

environmental SCIENTIST

January/February 2007



◆ Why the humble roach deserves attention from all of us, anglers or not	4
◆ Housing developments in inner city areas are throwing a new spotlight on air quality issues	6
◆ Elizabeth Stanmore describes her time working as a geoenvironmental engineer in Jamaica	11
◆ An environmental consultant takes a quizzical look at the policy makers who use science to justify their decisions	14





environmental SCIENTIST

Journal of
the Institution of
Environmental Sciences

ISSN: 0966 8411
Vol 16 No 1
Established 1971

The Environmental Scientist provides a forum for members' contributions, views, interests, activities and news, as well as topical feature articles. Articles should be submitted to the Editor, Environmental Scientist, Suite 7, 38 Ebury Street, London SW1W 0LU or emailed to enquiries@ies-uk.org.uk

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

Editor: Jennifer Blumhof

Published by The Institution of Environmental Sciences, Suite 7, 38 Ebury Street, London SW1W 0LU.
Tel: 020 7730 5516
Fax: 020 7730 5519
Email: enquiries@ies-uk.org.uk
Web site: www.ies-uk.org.uk

Design and origination by Davies Communications, Gordon House, 6 Lissenden Gardens, London NW5 1LX.
Tel: 020 7482 8844.



Printed on recycled paper by Uniprint Ltd, 36 Jaggard Way, Wandsworth Common, London SW12 8SG.



A MESSAGE FROM THE HON SECRETARY

At the start of a new year,
JENNIFER BLUMHOF,
IES Honorary Secretary,
reflects on the year
just ended and
looks forward to 2007



The past year has seen the Institution looking forward in its scope. Concentrating on the furtherance of its modernisation drive has allowed us to begin to expand existing member schemes and introduce new ones.

The IES Council met four times this year, under the direction of our new Chair, Carolyn Roberts, and Vice-Chair Dr Mark Everard. These Council sessions were restructured to allow more time for strategic, policy discussions and debates, covering aspects such as membership structures and working relationships with other cognate institutions both in the UK and the EC. The General Purposes Committee (GP) also met four times this year, implementing Council plans and reporting on the activities of the Institution.

The administrative change that has had the most impact this year was the introduction of a volunteer scheme, which has allowed the Institution to support and expand its activities and offer work experience to newly qualified graduates. Aspects which benefited from this new service include the website, accreditation, the e-newsletter and our Student Membership scheme. Many thanks to the hard work of our volunteers, Adam Donnan, Adrian Mill and Lyndsay Glanfield.

The administration team over this year has also created new procedures and reviewed and updated existing ones.

Under the Council portfolio of Dr Leo Salter and with the help of Phil Holmes (our administrator), the Institution's website has seen another dramatic lift, bringing it in line with the demands of our visitors. It is hoped that this site will be better equipped to relay news and important information to both the public and our members.

Accreditation of university environmental science degrees is an important aspect of the Institution's work, as preparing skilled graduates and supporting high quality environmental science degrees will ensure a continual supply of professionals to our field. This year the University of St Andrews, University of the West of England, University of Hertfordshire and the University of Gloucestershire all saw new programmes added to our scheme, and it is hoped more will join in the coming year.

One attraction of accreditation comes from another service new this year, that of our new Student Membership scheme. We have seen a steady uptake by students on these programmes, and hope to further promote this, first step on a career path, in the New Year.

2006 saw the introduction of the

The modernisation drive continues with

- ◆ a new volunteer scheme
- ◆ more university programmes accredited
- ◆ a new student membership scheme
- ◆ improvements to the web site
- ◆ an email newsletter
- ◆ a revised constitution

Institution's 'Full Process' for Chartered Environmentalist (CEnv). To apply for this status applicants must now submit a written report and attend a professional review interview. This brings our total number of Chartered Environmentalists up to 229. We encourage all those wishing to pursue this award to head to our website www.ies-uk.org.uk or to www.socenv.org.uk, the Society for the Environment's website, to find out more.

Our first successful applicants through this process were of very high quality, and join a band of very experienced IES CEnvs. I would like to acknowledge the continuing work of our Council Members, Will Pope and Professor James Longhurst, in this critical linkage with the Society.

Working with Peter Singer of Davies Communications, the Institution produced several Journals, all of which met good reviews. Articles on air quality, the state of environmental science and a report into research on sustainability skills in employment proved very interesting reads. Additionally the introduction of a regular email based newsletter has proved incredibly popular, and allows the Institution to keep in contact with its members more frequently. EnviroSci News has undergone a few months of consultation with members and will be back, with a new look, in 2007. As always, I encourage members to con-

tribute articles and news items to the Journal and the e-newsletter.

Professional Practice for Sustainable Development (PP4SD) in partnership with the Environment Agency, RSPB and the Natural Step has been led by our Senior Vice President John Baines supported by Professor Stephen Martin. The project has worked with the land-based sector including the production of training materials.

In association with the Higher Education Academy Subject Centre for Geography, Earth and Environmental Sciences (GEES) John Baines produced an essential report which researched integrating sustainable development principles into professional practice, in particular initial training requirements for environmental scientists. In collaboration with the Science Council a very successful conference on Skills for Sustainability took place in November.

The IES has continued to support the operation of the Institute of Air Quality Management, (IAQM) which is chaired by IES Council Member Professor Bernard Fisher from the Environment Agency and supported by Council Member Dr David Muir. The work of the IAQM can be viewed at www.iaqm.co.uk. The IAQM held an event which focused on the National Air Quality strategy and in its AGM, looked towards expanding the services it

could offer its members.

The modernisations to the IES Constitution (in line with Charity Commissioners' guidelines) were approved by the 2006 AGM. We would like to thank Irving Blumhof for all his help with this complex process.

The IES has switched its banking services to the Co-Operative bank. This decision was taken by Council due to the 'ethically led' nature of the bank, which was seen as being in line with the principles held by the Institution and its members. Dr Jim Whelan, the Institution's Honorary Treasurer, dedicated a great deal of time (and patience) to managing the move and I thank him for all of his work.

IES's sister organisation, the Committee of Heads of Environmental Sciences (CHES), has continued to be active in the accreditation of undergraduate and postgraduate degree programmes in universities. The 2006 conference in Oxford in March, led by our Council Member Dr Simon Watts, focused on the themes of 'Research, Scholarship and Sustainability (RSS)'. The close links between the Institution and CHES again further our important work in higher education. Closer links with further education are being pursued by our Council Member Dr Heather Barrett-Mold.

We have also been actively involved in the work of the Science Council, in particular with the Science and Sustainability Group, where we have supported the drafting of the Statement on Sustainability. We would also like to take this opportunity of welcoming their new CEO, Diana Garnham.

I would like to thank our Honorary Officers, Members of Council, our administration team and the IES membership for their continued work and support in these challenging times.





ROACH, THE FRESH WATER ENVIRONMENT AND SUSTAINABILITY

The humble roach is a significant economic resource and deserves more than just the occasional angling foray, suggests **DR MARK EVERARD**

We live in a society enlightened by a half-decade of realisation of unintended environmental consequences from its historic pattern of development. Also, albeit at a slower pace, a dawning awareness of the need to understand and protect the ecosystems that underpin our long-term vitality. We have witnessed stated commitments to the achievement of sustainable lifestyles and, at least in the already-developed world, we have made some early progress. Some cleaner technologies, the phase-out of a few dangerous chemicals, and a general improvement in management and treatment of waste emissions are all practical examples. However, across many spheres of developed-world activity, from rising per capita water consumption, the continued loss of biodiversity, and escalating material and energy usage and carbon emissions, we are merely perpetuating our historic trajectory: not so much to sustainability, rather towards oblivion.

We therefore have an over-riding need to understand how species and ecosystems 'tick', how they respond to our intended and unintended interventions, and how their natural limits and requirements should shape a pathway of truly sustainable human policies and activities. Whilst today we use all manner of clever indicators and other metrics of ecosystem health, there is a more fundamental question as to how well we really understand and appreciate the basic 'building blocks' of species, habitats and ecosystems upon which the edifice of a sustainable society must be founded.

For the water environment, populations of native fish are one such 'building block', integral to and indicative of the functioning of aquatic ecosystems. For this reason, we need to understand the basic ecology of key native species. However, we need to do so not merely in terms of detailed autecology, over-specialised and 'boring' as it may appear to most of society, but also with respect to cultural context that can further inform the significance of species for human wellbeing.

Introduction to the roach

The roach is, with the exception of the stickleback, the most widely-distributed freshwater fish in the British Isles. Roach are hardy cyprinids (members of the carp family) with a generalist ecology that suits them to diverse habitat types from still, flowing and brackish waters throughout most of Europe. They survive, even prosper, in grubby farm ponds, powerful rivers, canals, reservoirs and gravel pits, drains and streams. So the very ubiquity of the roach in freshwater and brackish environments, though it can lead us to take them rather for granted, also makes them valuable 'barometers' of environmental pressures. For this reason, the requirements of cyprinid fish are integral to physico-chemical river quality standards in the UK and in EU Directives. Furthermore, their wide distribution means that roach populations have been selected for surveys of, for example, the general pervasion of the endocrine-disrupting effects of chemicals across the UK. (Alarming, male roach from all populations, whether from rural or urban areas, show significant degrees of feminisation.)

