just £15 a pole. One has GPO 1909 written on it.

All the technology is available for domestic buildings.

The Welcome Hall and Castle View Conference Centre are not the only new sites. During the past 12 months, an amphitheatre for outdoor performances in the summer has been created and landscaped and a new electricity substation. To make the grass grow on the old spoil heaps, treated sewage had to be mixed in the top 700 mm.

Mr Guy Jackson, project manager, said Taylor Woodrow had engaged Bill Dunster Architects after a competition to find the most innovative designs. He said most of the company's projects were unusual and they found it rewarding to deliver the goals of sustainability and low environment impact.

He said the project had presented new challenges. These included sourcing materials, creating the shape of the conference building and installing the revolutionary heating system, a 'clever concept but an unproven concept'.

'The industry as a whole, design and construction is just starting to address some of the issues of sustainability, low environmental impact and re-cycling and the team has worked hard at looking at alternative materials. They really have thought outside the box on this one.'

He said sometimes sourcing materials had involved going to buildings which were due to be demolished or staff searching reclamation yards with £100 in their back pocket.

'We're very enthusiastic about the goals of the Earth Centre and we're pleased that we've been able to prove our skills and pleased that the clients are delighted with the result.'

Chris Wilford, Earth Centre architect, said designing and constructing buildings like those at the Earth Centre did require re-thinking because it involved breaking new ground.

He said that re-using materials was a way of cutting down waste in the building industry, of which there was a lot, and that everything they had used was domestic technology and not just an Earth Centre special.

The buildings are extra attractions for visitors to the Earth Centre, which is set in 400 acres of informal parkland, 26 acres of formal gardens and includes a restaurant which serves a *cordon bleu* menu of mainly organic food. Other notable buildings on site are by architects Peter Clegg, Allsop and Stormer and Matthew Letts.

The Earth Centre opened for school groups on May 21 and guided tours on May 26. It opened to the general public on July 21.

■ For further information, contact:

Earth Centre – Michaela Gee, PR/Marketing Officer.

Tel: 01709 513936. Email: info@earthcentre.org.uk

Web site: www.earthcentre.org.uk

Taylor Woodrow – Guy Jackson, Project Manager.

Tel: 07887 823999.

Foot and Mouth Disease

NIGEL TITCHEN, a member of the IPMS National Executive Committee, who works at North Wyke Research Station, Devon, writes from the middle of the epidemic

Foot & Mouth Disease (FMD) is a viral disease of cattle, sheep, goats and pigs. Cloven hoof species of wild animals such as deer and some zoo animals can also catch FMD. There are many strains of the virus. The current outbreak is due to the 'O' strain.

It is possible but very unlikely for humans to contract the disease which has flu-like symptoms, is mild and soon passes. The last case in the UK was in 1966.

How is FMD spread?

FMD is spread by direct or indirect contact with infected animals. Infected animals begin by excreting the virus a few days before signs of the disease develop. Pigs in particular produce large amounts of virus particles. The virus can be spread mechanically by the movement of animals, persons or vehicles which have been contaminated by the virus. If an animal is infected at the time of its slaughter then it is possible for the disease to be transmitted by the carcase.

The virus can be transmitted by the wind. On a calm, warm, spring day during the 1967 outbreak, airborne infection was recorded within the neighbouring 3-5 km. Under more favourable transmission conditions (cooler airflows and high humidity) wind-borne spread of 200km has been recorded.

The disease

The symptoms of FMD are blisters in the mouth or on the feet in addition to fever, clumsiness, off feed,

reduced milk yield and slaving. There is at present no cure. The disease usually runs its course in two or three weeks, after which most animals naturally recover but some 10 per cent of the animals may die. These will mainly be young or infirm.

Not all species are equally infectious. Pigs and cattle amplify and shed more viruses than sheep but the latter can be infectious without showing the disease. Sheep and pigs can be infectious less than four days after infection while 25 per cent of sheep may be infectious after two days.

The 14-day incubation period referred to by MAFF is based on the Office Internationale des Epizootes (OIE) animal health code and refers to the maximum incubation time.

