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FEATURE ARTICLES

Chemicals in the environment

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Concern over chemicals in the environment has increased as evidence for adverse impacts on wildlife and ecosystems and the health of people has emerged. This is reflected in the large numbers of national and international initiatives aimed at reducing exposure to potentially toxic chemicals. Many of these are based on the precautionary principle whereby action to reduce exposure is taken without waiting for definite proof of harm.

The approach to chemicals in the environment favoured by the industry is risk-based since, it is argued, a chemical may be potentially harmful (toxic), but if there is little or no exposure (dose) to people or the environment there is minimal chance or risk of harm. The risk-based approach is statistical and poorly understood by the public. Moreover it is sometimes based on inadequate data and assumptions.

Greater transparency, openness and public involvement is required about the distribution and health aspects of chemicals in the environment and a new paradigm for the manufacture and use of chemicals is required if the environment and the chemicals industry are to be sustainable in the future.

It is important to consider the hazards posed by manufactured chemicals in the context of variations in the levels of chemicals which occur naturally or as a result of past human activity. Concentrations of chemicals can vary in relation to bedrock, drift including glacial deposits, soil, and vegetation type. Three groups of chemicals are of concern in relation to the environment: essential and potentially harmful chemical elements; radioactive substances; and persistent organic pollutants.

Inorganic substances

There are many elements essential to animal life and there is a whole range of disorders associated with deficiencies in them. Some elements have not yet been shown to be necessary for animals, although

essential for higher plants: boron is an example of one such. Concern about essential elements centres on environmental degradation. For example, modern agricultural practice can lead to deficiencies in some trace elements. Potentially harmful elements known to have adverse physiological significance at relatively low levels include arsenic, silver, cadmium, lead, mercury and aluminium. All trace elements are toxic if ingested or inhaled at sufficiently high levels for long enough periods of time and some (selenium is an example) show a relatively narrow concentration range between deficiency and excess (toxic) levels.

Radionuclides

Radionuclides can also be considered in two groups: those which occur naturally, and those produced deliberately or accidentally by nuclear reactions as a consequence of human activities. Uranium is not the only naturally occurring radionuclide, there are a number of others. They produce elements as a result of their radioactivity, for example, radon (a

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decay product of uranium-238) is a naturally occurring radioactive gas which can cause lung cancer. Many man-made radionuclides are naturally stable elements which are made unstable by a change in the structure of their nucleus: caesium-137 and iodine-131 are examples.

Organic compounds

According to the European Environment Agency the exact number of marketed chemicals is unknown; the current estimate varies from 20,000 to 70,000. What is known is that in 1995 the chemical industry produced world-wide 400 million tonnes of chemicals. In addition to marketed chemicals, the chemical by-products from production and from energy generation also impact on the environment, ecosystem and human health. Some persistent organic pollutants (POPs) such as dioxins and polycyclic aromatic hydrocarbons are also formed by natural processes including forest fires. The POPs that are of most environmental concern are those which bioaccumulate up the food chain. Some POPs travel long distances, in some cases on a global scale. Some POPs are found in the Arctic, thousands of miles from major primary sources.

Linking health with chemicals

The link between chemicals and the effects on health varies from the well-known causal relationships such as between benzene and leukaemia to suggestive associations such as chemical sensitivity and pesticides.

Cancer is linked to asbestiform minerals, polycyclic aromatic hydrocarbons, benzene, some metals, some pesticides, some solvents and natural toxins. Cardiovascular diseases to which the elderly are particularly susceptible are linked to carbon monoxide, arsenic, lead, cadmium, cobalt, calcium and magnesium. The respiratory diseases affecting children are linked to inhalable particles, sulphur dioxide, nitrogen dioxide, ozone, hydrocarbons, some solvents and terpenes. Effects on reproduction is linked with polychlorinated biphenyls (PCBs), DDT, phthalates and other endocrine disrupters while the development of fetuses and children is affected by lead, mercury and other endocrine disrupters. Nervous disorders are linked to PCBs, methyl mercury, lead, manganese, aluminium, organic solvents and organophosphates including pesticides.