Roach also represent a significant economic resource. This is both as a sporting fish across much of their predominantly European range but also as a commercial catch and source of protein, less so in the UK since the 1960s but still quite importantly across the continent. This economic context facilitates their inclusion in sustainability planning or, perhaps more accurately, makes their role in supporting a sustainable society less easy to overlook than that of other equally-important elements of freshwater ecosystems such as, say, the less well-appreciated plumed gnat larvae, flatworms or saprolegnia fungi.

Some aspects of the ecology of roach

We have learnt a lot about fish ecology in the past centuries. Izaak Walton, considering eel reproduction in his famous 1653 book *The Compleat Angler*, presents contemporary ideas about eel reproduction that have aged rather less well than the concept of mummy eels loving daddy eels very much (as primary school texts have it about us bipeds). It was thought, for example, that eels were '...bred, as some worms do, of mud', or else '...out of the putrefaction of the earth, and divers other ways', or even '...out of the corruption of their own age'. More plausible, when one takes account of the sudden appearance of small eels, was the view that '...Eels are bred of a particular dew, falling in the months of May or June on the banks of some particular ponds or rivers, apted by nature for that end; which in a few days are, by the sun's heat, turned into Eels.'

Today, we know an awful lot more about how roach, eels and other fish breed, feed, evade their predators, survive parasites and other diseases, and generally go about the tricky task of surviving and prospering amid the





daily perils of the freshwater environment. This ecological understanding has huge relevance to the ways we manage not only the fisheries themselves, but also the freshwater ecosystems that sustain them.

The societal context

However, we need to go beyond basic ecology to construct proactive environmental protection arguments in terms that may be persuasive to politicians, developers and the general public. Of the many and varied aquatic organisms that prosper in the diverse freshwater environments of our islands, almost all lack the charisma to grasp public imagination or even interest. The million-plus membership of the Royal Society for the Protection of Birds (RSPB) is evidence of substantial public concern and affection for birds, with an associated political leverage. Fish also have some resonance with public and political concern, albeit less than birds, representing as they do an economic resource enjoyed by millions.

Healthy roach populations are of huge economic importance to commercial freshwater fisheries across the UK and their wider European range, where they provide significant local sporting revenue and (in continental Europe) protein. The roach is one of the most popular of all target species for coarse anglers, and is therefore representative of much of the attraction and value of freshwater fisheries. Their contribution to local economies in the UK through angling and associated tourism activities is also highly significant. The angling economy of England and Wales is estimated to be worth in the order of £3 billion, and the sport is actively enjoyed by perhaps four million participating anglers. Furthermore, we are coming to appreciate the contribution of angling to the physical and mental health of its participants, and also the 'cultural capital' of angling associations, informal gatherings and participation which contributes to breaking down social exclusion.

It is hardly surprising then that the wellbeing of fish stocks is central to water quality planning and the reference point of some EU Directives. The roach is one of the most popular amongst a variety of native fish species driving public support for substantial investment in the control of pollution and wider management of freshwater ecosystems. And this, let us recall, is in the context of a declining farming economy which, on the basis of calculations in the wake of the Foot and Mouth Disease outbreak of 2001, was estimated to be worth only £3.2 billion across England and Wales.

The value of roach is also representative of the quality of the environment that supports a far larger rural tourist economy. This realisation of the relative scales of costs, benefits and environmental impacts in the rural economy has gone some significant way towards reshaping agricultural subsidies. Under the 2005 implementation in


England and Wales of the revised EU Common Agricultural Policy, farm subsidies are no longer tied to output of food but rather will be progressively linked to other environmental and societal services provided by land management. For this, we can in part thank society's appreciation of the roach, other aspects of freshwater ecosystems, and the diverse societal benefits that arise from them.

The humble roach, or at least society's interest in angling for roach, also makes a contribution to technology and international commerce, reflected by the bewildering array of hi-tech products offered by an increasingly globalised fishing tackle industry in which the UK is a player.

Applied ecological understanding about roach, put into a cultural context, then has major significance for our perception of and investment in the water environment. At least in part, it directs substantial investment in pollution control, agricultural subsidies and other environmental protection measures, not to mention public appreciation of the water environment including recognition of the importance of maintaining vital ecosystems in the face of ongoing human development.

Valuing roach and the environments that sustain them

As roach, general freshwater biology, and the societal importance of clean and functional freshwater ecosystems have generally become better understood and appreciated over recent years, we are slowly coming to realise that roach and other coarse fish deserve from us more than just the occasional angling foray. They deserve instead to be appreciated in terms of their unique role in ecosystems, value as a charismatic focus for investment in environmental management, appreciation in cultural and even gastronomic terms, sporting heritage, and human utility across the continent that is their native range. In so doing, we may just learn a lot about the workings of the natural world that sustains us, as well as how to catch more and bigger fish on rod and line.

Perhaps more tellingly, we can develop from this some novel understandings and 'messages' about our interdependence with the natural environment that will resonate with the wider public. Thriving roach stocks are not only indicative of healthy aquatic ecosystems, but also of the sustainability of vital and irreplaceable environmental functions that support our needs now and into the future. 

■ Dr Mark Everard's *The Complete Book of the Roach* is published by the Medlar Press (01691-623225; www.medlarpress.com). It addresses in reader-friendly terms details of their biology, much about angling for them, and diverse aspects of their cultural importance. It is comprehensively illustrated with photographs and drawings.



AIR QUALITY RISES TO THE TOP OF THE PLANNING AGENDA

New housing developments in inner city areas are increasingly focusing attention on air quality as a planning issue, says **GARY MAHONEY**

For many years, air quality issues played only a minor role in the planning process. That has now changed – and air quality has risen towards the top of the planning agenda. Increasingly, developers are being challenged on air quality issues at planning appeals.

It is no longer just the impacts of the development that have to be taken into account – it is often just as important to address the impacts upon the development, for example where new housing is proposed in areas of existing ‘poor air quality’.

This is becoming more prevalent with the focus upon the regeneration of inner urban areas. Informal guidance, published by the National Society for Clean Air (NSCA), sets out approaches to deal with these issues. The guidance, first published in 2004, was re-issued in November 2006.

It has long been recognised that the local planning process has an important role to play in improving air quality and reducing exposure to air pollution. This works both at the strategic level, through the development of planning policies and local development frameworks, and at the local level through development control. Planning authorities are responsible for determining applications set against a raft of social, economic and environmental criteria, of which air quality may be one material consideration. Under separate responsibilities, local authorities are also responsible for identifying locations where concentrations of air pollutants are expected to exceed health-based objectives.

The number of local authorities that have identified such areas of ‘poor air quality’ is increasing. Where such areas are identified, the authority is required to declare an Air Quality Management Area (AQMA). Currently around 200 of the 433 local authorities in the UK have declared AQMAs. Planning decisions within AQMAs are critical where the development will add to pollutant emissions. Such impacts may be direct – for example in the case of industrial developments – or indirect, by

creating an increase in road traffic. Planning decisions within AQMAs may also be critical even where the impact of the development itself is insignificant, if more people become exposed to poor air quality. This will be the case where new housing developments are proposed within AQMAs.

Integration of local air quality management and planning (and often transport planning which spans both policy areas) is crucial. However, it is still often the theory rather than practice which prevails. In some authorities, planners and air quality specialists have regular meetings; planning applications are routinely passed on to air quality specialists where there may be an air quality issue; and planners are kept up to date with the pollution picture of the area. As an example, the Greater London Authority has set up a process whereby all relevant planning applications are appraised on air quality grounds. Different local authorities have diverse priorities which often results in different approaches to dealing with air quality considerations in planning decisions – for example a developer may be asked to undertake an air quality assessment in one authority, but wouldn’t be required to do so in another. A number of authorities have developed Supplementary Planning Guidance on air quality, which specifies the situations in which an assessment will be required and what needs to be done – but this approach is far from the norm.

Planning Policy Statement (PPS) 23 makes it clear that planning applications within AQMAs should not be automatically refused if the development causes a deterioration in local air quality, as such an approach could sterilise development. It is for individual planning authorities to strike the right balance between fostering development and regeneration, whilst at the same time ensuring that poor air quality does not adversely impact upon the amenity of the local population. In some cases this is a difficult balance to get right, particularly where there are issues of cumulative impacts, caused for example by many small developments leading to progressively higher traffic flows.

In order to increase awareness amongst planning and air quality professionals, help address inconsistency in working practices, and address the lack of detailed official guidance on this issue, the National Society for Clean Air (NSCA) issued a guidance document on Air Quality and Development Control in 2004.¹ This ‘informal guidance’ has been used extensively by local authorities, and has been cited at a number of public inquiries. The guidance is designed to act as a general information source for planners, air quality specialists and developers, and provides overviews of both the planning and Local Air

¹ *Development Control: Planning for Air Quality* (2004). Available from NSCA at www.nasca.org.uk

Quality Management regimes. In addition, the guidance sets out criteria as to when an air quality assessment might be required for a particular development; provides local authorities and developers with information on what an air quality assessment should include; and sets out an approach for determining whether an impact is 'significant'. The guidance also discusses approaches to mitigation.