Vaccination

There is a vaccine for the 'O' strain of FMD which could be used to create a barrier to stop the spread of infection, the so-called 'firebreak' use. Estimates vary as to how much vaccine is available but in the UK and Europe stocks could amount to over 10 million doses. It takes up to ten days for the vaccine to provide immunity. However, the immunity is relatively short-lived but it would last long enough to control an outbreak if used alongside slaughter.

It is difficult to estimate the cost of a vaccination programme but depending on its extent it could be up to £50m.

International trade

To vaccinate now would affect international trade. The UK would lose its disease free status and would be unable to export to other countries until that status had been regained through the eradication of the disease. If there were a vaccination programme then if all the animals that had been vaccinated were subsequently slaughtered it would take three months from the time of the last animal being slaughtered to regain the disease free status. However, in the case of dairy herds which were not slaughtered the period could be between one and two years.

Estimates suggest that the value of the trade lost if our disease free status were lost would be in excess of £250m.

Controlling the spread of foot and mouth

The extended slaughter of healthy animals is necessary to create a 'firebreak' (in the same way as vaccination would) to prevent the airborne transmission of the virus. Prompt slaughter within 24 hours of an initial diagnosis reduces further spread and prompt disposal limits the spread of the disease. Carcasses may be either burnt or buried, depending on local conditions.

Farmers are required to wait six months before restocking as a precaution to ensure that no traces of the virus are left on the premises.

In some upland areas sheep may never be re-introduced, but our landscape is managed and the removal of small hill farmers could adversely affect tourism as the landscape loses its 'beauty'.

Slaughter or vaccination?

Both approaches have merit. The slaughter policy was successful in 1967 (albeit in different circumstances) and appears to be working in some areas of the present outbreak (Wiltshire) where the extent of the infection was limited. However, in areas such as Devon, Cumbria and Dumfries the extent of animal movements before the ban was greater than realised and the extent of the outbreak is not clear. In these circumstances it is difficult to know where to place the 'firebreak' and therefore a vaccination programme across a wide area is probably necessary.

The author's predicament

In the midst of the crisis-ridden area of south west England, close to Okehampton in Devon, lies the North Wyke Research Station, part of the Institute of Grassland and Environmental Research (IGER). I work there. The site consists of a mixed farm of 400 acres with dairy cows, sheep and beef cattle and extensive laboratory and office accommodation for over 100 scientists.

The remit of the research station is to examine the environmental, social and economic impact of various farming systems in lowland grassland areas of the United Kingdom.

Since the first outbreak of Foot and Mouth disease was discovered in Essex during February and in Devon a few days later, the research community at North Wyke has been under virtual siege. Immediately the outbreak

was confirmed in the south west all movements by staff between the other institute sites in Brecon and Aberystwyth were halted, all visits to North Wyke were cancelled and disinfection precautions were implemented. The farm was placed out of bounds to all scientific staff and the laboratories to all farm staff.

Initially, the impact on the site was merely an inconvenience, but as the number of cases in Devon rose rapidly and the outbreaks got closer to the research site, the effects became ever more dramatic. As I write, all staff who have contact with animals, who live on farms, or who live within one mile of a confirmed outbreak are excluded from the site as a precaution. Nearly 30 per cent of the total staff are so affected. We try to work from home using e-mail, because the post is intermittent. We scan the news each day to see where the disease has reached. If it were to strike North Wyke, the research programme, which is already deeply affected, would be decimated. Contracts would be lost and staff made redundant.

The vets

However, as a member of the Institution of Professional Managers and Specialists (IPMS) National Executive, I am also aware of the effect that this crisis is having upon other areas of our membership.

Vets from the State Veterinary Service (SVS) have been in the front line from day one, working incredibly hard for long hours in appalling conditions. Similarly, colleagues in the Veterinary Laboratory Agency (VLA) and the BBSRC Institute for Animal Health have been under immense pressure to provide accurate rapid test results. Other colleagues in MAFF, MLC and the Environment Agency have provided immense support to the farming community. All this has been achieved against the backdrop of declining public funding for these areas for many years. For example, in 1966, on the eve of the last outbreak, there were 418 veterinary officers in the SVS; today there are only 273. Veterinary centres have been reduced from 24 to 12.