Mapping and monitoring chemicals in the environment

Manufactured chemicals and their toxic metabolites are widespread in the air, soil, water, sediments and in biological species, following the manufacture, use and disposal of up to 100,000 chemicals. There is a serious lack of information about their concentration and dispersion, their effects on people and ecosystems, and the changes in their concentrations through time.

Increased concern about the environment has led to more studies into the quality of water resources, waste and pollution. In developing countries there are also studies of soil degradation and desertification resulting from overcropping, salination and deforestation. Many such studies are concerned only with specific media,

such as groundwater or soil, and frequently provide data on just one or two chemical substances. Methods of sampling, analysis and data interpretation can vary greatly and results are generally published in the journals of learned societies aimed at other experts, with relatively little impact on society as a whole. A more strategic approach to chemicals already present in the environment, including their interactions, is required.

In the UK and most other developed countries, geological surveys provide strategic information on the Earth's crust, including its surface geochemistry. Soil, sediment and water are sampled and analysed to international standards; and radioactive elements which can be identified by their specific gamma energy emissions are surveyed using airborne radiometric measurements. Increasingly, information is held digitally and is displayed using Geographical Information Systems. Such programmes provide strategic information on the environment which can be analysed and integrated. Moreover problems can be presented to public and policy makers in an easily understood format. Also, combinations of chemicals in different media can be presented using simple colour addition methods. When linked to process and modelling studies, such data provide a powerful means of documenting chemical hazards of natural or human origin, as well as providing solutions and subsequently assessing their effectiveness.

They can be used with sophisticated models to indicate the bioavailability of chemicals. This is important because it is the amount of a substance that is bioavailable that is likely to be most significant to human or ecosystem health. For example, the potential toxicity of aluminium, which is the commonest metal at the Earth's surface, and of trace elements such as arsenic and antimony, depends on their chemical form or speciation.

Data for essential and potentially harmful chemical elements are available over much of the UK as a result of the BGS's Geochemical Baseline Survey of the Environment (GBASE). Britain is seriously behind most developed countries in airborne radiometric surveying coverage. Only a small area has been covered to modern standards, despite the value of the data in identifying potential hazards from natural and man-made radioactivity. Data on POPs are even more sparse and are limited to a relatively few sites monitored by the Environment Agency. No POPs are included in the G-BASE programme.

Reducing chemical pollution in the future

In the past 20 years there have been significant changes in the perception of chemical pollution. It has changed from a local/regional to a national/international one; from point sources of pollution (eg, chimneys) to diffuse sources (agriculture, food, consumer products); from 'end-of-pipe' to clean production and life-cycle assessment of impacts; from occupational health to consumer health and the health of ecosystems; and from specific regulations to framework regulations, taxes, voluntary agreements, etc.

A new paradigm is increasingly being adopted for

chemical production based on 'clean production'. For example, in the USA the Massachusetts Toxic Use Reduction Act 1989 has resulted in firms using 20 per cent fewer toxic chemicals and generating 30 per cent less toxic waste. There is also an increased emphasis on services rather than products which should increasingly lead to full lifecycle management of chemicals with full product stewardship and increased recycling. Further efforts are needed, however. In particular, more information should be made available to the public on the content of chemicals in consumer products and their use by the food industry. Moreover, the same standards for chemical manufacture, use and disposal should be applied to developed and developing countries. Environmental scientists should be involved at all stages of chemical manufacture and use.

Conclusions and recommendations

The UK has a world lead in mapping and monitoring chemicals in the surface environment although more POPs should be included. Radiometric coverage should

also be extended. Such information provides valuable models for informing risk analysis and risk management for the future manufacture and use of synthetic chemicals.

BGS, together with other European and North American geological surveys, is taking a lead in developing such programmes at the global scale with the communication of methods, and environmental geochemical data and information over the world wide web. Hence it is hoped that in the future it will be possible to study particular regions and countries in a global context and provide a baseline against which future change in the chemistry of the surface environment can be measured.