The NSCA guidance has been reviewed, and has been re-published in October 2006. The new guidance has been extensively revised – it contains a wider range of case studies; describes how local authorities have dealt with mitigation in practice; and provides examples of how cumulative impacts may be tackled. It takes into consideration the experience of local authorities and consultants who have used the guidance over the last couple of years, as well as taking account of other relevant documents that have been published over this timescale (such as PPS 23, the Draft London Code of Construction Practice and the Association of London Government guidance on air quality and planning).


Some examples of mitigation that are cited include the redesign of building layouts to minimise pollution exposure (for example by positioning of the building with respect to a nearby busy road). Forced ventilation, whereby air is drawn into the building from the rear façade away from a busy road, is also discussed. Other approaches including travel plans, and 'offsetting' of air quality impacts, are also discussed.

Although the guidance focuses on development control, it is recognised that the process should be backed up by robust strategic policies. In particular, the development of Supplementary Planning Documents is strongly encouraged. The Local Development

Framework process provides a timely opportunity for updating existing policies, or implementing new ones.

Key points

- ◆ Air quality assessments are increasingly being required for many developments, even where the scale of development is relatively small.
- ◆ The introduction of new residential exposure into an area of poor air quality is increasingly a focus of attention.
- ◆ There is a need for better integration and interaction between pollution control officers, planners and transport planners within local authorities.
- ◆ Informal guidance, published by NSCA, sets out approaches to deal with issues of air quality and development control. The guidance, first published in 2004, has now been re-issued.

The Institute of Air Quality Management (IAQM) supports initiatives such as the NSCA planning and air quality guidance which help the local air quality management process integrate with other policy areas and help raise awareness of air quality within both environmental and planning professionals. For more information about IAQM, including how to join, see www.iaqm.co.uk or contact secretary@iaqm.co.uk. More information on air quality and planning can be obtained from Clare Beattie, Air Quality Consultants (www.aqconsultants.co.uk, ClareBeattie@aqconsultants.co.uk, 0117 974 1086). The 2006 version of the NSCA guidance can be obtained direct from the NSCA. One free copy will be sent to all local authorities who are members of NSCA and further copies can be purchased at a cost of £10 for members and £25 for non members. Contact Loveday Murley at NSCA for further information (www.nasca.org.uk, lmurley@nsca.org.uk, 01273 878770). 

UPDATE ON THE INSTITUTION'S VOLUNTEER SCHEME

The Institution volunteer scheme has two new faces: Lyndsay has been working at the IES for two months and Chantal started in January. They are both working with the new Project Officer, Adam Donnan, on a number of exciting new projects.

Lyndsay Glanfield

After graduating from Brunel University earlier this year with a BSc in Environmental Hazards, Lyndsay decided to return to the university to undertake an MSc in Environmental Science: Pollution and Monitoring. Lyndsay is particularly interested in all aspects of pollution and completed her third-year dissertation on a study of air pollution in Hillingdon, Middlesex.

She hopes after university to pursue a career within an environmental consultancy, and is currently seeking part-time employment within the environmental sector. She

can be contacted at l.glanfield@ies-uk.org.uk.

Chantal Brown

After graduating from the University of Canterbury in New Zealand, with a Biology/Zoology degree, Chantal worked at a wildlife reserve as a tour guide, informing the public of the reserves' conservation programmes and New Zealand's unique wildlife and the threats it faces.

After moving to England in 2005, she worked in a corporate environment developing customer, sales and administrative skills, before pursuing her career in the environmental sector. Chantal has volunteered with London Wildlife Trust and has written a management report on an internationally recognised urban nature reserve. In 2007, she hopes to also volunteer with the RSPB and train with the conservation team at London Zoo and Woburn Safari Park. Email: c.brown@ies-uk.org.



SCANNING THE HORIZON FOR AIR QUALITY ISSUES

DR MARK EVERARD
explains the advantages
of a more
forward-thinking
approach to air quality

As we grapple with the implications of sustainable pathways of development, we need to be guided by a different set of principles from those that have driven environmental management over the past century and more. By and large, these historic principles have been reactive to adverse environmental and human health impacts only after they have manifested, and when the economic interests underpinning them have become deeply entrenched.

We need to be more precautionary and preventative, and to seek to address issues at source, rather than later at their generally dispersed points of impact. By better anticipation and 'course correction' to avert likely adverse environmental, social and economic implications, we can make better progress with sustainable development. By helping in the quest to anticipate and plan to avert negative consequences, and to seek positive opportunities, the emerging approach of 'horizon scanning' forms part of an ongoing culture change from the retrospective to the proactive.

The emergence of horizon scanning

From 2002-03 onwards, all UK Government departments and major agencies have been engaging in horizon scanning. This activity was initially triggered by what is commonly referred to as the 'four Fs': foot and mouth disease; flooding; the fuel crisis; and the firefighters' dispute. Although diverse in nature, all were largely unforeseen but subsequently disrupted the smooth running of society at national and/or regional scales. However, there had for some time been a feeling in Government that it would be beneficial to seek a more forward-thinking approach. Horizon scanning was advanced to aid a more foresighted basis for policy formulation.

Of course, the future is unknown. However, through a deliberate policy of looking ahead to emerging and nascent issues and then taking a risk-based approach to address them, we are theoretically more likely to be better prepared to deliver adaptive and preventative policies and to spot opportunities. An eye to possible or probable futures represents a wise investment for the construction of more sustainable policy and practice. This can include progressive changes (such as rising atmospheric carbon dioxide levels), potentially disruptive events (such as a

wholly new technology arriving at market) and 'tipping points' (such as sudden ecosystem change consequent from nutrient levels reaching a trigger level).

The characteristics of horizon scanning

Horizon scanning is perceived in a variety of ways by different organisations, the particular remit of each shaping its unique perception of the time scale of the 'horizon', spheres of societal impact of primary concern, the inclusion or exclusion of longer-term environmental changes (such as marine fish stocks), etc. However, all approaches to horizon scanning share the defining feature of being predicated upon less certain potential changes and risks as compared to more 'routine' forecasting initiatives.

Horizon scanning is, of course, focused not merely upon threats, but also opportunities. It should also, importantly, highlight issues about which there is insufficient knowledge to formulate robust and adaptive policy, but which must not simply be forgotten due to the potential for significant consequences at some indeterminate point in the future.

Horizon scanning research for air quality issues

The Environment Agency's interests in air quality extend from those matters for which it has statutory regulatory authority (such as emissions from industrial processes) to the broader 'vision' expressed in its Corporate Strategy Creating a Better Place under the theme of 'Cleaner air for all'. There is therefore a spectrum of issues over which the agency has direct control, less direct control, no control but a desire to influence, and matters for which air quality implications are currently unknown.

Consequently, the Environment Agency commissioned a two-year research and development project in 2003 (Science project number SC030173 conducted by the consultancy ERM) to undertake horizon scanning for issues with potential impacts upon air quality over a time horizon of perhaps the next ten years. To be precise about a time horizon is to overestimate the certainty with which the various emergent issues are understood, but this at least sets a guideline.

The research had two principal strands:

- ◆ development of methods of horizon scanning and their application to novel air quality-related issues; and
- ◆ exploration of the ways in which other EU member states respond to emergent air quality issues. This short article addresses only the first of these strands.

Horizon scanning methods

The horizon scanning method that was developed and applied broke down into the three phases of (a) identification of issues; (b) definition of those issues;

and (c) prioritisation.

Issue identification was through media surveillance, structured internet searching and expert elucidation including a project workshop. Sources ‘scanned’ included governments and their departments at EU and UK scales, environmental regulators and legislators at UK, EU and US scales, major research programmes at global (i.e. World Health Organisation) and EU levels, dialogue with industrial trade associations, and key networks (such as the EU CAFÉ or EUROTRAC programmes).