Lessons for the future

When this outbreak is over, (and it will be!) there will need to be a radical reassessment of how the UK funds and supports its veterinary infrastructure. There will need to be a national debate into what we want from our agricultural industry and in particular the livestock sector. There will need to be research into the options that will face us as a nation. Should we rely on more imported produce rather than supporting our home grown industry and if that were the case what would be the social and economic impact of that decision?

Or should we as a nation support the UK farming industry that provides us with food, landscape and rural employment? Free market economists will argue for the former, whereas I subscribe to the *realpolitik* that in an unstable world a country would be wise to maintain the means to feed its own population.

Many lessons will need to be learned from this crisis and many will be costly.

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£215m emission trading scheme is world first

British firms could become world leaders in the new market for trading greenhouse gas emissions under a £215 million government scheme launched in August.

The first of its kind in the world, the UK Emissions Trading Scheme could cut up to 2 million tonnes of carbon a year from the atmosphere by 2010 and generate new job and investment opportunities for industry.

Emissions trading allows a group of companies to achieve a target for reducing greenhouse gas emissions flexibly and cost effectively.

Under the scheme participants sign up to delivering emission reduction targets which can either be made by cuts in-house or by buying and selling emission 'allowances' on the market to meet those targets. If firms can reduce emissions cheaply and beat their targets, they can sell the surplus allowances or bank them for future use.

The government has pledged up to £215m over five years from 2003-04 to provide incentive payments for companies to join the scheme. This will be allocated through an auction next year.

The final *Framework Document for the UK Emissions Trading Scheme* contains details of who is eligible to join the scheme and how to bid for the incentives on offer.

There will be sanctions on companies which break the rules. Those failing to achieve their emission reduction targets will have to pay back incentive money with interest and will face tougher targets in future years to make up the shortfall.

Environment Minister Michael Meacher said the scheme established the UK as a world leader in the field of greenhouse gas emissions trading, and gave

British business a head start in the new market.

'It builds on the success of the recent climate change talks in Bonn by demonstrating that tackling climate change can be good for business,' Mr Meacher said.

'The UK climate change program could cut greenhouse gas emissions to 23 per cent below 1990 levels by 2010. I expect our scheme to make a significant contribution and at the same time benefit both business and the environment by stimulating and financially rewarding innovation and investment.'

The government has introduced the Emissions Trading Scheme to reduce greenhouse gas emissions as part of the UK Climate Change Programme. The scheme is the world's first economy-wide greenhouse gas trading system. The scheme has been developed by government in close co-operation with the business-led Emissions Trading Group.

The programme and rules for the auction of incentive money will be published in December, and bids from those wishing to enter the auction will be invited early next year. The government has made available up to £215m from 2003-04 to 2007-08 as an incentive for companies to join the scheme. This is equivalent to up to £30m a year after corporation tax.

Companies that have entered into Climate Change Agreements will also be able to use the trading scheme to help them meet their emission targets.

■ Copies of the framework are available from DETR, PO Box 236, Wetherby, LS23 7NB (Tel: 0870 1226 236 or fax 0870 1226 237), or via the DEFRA website: www.defra.gov.uk/environment/climatechange/trading/index.htm

Recycling of domestic waste continues to rise

The amount of domestic waste collected through 'kerbside' recycling schemes increased by 23 per cent in 1999-2000, the latest government statistics reveal.

More than 10 per cent of household waste was collected for recycling or composting compared to 8.8 per cent in the previous year.

The 1999-2000 Municipal Waste Management Survey report shows that the amount of municipal waste collected rose to 29.3 million tonnes. Over the five years of the survey, municipal waste has grown at an average annual rate of just under 4 per cent.

The proportion of municipal waste being disposed of at landfill fell from 82 per cent in 1998-99 to 81 per cent in 1999-2000.

Paper and card accounted for a third of all household waste collected for recycling, compost 25 per cent and glass 15 per cent.

Slow growth in traffic due to foot and mouth outbreak

The foot and mouth disease outbreak has been cited as the cause of the slow growth in road traffic in the second quarter of this year.

Traffic levels remained at about the same level as in 2000: car traffic was unchanged and goods vehicle traffic fell by 2 per cent over the period.