Future chemical pollution can be limited by a new paradigm for the chemicals industry which aims to minimise both deliberate and accidental emissions of hazardous substances to the environment, including in developing countries. A new culture of transparency, openness and consumer involvement is essential. **G**

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Confidence in chemicals

Professor David Taylor

Chairman, RSC Environmental Health and Safety Committee

The chemical industry: a key industry for society

The chemical industry is a key industry whose products and services are essential in meeting the basic needs of humanity, ranging from food and health to clothing, housing, communication and transport, through to leisure activities. However, opinion polls demonstrate that most people think of chemicals as a special class of materials used only by industry. They do not connect the idea of 'chemicals' with any of the products that they use and value highly in their daily life.

People appreciate that a mobile phone is a miracle of electronic engineering but fail to recognise that it consists in its entirety of a complex mixture of chemicals, each one designed to provide the necessary functions to make the phone operate. This disconnect causes problems for manufacturers who are encouraged by environmental regulators and pressure groups to avoid using persistent and toxic materials whilst simultaneously trying to meet the needs of their customers. Consumers would, of course, be highly dissatisfied with a mobile phone that needed to be replaced in three months because it was made from non-persistent materials, or with a household disinfectant that had such a low toxicity that it allowed germs to thrive.

Another critical issue is the perception, held by many people, that chemicals can be divided into those that are 'safe' and those that are 'dangerous'. This is associated with the increasing demand that the 'burden of proof' should be changed such that manufacturers would have to demonstrate that a chemical was 'safe' before it could be used. However, there are no 'safe' chemicals, only safe concentrations. Although the vast majority of chemicals are safe at normal levels of exposure, any materi-

al, however innocuous it may appear, can cause toxic effects at a sufficiently high intake. Several people die each year from alcohol poisoning as a result of over indulgent drinking, and one person in the UK has died of B-carotene poisoning due to his over-reliance on carrot juice as a health food. Thus the problem we face, as society, is not how to identify which chemicals are safe, but how to manage the safe use of any chemical.

How should we manage chemicals in a safe manner?

The chemical industry aims to market only those products that can be manufactured, used and disposed of safely. If it failed to do so, the very benefits that it offers to society would be jeopardised and its long-term economic success would be threatened.

Since no substances are inherently safe, we cannot entirely eliminate risk. Thus society needs to manage the risks posed by any product that it wishes to use. In order to do this we need to understand what these risks are, and in order to understand the risks we need to know what the hazardous properties of the substance are and how the substance will be used throughout its life cycle. For example, radon gas, resulting from the decay of natural radioisotopes, is found in every house in the United Kingdom. The process of hazard analysis, risk assessment and risk management demonstrates that in most cases no action need be taken by the household, but that in a very small number of cases, where the concentration of radon is high, some prudent amelioration measures would be desirable. Reliance on hazard assessment alone would necessitate expenditure by every household in the UK.

All three steps of hazard analysis, risk assessment

and risk management are essential, and although the assessments may frequently be simple and straightforward, the omission of any step may lead to perverse consequences. For example, the substitution of one material by another which is less toxic to humans but substantially more flammable than the original may actually increase the overall risk.

How are we doing?

Since 1981 all new materials introduced into the EU have been required to have a basic set of toxicological and ecotoxicological data to enable an appropriate risk assessment to be undertaken. The number of 'new' materials introduced is modest (ca 100 per year in the EU) and the system works well.

It was always envisaged that once the system for 'new chemicals' was in place all existing chemicals would be subject to assessment, and the Existing Substances Regulation passed in 1993 was intended to do this. The industry provided all the data that was required by the appropriate date, but the rate of progress by member states in evaluating risk has been very slow with only ca 20-30 assessments close to completion. In the late 1990s the industry became very concerned at this and decided that it needed to be more proactive.