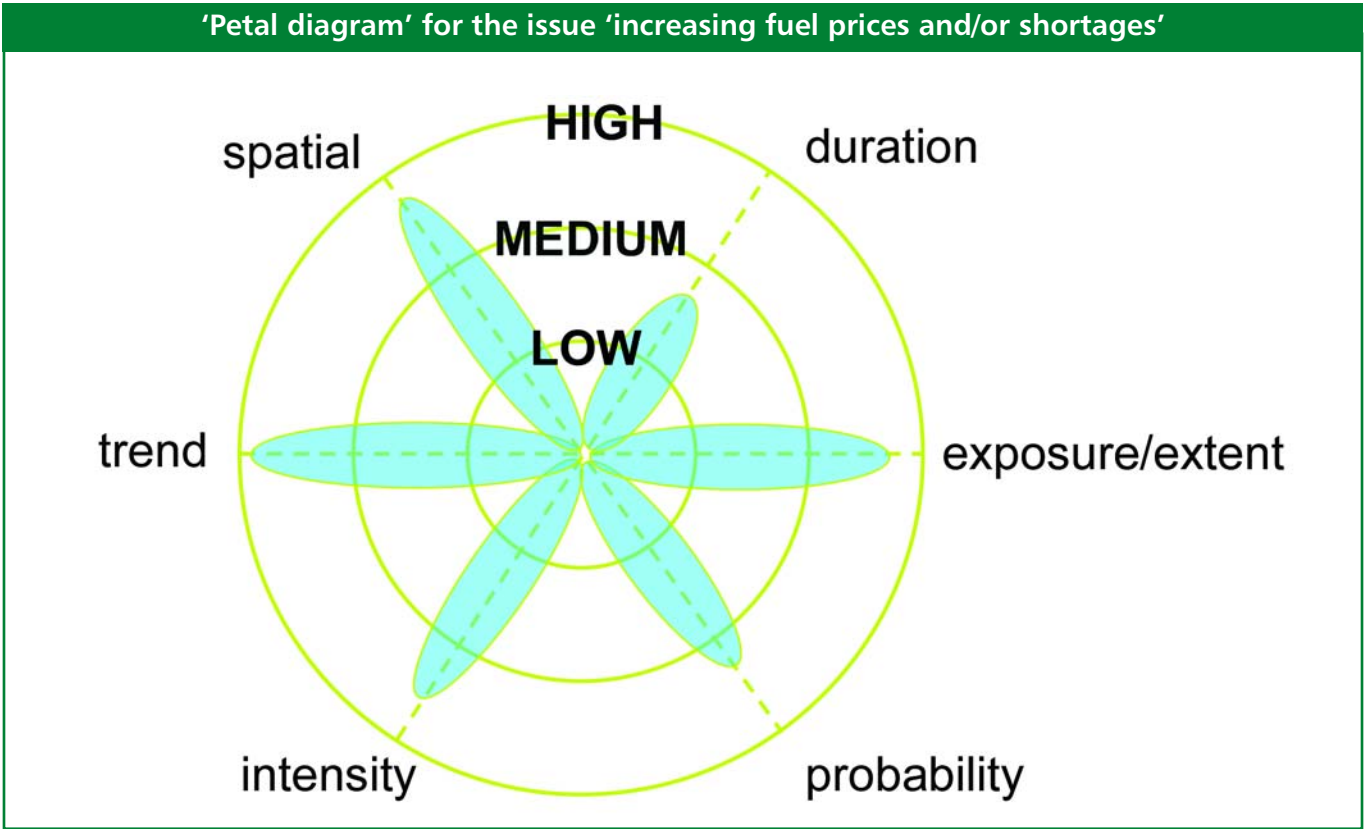
Issue definition was essentially a classification scheme using the five criteria of: technology; events; societal issues; government; and forthcoming legislation. This was not a highly sophisticated method of definition, but it did serve to determine the broad categories of issues flushed out by the identification phase, and therefore to determine any ‘blind spots’ in the scanning methodology.

At the prioritisation phase, the issues identified were scored against a suite of six risk characteristics. These risk criteria were: spatial scale (geographical scale of the air quality impact); duration of effect; the extent of effect (number of people affected); probability of the effect happening; intensity of impacts; and trend (increasing, decreasing or continuous). The scores were determined semi-objectively by a project team representing different disciplines to seek to ensure that no single category of expertise uniformly biased conclusions. During the research and development project, scores for the six

criteria were combined using a variety of arithmetic methods to calculate sets of relative scores. Although the score derived for each issue, irrespective of arithmetic methods used, had no absolute statistical value, relative values allowed a transparent and repeatable method for overall scoring and prioritisation of issues.

For a number of the issues, ‘petal diagrams’ were produced to demonstrate visually the varied risk characteristics of the particular issue. This enabled a simple classification of types of issue according to their relative balance of risk criteria. For example, some issues, such as asteroid impact, may have a very low probability but a potentially high impact, whereas other issues, for example, rising use of domestic air-conditioning, have a high probability but seemingly a low trend of uptake. For the issue illustrated in the ‘petal diagram’ below (increasing fuel prices and/or shortages), the trend is strongly increasing, the intensity and effect are both high-scoring, but the duration of the effect is perceived as shorter.

The various different arithmetic ways of combining scores across six risk criteria also provided a means of sensitivity analysis. However, six prime issues were always represented in the ‘top 10’ scores from the 120 issues prioritised, regardless of arithmetic methods, suggesting that the methods for relative prioritisation are adequately robust for the purpose of highlighting issues of greatest potential concern. The ‘top 10 issues’, using a simple additive algorithm for scores, are reproduced in the table above.



'Top 10' issues from the prioritisation phase of air quality horizon scanning	
1	Increasing fuel price and/or fuel shortages
2	Change to focus on particle numbers rather than mass
3	WHO: health importance of indoor air pollution
4	Increased use of air conditioning → energy → emissions
5	Increasing mobility → transport emissions/infrastructure
6	Shipping/aviation → next priority for emissions control
7	Increase in biofuels for transport and renewables for power
8	Progress with fuel cells: pathway to hydrogen economy
9	AQ standards in West, but not in developing countries
10	New systemic biology affects how pollutants regulated

Each of these issues is different in character and may demand a different type of response. It would be irresponsible to ignore the third issue, the health importance of indoor air pollution, simply because it falls outside any organisation's particular statutory remit. If it is an issue of environmental or public health concern then it is a sustainability challenge, response to which may, for example, require institutional changes so that there is a focus of statutory responsibility. Of the highest scoring issue, 'increasing fuel prices and/or fuel shortages', we are already seeing intensifying consequences since this project reported in late 2005. However, the wider ramifications might include such unexpected issues as novel forms of pollution from alternative energy sources, reduced mobility with declining emissions, increased emissions to air and water from land-use due to the escalating costs of importing agricultural or industrial products from foreign countries, and so forth. The key message here is that the mere identification, definition and prioritisation of an issue is not the end of the process. Issues, not matter how well characterised, do not automatically and seamlessly enter the wider policy-making machine. There has to be an effective interface and further interpretation if the wider-scale implications of novel issues are to be acted upon.

Horizon scanning then does depend upon a robust and repeatable method, but its effectiveness is only as good as the route of uptake into the mainstream, which is by no means a given. Busy policy staff are under intense pressure to address current and pressing issues; appropriate organisational mechanisms must be instituted if novel issues, no matter how well characterised, are to be addressed with any sense of priority.

The outcomes of this project

The first principal theme of this research project, development of methods of horizon scanning and their application to novel air quality-related issues, which forms the basis for this article, has produced two outcomes of use to environmental professionals. The first of these is a process that imposes a set of transparent principles for capturing and thinking about emergent and nascent issues. This can be applied to any topic or sphere of environmental interest. The second outcome is a prioritised set of air quality-related issues, which may be taken up by the air quality management community.

The second principal theme of this research, exploration of the ways in which other EU member states respond to emergent air quality issues,

falls beyond the scope of this short article. However, it was clear from structured dialogue with EU partners that the Environment Agency (for England and Wales) is Europe's best-placed regulatory body to be strategic about air quality, simply because it is the only one that combines an adequately wide range of air quality responsibilities within one organisation. The UK is perceived as generally ahead of the rest of Europe in terms of a proactive approach to air quality issues. There is also broad agreement, amongst the EU partners polled, that the issues identified and prioritised are relevant and appropriate. The attitudes and responsibilities of different regulatory bodies across the EU are shaped significantly by regional geography and climate, governance arrangements and public tolerance of air quality issues.

Reports for the research project SC030173, Air Quality Horizon Scanning, can be obtained from the Environment Agency's science publications web site at <http://publications.environment-agency.gov.uk/>

Scanning for the future

We live in a world that is fast-changing. Change, or at least our awareness of it, has become the new over-riding constant. Horizon scanning is one tool to help us to pre-empt and perhaps to shape alternative futures. It is therefore part of the mix of forward-focused activities that can help us change our practices, and hopefully our habits, in delivering a sustainable future.

However, horizon scanning is no 'magic bullet'; it is ultimately only as useful as the degree to which it influences mainstream activities.

■ Dr Mark Everard is Principal Scientist at the Environment Agency, www.environment-agency.gov.uk





MY JOB AS A... GEOENVIRONMENTAL ENGINEER

ELIZABETH STANMORE
describes her time
working as geoenvironmental
engineer in Jamaica

A Geoenvironmental Engineer endeavours to provide solutions to land environment problems, such as remediation of contaminated land, pollution control and risk assessments.¹ I work as a geoenvironmental engineer at Structural Soils Ltd (SSL), a Bristol-based consulting and drilling contractor who undertake integrated geotechnical and geoenvironmental investigations. After many years of working in the UK, I was fortunate to obtain a short-term contract within a large multi-phase site investigation in Jamaica earlier this year.

Jamaica has the fifth largest bauxite (alumina) reserve in the world and a number of international mining firms are involved in extracting and processing the ore on the island. Many of the mines and processing plants regularly expand and require additional infrastructure. This has led to numerous site investigations being conducted to explore the variable ground conditions across the island.

Site investigations are critical prior to any construction, as they develop an understanding of the ground conditions and foresee potential geotechnical and environmental constraints. Due to the complex nature of the geology at our site, indeed across the entire island of Jamaica, a large multi-national team of engineers, geologists, surveyors, project managers and ground workers are employed to design and construct the various new developments.

Jamaica is the third largest of the Greater Antillean islands, approximately 205km long and 80km wide, and

lies within the seismically active Caribbean and North American plate boundary. Its geological history is complex, and if simply described, comprises depositional phases separated by changes in tectonic stress regimes and/or tectonic events.