Motorcycle traffic fell by 3 per cent between 1999 and 2000 following a 16 per cent rise in the previous year. The change is attributed to the good weather in 1999 and wet weather in 2000.

Wildlife conservation unit gets charter mark

The DEFRA division responsible for issuing licences for the control of trade in endangered species and the registration of birds kept in captivity has been awarded a prestigious Charter Mark for excellence in public service.

The Wildlife Licensing and Registration Section issues 40,000 permits a year to control the import, export and commercial use of endangered species. The unit's 29 staff also register the keeping of threatened birds such as peregrines, hawks and eagles.

Improved quality of drinking water

Year on year improvements in drinking water quality have been achieved through tough enforcement action resulting in £5.7 billion of investment over the last ten years, according to Environment Minister Michael Meacher.

This major investment was now paying off, he said, but the Government was committed to yet further improvements.

The Drinking Water Inspectorate's fifth annual report shows the best results achieved to date in improved drinking water quality: 99.83 per cent of the 2.7 million drinking water samples taken in 2000 met the stringent quality standards.

About 4,500 samples failed to meet the drinking water standards compared with 50,000 in 1992.

Talks at Zoological Society of London

The Zoological Society of London holds a series of Scientific Meetings, Tuesday Talks and Symposia every month from October to June. The topics cover a range of conservation and environmental issues, and the speakers come from institutions and universities in the UK and overseas. A list of the talks up to November 2001 is as follows.

2 October 2001: 6.30 pm

Tuesday Talk – The international crime in exotic species – CITES

The history of CITES will be discussed. The present-day theft and illegal trade of exotics, especially parrots, cockatoos and macaws, reptiles, primates, and birds of prey will be examined, and the work of police forces and other agencies to trace stolen animals and thieves will be described.

John Hayward, Co-ordinator, National Theft Register of Exotic Species.

9 October 2001: 5.30 pm

Scientific Meeting – European Red Squirrels: a species at risk?

This meeting will consider the reasons for the alarming decline in the range of the British red squirrel over the last 50 years and its replacement by the alien grey squirrel from North America. Parallels will be drawn to a similar replacement process that is occurring in Northern Italy, and strategies for conserving the red squirrel will be examined.

Dr John Gurnell, Queen Mary, University of London; Dr Tony Sainsbury, Institute of Zoology, ZSL; Dr Peter W.W. Lurz, Centre for Life Sciences Modelling, University of Newcastle upon Tyne.

6 November 2001: 6.30 pm

Tuesday Talk – Making waves

A lavishly illustrated talk describing

how BBC1's forthcoming landmark series on the world's oceans, *The Blue Planet*, was made. The series producers will present this talk.

The BBC Natural History Unit, Bristol.

13 November 2001: 5.30 pm

Scientific Meeting – The Invaders! The impact of biological invasions and hybridization on native TAXA

Humans have translocated many plant and animal species into novel ecosystems. Often alien species escape containment and go on to establish feral populations in the new habitats. This meeting will examine examples of biological invasions and associated hybridisation events currently of interest; their impact on native taxa and conservation implications.

Organised by Dr Simon Goodman, Institute of Zoology, ZSL.

All meetings are held in the meeting rooms of the Zoological Society of London, Regent's Park, London NW1 4RY, and are open to members of the society and the general public. Access is from the Outer Circle, Regent's Park. Nearest bus: No. 274; Underground station: Camden Town.



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Offshore oil and gas industry publishes sector's first sustainable development strategy

The UK offshore oil and gas industry published its strategy for sustainable development earlier this year, one of the first documents to be produced by a UK industrial sector that comprehensively describes how it plans to meet its economic, environmental and social responsibilities.

Striking a balance – the UK offshore oil and gas industry strategy for its contribution to sustainable development 2001 is published by the UK Offshore Operators Association (UKOOA), the industry's representative body. It encompasses the activities of the association's 32 member companies who carry out oil and gas exploration and production operations on the UK continental shelf (UKCS) and was produced in direct response to the government's challenge for companies to address the 'triple bottom line' – to integrate better performance in the economic, environmental and social aspects of their business.