Consequently, the global chemical industry has launched an initiative to generate additional information to help satisfy public expectations. As a first step the International Council of Chemical Associations (ICCA) is coordinating and accelerating the process of data collection and initial hazard assessment for 1,000 high production volume (HPV) chemicals by the end of the year 2004. These chemicals have been selected first because they make up over 90 per cent of the world's chemical productions and have a greater potential for exposure to man and the environment.

When should we use the Precautionary Principle?

The chemical industry supports the precautionary principle as stated in Principle 15 of the Rio Declaration. We also welcome the recent communication on the precautionary principle from the EU Commission which seeks to provide clearer guidance for deciding when the principle should be used. However, it needs to be recognised that the application of this principle will always be controversial.

The most ardent promoters of the precautionary principle seek to imply that the result of adopting a precautionary approach is always beneficial to society with the only adverse consequences being a minor reduction in industry profits. In reality, precautionary action is always likely to produce adverse consequences for stakeholders in the present which must be justified by the probable avoidance of potentially worse consequences at some unspecified time in the future. Thus the problem is to determine when the severity and probability of the future event is sufficient to warrant the removal of the current benefit. This problem is magnified when there is no viable alternative, either in existence or likely in the immediate future. The controversy over DDT during the recent discussions on the

UN Convention on Persistent Organic Pollutants is a classic example. Should the production of DDT be eliminated entirely on the basis of precaution if this would then lead to several million additional cases of malaria in Sri Lanka and India?

The adoption, or otherwise, of precautionary action must be based on balancing the costs and benefits, both in the present and the future. In some cases companies will determine that such action is in their own self interest; however, in most cases governments will need to listen to all the stakeholders, including manufacturers and users as well as environmental bodies, before coming to a decision on behalf of society as a whole.

The way forward

The chemical industry is committed to maintaining continuous dialogue with its stakeholders, government, public authorities and non-government organisations, to listen, learn and engage as a responsible member of society.

Industry recognises, as a result of this dialogue, that current risk assessment methodology needs to be improved and consequently the global chemical industry, predominantly in North America, Europe and Japan, has set up its Long-range Research Initiative (LRI) to address the existing and emerging health and environmental issues facing the chemical industry. This provides financial support for external research to focus on the development of sound scientific understanding of the impact of chemicals on people and the environment. It is intended to provide new insights into risk assessment and to generate information for sound and cost-effective regulations on chemicals.

The emphasis of this 10-20 year European research programme, for which \$30m have already been committed for the next five years, has been developed around five major themes: the assessment of exposure for man and the environment; improvement of the understanding of the dynamics of the ecosystem; development of methods for risk assessments, in particular with respect to the marine environment; endocrine disruption and carcinogenicity, immunotoxicity, allergy and neurotoxicity.

Conclusion

Industry takes its responsibilities extremely seriously and is trying to meet the needs of all its stakeholders which also include consumers as well as employees, shareholders and the public. Our objective is to ensure that society can benefit from the products produced from chemicals whilst seeking continually to minimise any associated risks to mankind and the environment.

■ This paper was originally written on behalf of the RSC and is reprinted from *Science in Parliament*, Vol 58 No 1 with the kind permission of the publishers.

■ **EDITOR'S NOTE:** *The European Commission has just produced a paper, put forward by environmental commissioner Margot Wallstrom, proposing that all chemicals on the market should be assessed by 2012. Of the 100,000 products currently on the market, less than 1 per cent have been properly tested. Responsibility for assessment will pass from public authorities to industry.*

Fear of flying?

Professor Derek Hall MEnvSc

Amid debates on ozone layer and climate change impacts of air travel, on the impending need to ration travel and tourism – as many more millions of the globe’s population seek to travel the world, often helping to destroy the very sources of their attention in the process – there has emerged an important debate on questions surrounding the well-being of travellers on longer-haul flights.