The stratigraphy of the island can be sub-divided into three components:

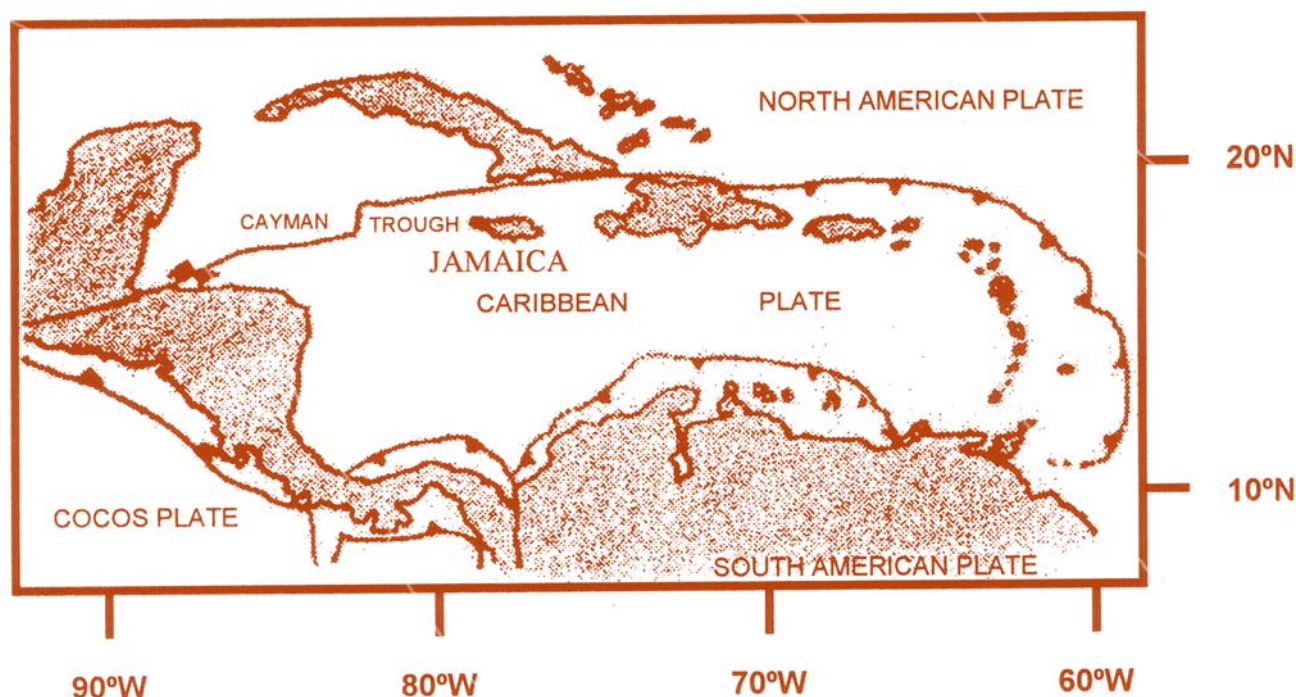
- ◆ Cretaceous basement complex formed of crustal blocks primarily consisting of volcanic rocks, volcanics and associated intrusives and coarse clastics;
- ◆ Post-cretaceous trough sediments, volcanics and intrusives; and
- ◆ The Cenozoic (tertiary) White and Yellow Limestones, developed by seaward progression which formed a carbonate platform. These limestones form an unconformity overlying the Cretaceous basement, forming the highlands of the island. This unit covers approximately 70% of the island.²

The faulting and volcanism conveniently divided the country into six morphotectonic units, comprising the three main structural blocks separated by two northwest-trending graben structures (belts), and a third belt defining the eastern area of the island.³ Our site was situated within the Central Clarendon Block and consisted mainly of Cretaceous-aged volcanic and volcanically-derived clastic sedimentary rocks, capped by limestones, which had more recently undergone deposition of alluvial deposits extending across the southern margin of the island.³

The new developments proposed at our site included the expansion of tailings lagoons and evaporation lakes, a large scale redevelopment within the existing port facilities and a new transportation network. The transport network will consist of railway tracks, road conveyors and an innovative



1. Cardiff School of Engineering.
2. Petroleum Geology of Central Jamaica Source rocks, seals and reservoirs, Department of Geography and Geology, University of the West Indies, 2005.
3. Zans, V.A. *et al*, 1963, Synopsis of the Geology of Jamaica, Bulletin of the Geological Survey Department of Jamaica, 4: 72.



tower-height cable car type transporter, which will move bauxite ore down the mountains to the processing plant.

From March to June this year, I had the privilege of managing the site investigation works for the proposed tailings lagoons/evaporation lakes (or mud lakes) at one of the processing plants in central Jamaica. The site covered an area of approximately 4km² and was situated on a former flood plain south of Maypen, a town located one hour west of Kingston, the capital. The site itself was situated within an alluvial fan of the Rio Minho Basin surrounded by the highlands (Central Inlier), with the river itself flowing in a southerly direction through the western area of the site. The surface conditions were extremely rugged, with intermittent watercourses, and often became impassable following tropical rains.

Fortunately, it was timed that my husband would be on the island as well in the role of an experienced rotary driller. We were employed by the company Emerson Moore Geosciences, another Bristol based geotechnical firm, who were managing the site investigation as well as supplying two of their versatile, light-weight, tracked rotary rigs to be used in the more difficult terrain.

The site investigation consisted of trial pits extending to 6m depth, window sampling, cable percussion boreholes down to 30m depth, rotary drilled and/or augered boreholes sunk to depths exceeding 50m. In addition, various in-situ tests including variable head borehole permeability tests and ground profiling with a memocone (CPT cone) were carried out.

My main job was to organise the team and equipment to be in the right place at the right time. This was a

challenge, particularly when the setting of the investigation was in scrub land and cane fields adjacent to an operational mine and processing plant, in a developing country. Also, it was fast approaching hurricane season with regular and intense tropical storms.

One of my more enjoyable jobs was to supervise (and sometimes instruct) the local drilling crews including the only cable percussion rig in the Caribbean! Most boreholes sunk across the island are for abstraction purposes. Site investigation, including undertaking geotechnical and environmental testing during borehole development, was a considered a relatively new technique.

It was imperative to plan the location of the exploratory boreholes to maximise coverage of the site, thus obtaining optimum geotechnical and environmental information. It was also critical to ensure that all site works and documentation (i.e. logging of rock core) were completed according to the British Standards (BS5930:1999 – Code of Practice for Site Investigations).

The numerous exploratory holes revealed an alternating and extremely variable sequence of granular and fine grained quaternary alluvium, primarily derived from weathered volcanics that had been transported down from the mountains by heavy summer rains. The sequence was highly variable in thickness ranging from 7.3m to 48.3m depth.

These previously strong extrusive volcanic rocks, comprising rhyolites to andesites, graded from fresh to completely weathered very weak rock and decayed clays. Often they contained secondary fine-grained constituents

of clays and clay/silts which are the result of extreme weathering typical of tropical soils. Access cuttings and trial pits showed rounded cobbles (up to 200mm in diameter) and gravels, indicating high energy environments as these gravels and cobbles had been transported down from the mountains by peak water flows during the wet season and deposited across the flood plain.

This type of extreme weathering, particularly of the volcanics, was a cause of interest amongst ourselves and other international geologists on the island. These volcanic rocks are normally considered to be very strong; however, in Jamaica, these volcanic rocks were degrading to very weak gravel and often easily broken down to powder-like material with the hand.

The superficial deposits were primarily the result of ongoing flooding and the subsequent dry, low energy environments. This type of weather was experienced during the investigation, as the intense rain from the short duration thunder storms would often obliterate any newly formed access track or cleared area.


White Limestone underlies the superficial deposits and displayed a fairly developed weathering profile. At the interface of the superficial deposits, a limestone soil was often encountered, comprising firm to very stiff green-grey clays with occasional small 'core stones', indicative of a residual limestone soil. Although the soils were residual and completely weathered, they did maintain a level of structure, similar to the underlying more competent limestone.

The limestone itself, ranging from top to bottom, comprised a very weak completely to highly weathered arenaceous limestone, which was underlain by weak to moderately strong white, highly to moderately weathered limestone with a 'vuggy' texture. These 'vugs' were the result of dissolution processes and were often infilled with brown sandy clay. Beneath this layer was a strong white crystalline limestone with numerous fossils. These were present at specific depths within the limestone core, indicating various depositional environments within the carbon platform and subsequent reef formation.

Groundwater was present within the limestone at approximately 40m depth. Its depth significantly fluctuated within short periods of time and it was noted that the limestone occasionally became increasingly weathered the deeper we bored into the aquifer. It was presumed that the many vugs and solution features within the limestone, and subsequent infilling of clay and volcanics, were the result of previous groundwater flows.

Jamaica relies heavily on bore water (or artesian water) for drinking, and many of the exploratory boreholes extended into the aquifer. Groundwater monitoring wells were installed in many of the boreholes and great care was taken when drilling the boreholes to these depths to ensure drilling lubricants and other potential contaminants would not enter the aquifer.

The information collected on ground conditions, water levels and in-situ tests provided the basis for the detailed design of the future structures, ensuring safe structural design and cost-effective construction measures. This process, of a comprehensive site investigation prior to development, is standard across the world as it is imperative that any development is guided by knowledge of ground conditions.