The strategy took over a year to develop and involved both internal debate amongst UKOOA members and external consultation with government departments, the contractor sector, trades unions and a diverse range of interest groups.

It brings together for the first time a thorough examination of the industry's economic and social contribution and responsibilities to society, its environmental performance and its stewardship of natural resources, and the relationship between each.

It also addresses the apparent contradiction of an industry whose products underpin modern society, which employs hundreds of thousands of people and makes a major contribution to the UK economy, yet whose operations are extractive in nature, focused on a finite resource which is increasingly viewed as a potential threat to the environment.

'The UK oil and gas industry's responsibility is to find a way to balance the considerable economic and social benefits with good stewardship of the nation's natural resources and environmental care,' says Bob Connon, managing director of Chevron Europe and chairman of

UKOOA's sustainable development strategy group. 'That is the essence of our industry's contribution to sustainable development.'

Commenting on the strategy's publication, Energy Minister Peter Hain said: 'The offshore oil and gas industry provides thousands of jobs and is vital to the UK economy. I applaud the industry on achieving a long-term strategy that seeks to sustain supply while protecting the environment.'

'Our oil and gas industries are entering a new phase in the North Sea – one which has been foreseen and prepared for. The technological challenges are considerable but the potential for real achievements are great. Both Government and the industry strive to

'We are making commitments to a range of actions that require targets to be set and performance measures to be devised'

maximise our economic return from the North Sea, attract investment and sustain production to satisfy market requirements. But our ultimate commitment is to the consumer and we must strive to keep costs down through a world class, efficient and environmentally sound industry.'

The document commits the UK industry to a wide range of targets and objectives in four areas (economic and social sustainability, environmental protection and stewardship of natural resources), providing the blueprint for future plans and actions. For example, the industry undertakes to improve offshore safety, adopt independently verified environmental management systems by the end of 2002 and to reduce the volume of small accidental oil spills by 30 per cent by the end of 2003. Progress will be mon-

itored and published.

John McDonald, managing director of Texaco North Sea UK and UKOOA's current president, said: 'In delivering this strategy, we are making commitments to a range of actions that require targets to be set and performance measures to be devised to guide and validate planning and delivery. We are pleased that our diverse membership – over 30 member companies with quite different operations, structures, cultures and, sometimes, priorities – have joined in what has been a truly collaborative process to produce one of the first sectoral sustainability strategy documents in the UK.'

Acknowledging that the offshore oil and gas industry is breaking new ground, Dr Paul Ekins, associate director of the sustainable development charity Forum for the Future, comments in the publication's preface: 'Corporate sustainable development strategies are still a relatively rare breed of business initiative. Sectoral sustainable development strategies are even rarer innovations still. Both kinds of strategy reveal a shift in business thinking which is of potentially historic importance for the development of market-based societies in the future.'

Notes

1. The UK Offshore Operators Association (UKOOA) is the representative organisation for the UK offshore oil and gas industry. Its 32 members are licensed by the British Government and explore for and produce hydrocarbons in UK waters.
2. The idea of developing a sectoral sustainable development strategy for the UK offshore oil and gas sector first emerged from the work of the environment and sustainable development sub-group of the Oil and Gas Industry Task Force, the government industry joint initiative created in 1999. The inspiration, and guiding principles, for the strategy came from the Department of Environment, Transport and the Regions' (DETR) policy document, *A Better Quality of Life*, published in May 1999.
3. The offshore oil and gas industry cur-

rently supports some 270,000 jobs, has invested £190 billion (2000 prices) in the UK since the mid-1960s and has contributed some £170 billion (2000 prices) in tax revenues since the 1970s. It accounts for 84 per cent of the country's primary energy requirements.

Summary: UKOOA sustainable development commitments

1. Strategic economic objectives: to enhance the UK offshore oil and gas industry's competitiveness
 - to attract continuing investment and
 - deliver long-term benefits to the UK economy in terms of jobs, security of energy supply and tax revenues
2. Strategic social objective: to conduct

business in recognition of the industry's contribution and responsibility to society through

- continual improvement in safety and working conditions
 - engagement with local stakeholders and other users of the sea
 - support for local authorities and communities
3. Strategic environmental objective: to achieve continual improvement in environmental performance
 - using long term goal setting
 - developing knowledge of the industry's effects on the environment
 - promoting technological innovation
 - adopting independently verified environmental management systems
 4. Strategic stewardship objective: to

ensure prudent use of natural resources by:

- maximising recovery of the oil and gas
- developing and applying new technologies
- making best use of the existing infrastructure of offshore installations and pipelines
- adopting a whole life cycle approach.

■ For further information, contact:

Trisha O'Reilly
 UKOOA Communications Team
 232-242 Vauxhall Bridge Road
 London SW1V 1AU
 Tel: 020 7802 2422/2400
 Fax: 020 7802 2401
 E-Mail: toreilly@ukooa.co.uk

ENVIRONMENTAL EDUCATION AND CAREERS

Career profile

Nicky Woodfield, 31, is Co-ordinator for the Air Quality Management Centre at the University of the West of England (UWE), Bristol and a member of the University's Air Quality Research Group.

She graduated from the University of Bristol in 1991 with an honours degree in Geology and went on to the University of Leicester to obtain an MSc in Natural Resources Management and a Diploma in Environmental Technology. She spent two years as

Environmental Quality Officer at Congleton Borough Council in Cheshire and a year with Hays Chemical Distribution Ltd (also in Cheshire) before moving to the University of the West of England.

For the first year there, she was Information Research Manager for EURONET pan-European Environment Consultancy.

In December 1997 she joined the Air Quality Management Centre.

The role of the Institution – my own perspective

It wasn't so long ago that I began to search for an Institution of like-minded professionals, where a broad range of environmental science issues were of interest, and with whom I could offer some expertise in a developing environmental scientific field. For me, the Institution of Environmental Sciences offered exactly the route and establishment I was after, and I haven't looked back since.

Graduating as a geologist over ten years ago, I was determined to apply the various disciplines I'd explored through studying geology (notably chemistry, physics and biology), to a broader environmental discipline. Studying for an MSc in Natural Resources Management opened my eyes to this broader discipline, and in particular the evolving area of air pollution and air quality management. Having worked in local government environmental health departments

and the chemical industry since then, I've been able to see the field of environmental science emerge as an area of huge interest, to public, private and voluntary sectors alike.



And whilst I've developed a keen interest in one specific discipline, air quality, the interaction and emergence of this discipline with, and alongside, broader environmental science issues has been obvious over the last decade. Sustainability, climate change, pollution, liability, public health... all interacting at local, national and international policy levels to affect the overall health, wealth and quality of life for all of us.

Simply keeping abreast of developments across environmental science issues is important for maintaining an overall perspective of the discipline, which is easy to lose when engrossed in a particular issue. For me, the Institution and its dedicated journal provides both an important link to wider environmental issues, and an important tool for disseminating developments in the world of air quality management. I simply wouldn't be without it.

Managing climate change emissions: a business guide

This is the first of a series of 'practitioner' journals to be published by the Institute of Environmental Management and Assessment (IEMA).

The subject of climate change emissions management grew out of a series of IEMA regional seminars given by Ken Fletcher of AEA Technology.

The guide gives a comprehensive account of the key features of the levy package and associated national and international initiatives. It also offers a thorough introduction to the thinking that businesses should adopt on climate change agreements and emissions trading. The guide contains an instruction manual on 'The Emissions Calculator' and its web site. Also included are an algorithm for calculating the net unit costs of climate change investment and a risk assessment tool for exploring the threats and opportunities of climate

Managing Climate Change Emissions: a business guide
IEMA Review

A5 paperback, 59 pages

£10.00

Available from:

Amy Underwood

Communications & Marketing

Co-ordinator at the Institute.

Tel: 01522 540 069

Email: a.underwood@iema.net

change policies in the round. A comprehensive list of references is provided.

The journal is written for a wide audience, incorporating all involved in the management of climate change emissions. The first section is written for senior managers in industry who need to understand the financial implications of

climate change policies. The second and third sections will still be of interest to senior management but will be of particular interest to financial and technical experts who are responsible for looking at the options open to them to reduce costs and greenhouse gas emissions.