The project in Jamaica is ongoing, and it is hoped that a compilation of soil and rock profiles covering the central-southern area of the island will be completed in the near future. It was a wonderful experience, but tough being a female professional working predominantly with men. It was great to meet and work with so many interesting people whose personalities, I consider, are as diverse as the Jamaican geology. 

■ For more information and photos about Jamaica, please do not hesitate to contact me at Elizabeth.Stanmore@soils.co.uk. If you would like to know more about EMG's services, please visit EMG's website at www.emerson-moore.co.uk

Thanks to Richard Messenger (Geologist, EMG), Gabriel d'Francesco (Senior Exploration Geologist, EMG) and Jason York (Lead Rotary Driller, SSL) who kindly contributed and reviewed this article.

**Elizabeth Stanmore BSc (Hons) MEnvSci CEnv
Geoenvironmental Engineer.**

THE CHALLENGE OF GROWTH IN A TIME OF CHANGE

Following the great success of the 2006 meeting, the Committee of Heads of Environmental Sciences (CHES) is gearing up for its 2007 annual conference.

This essential event, being held from 13th-14th March, brings together higher educational institutions to discuss common challenges. Colleagues in leadership, teaching, research, marketing and support roles will find the conference stimulating and useful.

Sessions will include 'Challenges for departments:

leading the way in sustainable development'; 'Refocusing the curriculum: teaching, research and the employability agenda'; and a discussion forum on preparing environmental science for the future, 2007-12.

This conference is located in the historic village of Greenwich and, the event includes an overnight stay in a hotel and evening meal.

For more information please go to www.ches.org.uk or email info@ches.org.uk



ENVIRONMENTAL SCIENCE v ENVIRONMENTAL POLICY: A PERSONAL VIEW FROM MIDDLE ENGLAND

Environmental consultant
RON BARNES wonders about
the scruples of policy makers
who use science to justify
their decisions

Recently, *Environmental Scientist* has dealt with the issue of training environmental scientists. This led me to consider the, perhaps, more fundamental issue of what contribution environmental scientists make to policy development. I have therefore thrown a few words together on the question: evidence based policy or policy based evidence? In reality this is a no-brainer. They both exist but at different points in the legislative cycle.

In the beginning independent environmental research – if there is still such a thing – identifies a possible adverse effect on an environmental receptor. Or perhaps I should say ‘pure’ research identifies... That is, research initiated without any particular policy purpose in mind. Anyway, the bright ones amongst you will get the idea.

If the results of this original work identify something interesting, that is something for which research funding can be secured, kudos gained and perhaps the environment helped along the way; further research is undertaken to confirm the original findings. Then the dead hand of policy makers starts to get involved. Politicians, big business, the environmental NGOs and media all begin to take an interest. At this point further pieces of research are often commissioned to elaborate on the original findings but no practised interest group will ask a question to which they do not have a fair idea of the answer. Welcome to policy based evidence. A protracted debate then usually ensues drawing on the often conflicting or apparently conflicting policy based evidence generated by the spectrum of interest groups. Ultimately, compromise legislation is usually agreed.

That used to be the end of the story but more recently, with governments feeling more confident in their ability to manipulate and mislead their electorates, we see the emergence of ‘post-policy based evidence’. This usually comes about when one of the more powerful interest groups find they made an error of judgment in acquiescing to the original legislation: they want a second bite of the cherry.

Epidemiologists have beavered away for years seeking a robust dose/response relationship for atmospheric particulate loading and human morbidity and mortality. It has been clear for many years, certainly since the Great

London Smogs of the 1950s of which I am a survivor, that elevated atmospheric particulate levels have a profound effect on the human respiratory system. The World Health Organisation (WHO 2005) has recently confirmed its air quality guidelines for particulates as:

PM₁₀: 20µ/m³ annual mean; 50µ/m³ 24-hour mean

The values were chosen to represent the lower end of the range over which significant effects on survival have been observed.

It is important at this point to recognise that societal resources are finite and a judgment must be made on whether resources should be diverted from other public health goods such as improving diet, housing and primary health care – or reducing domestic heating bills – to achieving the WHO Guidelines. More lives might be saved, or morbidity reduced, by only moving part-way to the WHO Guidelines while maintaining or increasing resource allocation to other policies known to achieve the same public health end-point. In my experience politicians have difficulty with this concept and one appreciates how a visitor from Mars might be received.

It is therefore no surprise that the present European Union limit values are much the same as the WHO guidelines:

PM₁₀: 20µ/m³ annual mean; 50µ/m³ 24-hour mean,
not to be exceeded >35 times a year

The UK Air Quality Strategy objectives for 2010 use the same limits but with the national (excludes London and Scotland where objectives are respectively weaker and stronger than the national) 24-hour mean not to be exceeded >7 times a year.

In their current review of EU air quality legislation, the Commission have proposed retaining the existing PM₁₀ limit values but this has been the subject of intense debate with early moves in the European Parliament to drop the daily mean limit values altogether. The main reason for trying to backtrack on limit value commitments appears to be widespread non-compliance attributable to delayed or ineffective action at both local and member state level. The UK has contributed to the debate with a very creative but potentially flawed proposal in its recent Air Quality Strategy Review (DEFRA, 2006).

For pollutants without any identified zero effects threshold such as particles, DEFRA proposes changing emphasis from achieving health impact based objectives across the whole UK to reducing average exposure across the entire population. Effects based targets would be abandoned where they are costly or difficult to achieve (‘hot-spots’) while ever more demanding objectives would be set for areas where reductions in exposure are perceived as cost beneficial.

It is proposed to introduce ‘backstop objectives’, the stringency of which would be lower than might otherwise have been the case had the health based objective been the

only driver for air quality. Apparently this would '...ensure some basic level of air quality...' There is no suggestion that these 'backstop objectives' be linked to adverse effects thresholds. Indeed, it is stated that it '...may be more appropriate to set different concentration cap (or backstop) objectives... for different parts of the country.'

Superficially, DEFRA's argument is persuasive but in my opinion a second or two's reflection shows it to be both potentially technically and ethically flawed. The consultation points out in support of the proposed policy change that hot spots tend to be located close to busy roads where '...not many people are actually exposed to annual averaging periods'. This statement reflects, I feel, a surprising naïvety of exposure/response.

The human respiratory system reacts rather quickly to particles, certainly in seconds rather than hours or years. Anyone who has inadvertently disturbed fine dust or been exposed to building work at close quarters will know the almost immediate response of the respiratory system to a sudden rise in fine particulate levels. The reality that most, if not all, contemporary dose/response measures and air quality targets are set as 24 hour or longer averages, reflects the legacy imposed on epidemiological studies by historical air quality monitoring. Averaging periods have traditionally been much longer than exposure/response.

Necessarily, these extended averaging periods have been used by epidemiologists as surrogates for the short-term fluctuations in concentrations which determine respiratory response. So, although the probability of acute events falls with daily or annual mean particulate concentrations, the relationship is only indicative: there will be exceptions. Individuals, particularly with pre-existing respiratory conditions, are therefore likely to suffer debilitating effects from a short term exposure to high particle levels at busy road junctions or along congested highways. In extreme cases, such as an exercising asthmatic or elderly emphysemic, such short-term exposure could prove fatal.

The appeal of the 'exposure reduction approach' being advocated by DEFRA relies on a notional cost-benefit advantage compared to continued efforts to achieve effect-based health objectives. This advantage accrues because the whole population experiences slightly reduced particulate levels rather than those dwelling in or passing through 'hot spots'. However, this is to give preference to longer term chronic effects across the community rather than reduce potential acute effects in a small number of individuals. Moreover, the potential for adverse effects rises with increasing particulate concentrations, impacting on ever more healthy people.

In assessing the claimed cost-benefit advantages of the proposal, it is important to identify the group who account for most of the notional benefits. The

Department of Health's report *Economic Appraisal of the Health Effects of Air Pollution* (1999) is particularly helpful in this regard. For example, EAHEAP states:

'It is important to recognise that the deaths are thought to occur mainly in the elderly with advanced lung or heart disease and to be brought forward by weeks or months but not years... Air pollution acts as an aggravating rather than causal factor and this has implications for judging the importance of its effects.'

According to EAHEAP a high proportion of individuals most affected by air pollution are over 65 years old and, typically, life expectancy for those with pre-existing respiratory conditions will be reduced by less than one month. Prolonging the life of these already terminally ill patients by reducing exposure to particulates is seen by most cost benefit analyses as financially positive. This arises largely because of the Willingness to Pay methodology employed. However, EAHEAP notes that:

'...those who are most at risk from air pollution induced premature death from respiratory disease are older people who already have substantially reduced quality of life as a result of health impairment due to causes other than air pollution. These people will have a lower quality of life than the average of the elderly population.'

Further, EAHEAP reports that it is now well established that there are some states of health impairment that, at least ex ante, are viewed by many people as being bad or even worse than death.

DEFRA's proposed change in approach to particulate objectives is largely informed by a CBA performed on their behalf and reported by Chilton *et al* (2004). This study, a classic piece of post-policy based evidence, used a Willingness to Pay contingent valuation approach. Six hundred and sixty-five randomly chosen individuals were interviewed in their homes. The final sample size was 517. None of those surveyed were ill or incapable. Twenty-two percent had first hand prior experience of breathing problems with 6.5% experience of hospital admission for the same reason.