The journal is essential for anyone who is beginning to examine the impact of climate change policies on their business. Topics include:

1. managing climate change
2. managing emissions in the UK: the levy and associated policies
3. emissions trading: UK and overseas
4. practical guidance
5. risk assessment matrix, emissions calculator and how to calculate net unit costs.

This is a compact and very readable publication. It is recommended to all IES members with an interest in the subject.

Sustainable education: re-visioning learning and change

How will we move towards sustainability? By learning through crisis, or by design? In this new Schumacher Briefing, Stephen Sterling points out that

- progress towards a more sustainable future critically depends on learning, yet most education and learning take no account of sustainability;
- the reorientation of education towards sustainable development since Agenda 21 in 1992 has been very slow;
- education is largely behind other fields in developing new thinking and practice in response to the challenge of sustainability.

Whilst 'environmental education', and more recently 'education for sustainable development' are important trends, they are not sufficient to reorient and transform education as a whole – and yet time is short to realise such change. The Briefing critiques the prevailing managerial and mechanistic paradigm in education, and argues that an ecological view of educational theory, practice and poli-

Sustainable Education: Re-visioning Learning and Change

Stephen Sterling

Schumacher Briefing No. 6

Foreword by David Orr

Green Books/Schumacher Society

A5, 96pp

ISBN 1 870098 99 4

£5.00

cy is necessary to assist the sustainability transition.

The Briefing then shows how 'sustainable education' – a systemic change of educational culture towards the realisation of human potential and the interdependence of social, economic and ecological wellbeing – can lead to transformative learning.

The Briefing finishes with discussion of change strategies, emphasising the need for vision and design at all levels of educational systems, and includes action suggestions for both policymakers and practitioners.

A detailed listing of key organisations and websites is also included.

are you doing **your bit?**

Responses

Responses have been submitted to the following consultation documents:

- PPGN 17: Sport, Open Space and Recreation (to the DETR).
- Framework for Regulations on Draft Maps of Open Country and Registered Common Land (to the Department of Environment, Food and Agriculture – DEFRA)
- Implementation of the EC Water Framework Directive (to the DEFRA).

- Review of the Supply of Scientists and Engineers (to HM Treasury).
- Technical Amendments to the Conservation (Natural Habitats etc) Regulations 1994 (to the DEFRA).
- Sites of Special Scientific Interest's (SSSI): Appeals Regulations (to the DEFRA)

Inter-professional discussions

In accordance with my note in the May/June Journal, we have included in this issue a

formal statement of agreements reached for an umbrella body of environmental institutions.

All members are invited to write to me with views or comments as these will be of assistance in the on-going discussions for the development of the new body.

Editorial comment

In this issue we continue to feature items on 'green' buildings. This time there is an article on the new Earth Centre at Denaby Main, Doncaster

which is of particular interest as it was the venue for our recent Professional Practice for Sustainable Development (PP4SD) Train the Trainers Course.

Also included is a career profile of one of our members that we plan to be the first of a series of such items. We hope that this will be of particular interest to our student and recent graduate members and give some ideas and encouragement for their future career development.

RAF

Forthcoming conferences and courses

**3-7 September
Monitoring for nature conservation**

Plas Tan y Bwlch, Wales £313
Short course to further the knowledge and skills necessary for the effective monitoring of sites of nature conservation interest.

Details: Dewi Jones, Plas Tan y Bwlch, Maentwrog, Blaenau Ffestiniog, Gwynedd, LL41 3YU 01766 590324

email dewi.jones@eryri-npa.gov.uk

Gwynedd, LL41 3YU 01766 590324
email dewi.jones@eryri-npa.gov.uk

**17-20 September
Local action for biodiversity conservation**

Plas Tan y Bwlch, Wales £229
Short course to help those involved with the implementation of Local Biodiversity Action Plans.

Details: Dewi Jones, Plas Tan y Bwlch, Maentwrog, Blaenau Ffestiniog,

**22-24 October
Environmental Protection 2001**
Bournemouth International Centre, Bournemouth, £290-370
NSCA Annual Conference & Exhibition
Details: NSCA, 44 Grand Parade, Brighton, BN2 2QA.

New members

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

Mr I. Anker-Boonin	Strategic Health & Safety Policy Advisor, London Borough of Islington	Miss C. S. Gillies	Environmental Protection Officer, SEPA
Mr G. J. Applegate	Environmental Protection Officer, SEPA	Ms E. A. Green	Environmental Officer Environmental Advice Centre Ltd
Mr M. J. Ashworth	Deputy Technical Manager (Labs) & Research Development Officer DERA Radiation Protection Services (DRPS)	Mr R. R. Guthrie	Environmental Protection Officer, SEPA
Ms G. Back	Hon. General Secretary NAEE University of Wolverhampton	Mr G. W. Heaton	Environmental Protection Officer, SEPA
Ms G. D. Bourne	Environmental Officer Environmental Advice Centre Ltd	Mr S. H. G. Jenkins	Student Swansea Institute of Higher Education
Mr S. F. Boyle	Scientist, SEPA	Mr P. M. Mellor	Recent graduate, De Montfort University
Mr R. Brown	Marine Scientist, SEPA	Mr D. R. Miller	Environmental Protection Officer, SEPA
Mr M. G. Dawson	Project Officer, Groundwork Business Environment Association	Mr A. R. Potter	Assistant Hydrologist, SEPA
Ms S. Docherty	Environmental Protection Officer, SEPA	Mr G. D. Ritchie	Environmental Protection Officer, SEPA
Ms K. M. Donnelly	Environmental Protection Officer, SEPA	Miss J. T. D. Sekibo	Trainee Officer, Recycling & Waste Management, London Borough of Tower Hamlets
Mr S. A. Elliott	Environmental Safety Assessor British Nuclear Fuels Ltd (BNFL)	Miss A. M. Sinclair	Hydrologist, SEPA
Mr N. Genalis	Engineering Management Trainee, Bourne Salads	Mr P. J. Taylor	Director, Dunelm Geotechnical & Environmental Drilling Company Ltd
		Ms A. E. Terry	Environmental Protection Officer, SEPA
		Mr C. M. Waddell	Environmental Protection Officer, SEPA

Diary dates for 2001

10 September	GP Committee	13.00
31 October	Education Committee	10.30
	Council	13.30

New e-mail and web addresses

The IES has new e-mail and web site addresses:

◆ e-mail: ies-uk@breathemail.net

◆ web site: <http://www.ies-uk.org>

Have you moved? Are you changing jobs?

Remember to let us know promptly with your new address, telephone number, etc. This can avoid loss of communication, wasted postage and unnecessary complications. Write to:

IES, PO Box 16, Bourne, PE10 9FB
Tel/Fax: 01778 394846
E-mail: ies-uk@breathemail.net

Occasional papers available now from IES

Waste management

- From waste to woods – planting trees on landfill
- From waste to woods: trees on landfill and their place in landscape
- Enhanced landfill strategy
- Waste minimisation: the long term benefits
- European study on EISs of installations for the treatment and disposal of toxic and dangerous waste
- Mercury fall-out from crematoria

Education and training

- Environmental courses undergo a quality assessment
- Student environmental declaration
- On-line information systems in environmental sciences courses
- Global environmental charter and network for students

Business and industry

- The tourism challenge
- The tourism debate and environmental scientists
- Enjoying environmental science as a career
- The Brent Spar and the best practical environmental option

National and local government

- Transport policy, environmental pressures and the new UK government
- Local Agenda 21 – making it work

Price: £5 per paper including p&p
(£3 per paper for members)

Contributors

The *Environmental Scientist* aims to provide a forum for members' contributions, views, interests, activities and news, as well as topical feature articles. Articles up to 3,000 words should be submitted to the Editor, *Environmental Scientist*, PO Box 16, Bourne, PE10 9FB, three weeks prior to publication in the last week of January, March, May, July, September and November.

Views expressed in the journal are those of the authors and do not necessarily reflect IES views or policy.

Advertising

Advertisements should be submitted to reach the Institution by the 7th of the month of publication.

Rates: £50 (half page); £25 (quarter page); £12.50 (eighth page). Full page adverts at £100 can only be accepted under special circumstances, subject to space being available.