Perhaps surprisingly, even in this relatively fit cohort, there was little enthusiasm for paying to increase the life expectancy of those in poor health. As the authors observe (Page iii):

'For extra time in poor health, more than half the sample gave a zero valuation: there was considerable ambivalence among respondents about whether extending their lives in poor health was indeed a benefit. By contrast, extending life in normal health was viewed by the majority as the most highly valued benefit.'

The study sought WTP for increases in life-span of 1 month, 3, months and 6 months separately for individuals in 'normal' health and an estimate for 'poor'

health. As the table shows, the WTP of those surveyed falls off markedly as the duration of the notional extension to life increases.


	INDIVIDUAL IN POOR HEALTH	INDIVIDUAL IN GOOD HEALTH
1 MONTH	7,280 (3,840 - 10,760)	27,630 (20,690 - 34,440)
3 MONTHS	1,600 (1,000 - 2,200)	9,430 (7,520 - 12,700)
6 MONTHS	1,290 (900 - 1680)	6,040 (4,760 - 7,330)
DEFRA*	15,000	29,000

* DEFRA (2006, Table A3.3)

WILLINGNESS TO PAY VALUATIONS (£) FOR
EXTENDING LIFE EXPECTANCY
(after Chilton *et al* 2004)
(Values in parentheses denote ranges at
95% confidence interval)

The table also shows the WTP figures used by DEFRA in their Air Quality Strategy Consultation. The provenance of these numbers is unclear, a reference to the Interdepartmental Group on Costs and Benefits (2006) not providing any objective explanation on how they were derived from Chilton *et al* (2004). This is unfortunate because the values adopted are very much towards the top end of the scale identified by the latter authors, especially for individuals in poor health. Moreover, if Chilton *et al* had included respondents who were seriously or terminally ill or if a Gross Output valuation methodology had been employed instead of WTP, the values in this

category are likely to have been even lower.

So, there we have it, evidence based policy, policy based evidence and post-policy based evidence are all alive and working sequentially for the benefit of those who manage our country. Decisions are made incorporating varying degrees of uncertainty but policy makers are usually unwilling to admit this openly. Instead they prefer to project their policies as robust, despite inherent uncertainties. When an adopted environmental policy is found to be ineffective or becomes a handicap, usually because of cost or inconvenience to the establishment, environmental science is deployed to come up with some justification for a change. Integrity? What's that? 

■ Ron Barnes, PhD, FRMetS, MIEEnvSc, MIAQM is an independent consultant with previous experience in the UK Department of the Environment, UNECE and Esso UK plc. He represented CBI/UNICE at the EC during development of the Air Quality Framework Directive.

References

Chilton, S. *et al*, *Valuation of Health Benefits Associated with Reductions in Air Pollution*, DEFRA, London, 2004.
DEFRA, *The Air Quality Strategy for England, Scotland, Wales and Northern Ireland: A consultation document on options for further improvements in air quality*, Volumes 1 & 2, London, 2006.
Department of Health, Ad-Hoc Group on the Economic Appraisal of the Effects of Air Pollution, *Economic Appraisal of the Health Effects of Air Pollution*, The Stationery Office, London, 1999.
Interdepartmental Group on Costs and Benefits, *Third Report: An Economic Analysis to Inform the Air Quality Strategy Review Consultation*, DEFRA, London, 2006.
World Health Organisation, *Air Quality Guidelines – Global Update 2005*, WHO, Copenhagen, 2005.

Consultation Response Network

The IES has now launched its Consultation Response Network (CRN) to manage its responses to government policy consultations.

There has been a fantastic response to the initiative with 70 members already signed up. The size of the network will allow us to incorporate diverse opinions from a wide spectrum of environmental occupations in our consultation responses.

One of the aims of the Institution of Environmental Sciences is to get its members' opinions heard in the political realm. Consultation documents and processes offer an opportunity for our members to provide impartial environmental perspectives on major areas of public policy, legislation, planning and other initiatives.

If you have not already signed up, forms are available to download from the members' area of the website.

EnviroSci E-Newsletter re-launched and New Members' forum

The EnviroSci e-newsletter has undergone a design make-over and is now being sent to our members in .pdf format.

If you have not been receiving the EnviroSci Newsletter, you do not have an email address registered with the Institution. You can rectify this by filling in the contact details form on the IES website.

In a progressive move, supporting the contact between members and professional and person development, the Institution has also created an online forum space for members to use. You can find this in the members' area (www.ies-uk.org.uk/members) with threads for discussing professional issues and interests with other like-minded people.



THE GEOGRAPHY, EARTH AND ENVIRONMENTAL SCIENCES (GEES) SUBJECT CENTRE UPDATE - JANUARY 2007

The Centre has a UK-wide brief and this is reflected in the locations of its activities and events. The services offered to academic and support staff from GEES departments (including HE in FE) include:

- ◆ National conferences and bespoke departmental workshops
- ◆ An annual residential workshop for new and aspiring lecturers
- ◆ Funding for small-scale learning and teaching research and development projects
- ◆ An on-line Resource Database
- ◆ A free biannual publication (Planet) containing case studies and articles on learning and teaching in the disciplines
- ◆ Networks and project groups (e.g. e-Learning; Pedagogic Research and Education for Sustainable Development)
- ◆ A regular electronic newsletter with information about the latest developments and events (to subscribe, go to www.jiscmail.ac.uk/lists/gees.html)
- ◆ An enquiry/advisory service – Email: info@gees.ac.uk, Telephone: 01752 233530
- ◆ Additional information can be found at www.gees.ac.uk

Current work

Planet – special issue on ‘Threshold Concepts and Troublesome Knowledge’

We will be shortly distributing our latest edition of Planet. This bi-annual publication on learning and teaching in the three disciplines is aimed at identifying and disseminating good practice, acting as a forum for the discussion of ideas and providing information for readers on Subject Centre activities, related resources, conferences and educational developments. To obtain a copy contact: sian.evans@plymouth.ac.uk or visit: www.gees.ac.uk/pubs/planet/index.htm.

Student Essay Competition 2007

Deadline: Friday 16 March 2007

The Subject Centre is offering students the chance to submit their thoughts in an essay (of around 1,000 words) with the title: ‘What advice would you give to students starting your course?’

The winner will receive £250, be published on the Subject Centre’s nationally recognised website, and represent GEES in the UK-wide competition. This offers a top prize of a Toshiba laptop and all expenses paid attendance at the Academy’s Annual Conference in Harrogate in July 2007. The competition is open to any student studying geography, earth or environmental sciences in UK higher education from foundation degree to postgraduate levels.

Email your essay to j.dalrymple@plymouth.ac.uk or visit www.gees.ac.uk/projtheme/sawards/2007/sawards07.htm

Employability pack

The centre has developed a resource pack to support the integration of GEES graduate employability skills within the curriculum which will be available in the next couple of weeks; it will include:

- ◆ An Enterprise, Skills and Entrepreneurship resource pack.
- ◆ An Employability guide, containing information on including employability in the curriculum.
- ◆ Subject employability profiles: examples of how GEES subjects are suitable for preparing students for work in any sector.
- ◆ A report on ‘Integrating Corporate Social Responsibility to Curriculum Design’.
- ◆ PP4SD sustainability survey – ‘Initial Training Requirements for Environmental Scientists.’

GEES will also be launching an employability wiki allowing staff and students to discuss issues on employability as well as accessing resources on line. To receive a pack contact jane.dalrymple@plymouth.ac.uk

Student focused publication

The centre is currently developing a pilot publication which aims to give staff and students a glimpse of what it’s like ‘on the other side of the fence’. Hopefully by opening up the communication between the two communities it will enhance working relations and allow staff to tailor curriculum, support and recruitment strategies more effectively to a 21st century student. Simultaneously it will help students make the most of their learning experience. The publication will include personal recollections, research papers and examples of good working practice from students and staff on learning and teaching, emphasising student involvement and open communication.

Contributions are still being accepted: if you are interested in submitting please visit www.gees.ac.uk/pubs/student/contents.htm or contact Sian Evans at sian.evans@plymouth.ac.uk for more information. The publication is due to be launched at the Subject Centre’s summer conference on recruitment and retention.

Coming events

- ◆ Residential Workshop for Newly-Appointed and Aspiring Lecturers, Birmingham, 21-22 May 2007
- ◆ Recruitment and Retention, Birmingham, 25-26 June 2007
- ◆ Virtual Fieldwork in the GEES Disciplines: Pedagogy and Technology, Worcester, 16 May 2007

For more information and a downloadable booking form visit www.gees.ac.uk. If you have queries or want a full programme, when available, please email events@gees.ac.uk



SKILLS FOR SUSTAINABILITY

What does sustainability really mean for the professional?

JOHN BAINES reports

This workshop held at London South Bank University on 27 November 2006 was organised by Professional Practice for Sustainable Development (PP4SD) and the Science Council with support from the Institution of Environmental Sciences, London South Bank University, PP4SD and the Science Council. Almost 60 participants registered for the workshop, representing the professions, businesses, government and individual professionals. A full report of the workshop will be posted on the PP4SD and Science Council websites during February 2007.

Purpose of the workshop

The workshop was organised because of the increasing pressure on professionals from government, the public and business organisations to become more engaged with sustainability and sustainable development practice. The competencies, knowledge, skills and attitudes needed by professionals if the goal of sustainability is to be achieved are beginning to be identified. There is now a need to consider how CPD can most effectively help professionals develop these competencies in sustainability and sustainable development.

The workshop set out to:

- ◆ Develop cross professional dialogue to identify future skills needed by professionals to respond to the challenge of sustainability.
- ◆ Identify opportunities to integrate sustainability skills into CPD within professional institutions.
- ◆ Identify what needs to be done next.
- ◆ Produce a report of the findings of the workshop.

The inputs

Jimmy Brannigan, chair of PP4SD, chaired the morning session when a number of speakers made presentations. The information they provided was to inform the discussions later in the day.

Ann Finlayson, Commissioner for Education and Head of Social Change at WWF-UK, opened the presentations by describing the national context. She pointed out that DfES was recognising the importance of identifying and promoting skills for sustainable development, but at the moment they were adopting an instrumental approach – identify a problem, find a solution and teach the skills to implement the solution. Ann advocated an Action

Research Model in which learning from experience is a key component. She suggested that the skills needed seem to be generic rather than specific to sustainable development. They include the abilities to vision the future, to adapt to change, to think critically and act responsibly. However, achieving sustainability requires more than appropriate skills, it needs a change of mindset, a move away from the individualist agenda to something more universal.

Richard Howell, Sustainable Development Policy Manager at the Environment Agency, provided an employer's perspective. The Agency operates as a champion for sustainable development through its roles as an efficient operator, a modern regulator, an influential advisor and an effective communicator. Many professions are represented amongst agency employees and all need the skills to be able to practise sustainable development. Skills for sustainability embrace all previous skill development policies from a focus on technical issues to the current need for life cycle analysis. Richard continued by describing some of sustainable development skills needed in the Agency. The high order skills he listed provide a context within which the skills specific to a profession are used. Finally, he showed how staff in various operations of the Agency including procurement, regulation, engineering, science and environmental protection could use the skills.

Diana Garnham, Chief Executive of the Science Council, explored the implications of policies for sustainable development on professional bodies. She described some of the strong drivers for change and the desire of the science based professions to bring good science into the public and professional debates.

John Baines, Vice-president of the Institution of Environmental Sciences, reported on his research into the skills needed in the environment professions and the implications of the findings for professional training. There was overwhelming support for sustainable development topics to be included in initial training for environmental professionals and most work required competency in sustainable development. Initial training cannot provide all the training that is needed, especially as our knowledge of the issues improves and new technologies become available. There is therefore a need for professional development throughout a professional's career.

Discussion

There were four groups discussing:

- ◆ What is the role of professional institutions on sustainable development and sustainability?
- ◆ Are there key skills that all professionals need?
- ◆ What are the next steps for institutions and/or individuals?

The groups recognised the importance of cross-

professional dialogue on sustainable development and considered umbrella bodies for professional bodies such as the Science Council and Society for the Environment provided mechanisms for dialogue and actions such as joint professional development programmes.

The groups identified some general competencies that would help professionals integrate sustainable development into their practice. They included:

- ◆ The ability to engage stakeholders in discussion about sustainable development and to communicate good science appropriately and effectively.
- ◆ The ability to view professional activities in a holistic way and apply systems thinking skills.
- ◆ The ability to take account of ethical considerations even though these may not be 'scientific'.
- ◆ The ability to make decisions based on incomplete information.
- ◆ The ability to integrate learning with working.

A number of recommendations were made for professional bodies relating to their governance, policy development, practice and cross professional working. The umbrella bodies for the professions can help ensure the developments within the professions are coherent,

comprehensive and compatible with each other.

Conclusions

David Hickie, Chief Executive of Society for the Environment, summarised the discussions. He emphasised that the skills agenda was in fact a competency agenda, taking into account both knowledge and skills. He recognised the potential of the professional bodies to provide leadership in the many aspects of sustainable development, including cross professional dialogue. He also recognised that each professional body had its associated areas of technical knowledge and skills, but that many of the sustainable development skills were in fact relevant to all professions.

David considered that changes to mindsets and behaviours within the professional institutions are still needed. There is a need to engage more communities and stakeholders in professional plans for sustainable development in the communities where their members operate. He called on us to 'Inform, Influence, Innovate, Inspire and Involve and to avoid prescription'.

He summed up by providing a new strapline 'Sustainability through professionalism'.



IES NEW MEMBERS

The Institution of Environmental Sciences is pleased to welcome the following new members:

Dr Paula Atkin	Environmental Consultant	Mr Mark Mifsud	Assistant Lecturer
Mr Paul Ciniglio	Innovations and Environmental Manager	Mr Keith Munday	Environmental Consultant
Mr Nicholas Clarke	Environmental Manager	Mr Emmanuel Munyikwa	Environmental Engineer
Dr Gareth Collins	Technical Director	Miss Dheshnee Nadar	Air Quality Officer, Turruck Borough Council
Miss Katherine Connor	Environmental Engineer	Miss Julia Pittman	Air Pollution Researcher
Mr Owain Davies	Air Pollution Scientist	Mr Jonathon Powell	Project Environmental Consultant
Miss Kristina Dunning	Graduate Environmental Scientist	Mr Ian Renshaw	Environmental Consultant
Mr Jonathan Flitney	Technical Officer	Mr Jeffrey Roberts	Senior Consultant
Mrs Paula Gilfillan	CESO Environmental Protection Policy	Mr Ayuba Samaila	Environmental Scientist
Mr Nick Hall	Health Safety and Environment Manager	Mr Ho Sing	Safety Health and Environmental Manager
Miss Belinda Horrill	Project Environmental Advisor	Mr Kevin Stone	Senior Remediation Engineer
Mr Lee Jones	Senior Technical Officer	Mr Stephen Telford	Geo-Environmental Engineer
Mr Steven Lees	Environmental Scientist	Ms Julie Urquhart	PhD Student
Miss Anneliese Lithgow	Graduate Environment Scientist	Miss Helen Walker	PhD Student
Dr Trudie Mansfield	Assistant Director	Mr Richard Walters	Pollution Control Officer
Mr James McCance	Technical Support Officer	Miss Fiona Wark	Environmental Engineer
Miss Kim McKenzie	Environmental Engineer	Ms Pui Wong	Teaching Associate
Mr Tahir Mehmood	Safety Health & Environmental Manager	Mr Peter Wynn	Project Manager

Individual Affiliate Membership

What is Affiliate Membership?

Affiliate membership is appropriate for those individuals with an **interest in environmental issues** and practices, and also for those with qualifications or experience not directly related to the field. Students undertaking environmental degrees which are not listed on our accreditation scheme would benefit from this type of membership. The Institution embraces interest in environmental issues and aims to enhance knowledge in this area wherever possible. Members of the public are encouraged to join, signalling their belief in the application of science and professionalism as a way of tackling environmental challenges.

The application form for Affiliate Membership can be found and downloaded from the IES website: www.ies-uk.org.uk



What are the **benefits** of Affiliate Membership?

There are several advantages to becoming an Affiliate member of the IES, including:

- Online access to the latest edition of our regular **newsletter**, *EnviroSci News*
- Online access to the most recent issue of the our **journal**, *Environmental Scientist*
- Online access to the **Members' forum**, enabling **networking** opportunities with environmental science professionals
- Signals your commitment to environmental concerns through association with an established, reputable **professional environmental body**
- Supporting a charity which is committed to environmental awareness and supporting those who are working to protect it
- Improved **knowledge** and **environmental understanding**

How much will it **cost**?

Application to Individual Affiliate membership costs just £10. This entitles the applicant to membership until the end of the calendar year, after which the annual renewal is £10.

Supporting Environmental Professionals and their careers

- Provide enquiry/network information through the IES Offices
- Supporting the IES membership
- Promoting and developing CPD and research for professional development

- Ability to award Chartered Environmentalist status through SocEnv
- Professional Practice for Sustainable Development (PP4SD)
- *The Environmental Scientist*
- *EnviroSci News* e-newsletter

Promotion and support of Environmental Science

- Contribute to the promotion of environmental sciences internationally
- Supporting and promotion of environmental careers through our environmental careers web site
- Offer short term volunteering opportunities
- Enabling new environmental professional bodies such as the IAQM
- Aiding research/disciplinary research



- Represent environmental science professionals on Science Council and Society for the Environment
- Supporting initiatives that promote sustainable development across the professions
- Founder member of the Society for the Environment
- Responding to consultations

Supporting the Education of Environmental Scientists

- Support of environmental science higher education through collaboration with CHES and GEES
- Accreditation of Higher Education Programmes
- Student Membership
- Ensuring future generations of skilled environmental practitioners

About the Institution of Environmental Sciences

The Institution of Environmental Sciences is a charitable organisation which promotes and raises public awareness of environmental science by supporting professional scientists and academics working in this crucial arena. As a seminal environmental sciences organisation, founded in 1971, the Institution is consulted by the Government and other interested parties on environmental issues. The Institution has strong ties with Higher Education and promotes and supports environmental science and sustainable development in universities and colleges both nationally and internationally. The Institution offers continuing professional development, supporting professionals as well as awarding membership which recognises an individual's accomplishments.

Membership of the Institution offers stepping stones on a career path, from student to Chartered status, attracting professionals of high standing with significant specialist and interdisciplinary experience.