In November, following a nine-month inquiry, a report by the House of Lords science and technology committee criticised airlines and government for a ‘woeful neglect’ of medical issues associated with air travel. The report called for the mandatory safety demonstration given to passengers before take-off to be followed by advice on avoiding blood clots. This came at a time when a number of deep vein thrombosis (DVT) incidents following long haul air travel were being publicised by the media. Although, as indicated by the report, more research on this topic is urgently required, blood clots due to air travel are reckoned to account for 5 per cent of all blood clots in the legs. They can also occur on long trips by other forms of transport, though probably to a lesser extent. They are more likely in trips lasting 12 hours or more. Many researchers believe that cramped airline seats and inactivity during a flight increase the risks of blood clots in the leg. Pressurisation is also likely to be a factor. Normally, movement of the calf muscle helps to pump blood from the legs to the heart. But if the leg remains still or if circulation is restricted by the seat in front, blood is more likely to form a clot in one of the leg’s deep veins. If the clot is later dislodged, it can travel to the lungs, causing a pulmonary embolism, which can be fatal.

While the Lords committee concluded that air travel had ‘no significant impact’ on health for the vast majority of travellers, it recommended that those most vulnerable to DVT – anyone over 40, pregnant women or those using the contraceptive pill – should avoid drinking alcohol or tea or coffee at the airport or on board. They should also avoid sleeping for long periods in their plane seats. All passengers should be encouraged to move around the cabin and take part in ‘preventive leg exercises’.

The House of Lords report also called for seat space and leg room on passenger aircraft to be increased ‘to a healthy minimum’ and welcomed research by the Civil Aviation Authority into whether the minimum distance (‘pitch’) of 28 inches between backs of seats needed to be increased. Airlines had told the committee that increasing seat pitch by two inches would raise fares by about 10 per cent.

Several airlines are now facing lawsuits from relatives of passengers who have died of DVT. British Airways has decided to issue a leaflet with all tickets warning of the dangers of embolism.

DVT occurs ‘naturally’ in one person in 1,000 each year, but the extent to which its incidence is increased by flying could not be known because there were con-

sidered to be no rigorous scientific studies, although the committee calculated that for every million people taking a long journey in a year, only 200 might suffer the condition because of the extra risk of travelling. This is considered by several health practitioners to be a gross underestimate.

Risk factors for getting a blood clot on an air journey

- Long periods of immobility.
- Compression of the vein behind the leg from sitting down.
- Increasing age.
- Past history of clots or blood disorders.
- Pregnancy or post-natal condition.
- Recent surgery.
- Dehydration: particularly through alcohol or caffeine consumption and low intake of water.
- Taking the contraceptive pill or hormone therapy.
- Having a malignant cancer.
- Heart disease.
- Exceptional tallness or shortness.
- Obesity.

Preventive measures

- Drinking plenty of water on the flight and avoiding alcohol and caffeine.
- Performing stretching exercises constantly, moving ankles up and down to stimulate the calf muscles.
- Avoiding flying for at least a month after surgery or any major injury to the lower legs.
- Taking plenty of deep breaths, as this helps the venous blood return to the heart from the legs.
- Getting an aisle seat or an exit seat, so there is more room and easier access to walking around.
- Avoiding sleeping in an uncomfortable position, especially if taking sleeping tablets.
- Avoiding placing any luggage under the seat in front.
- Wearing thigh-high elasticated stockings, ensuring that they do not slip down and become tight around the knee.
- Taking one aspirin tablet before the flight to thin the blood.

Urgent need for verifiable research

Estimates of the prevalence of deep vein thrombosis in the general population vary from about 1 in 10,000 for young adults to more than 3 or 5 per 1,000 for people aged over 60.

The risk to any one individual may be small, but it applies to a very large and rapidly increasing number of people, and appropriate research is only gradually emerging. For example, recently reported research at University College Hospital, London, tested 200 passengers by ultra-sound, who were found to have no clots before flying. After flying, 10 per cent were found to have blood clots.

A study carried out at Ashford Hospital, close to

Heathrow Airport, led doctors there to suggest that perhaps more than 200 people die from flight-related DVT each year in Britain alone: they estimated that at least one long-haul passenger dies every month from a blood clot within minutes of landing at Heathrow, and that this figure is the tip of a large iceberg. Over the past three years, the accident and emergency department has dealt with 30 air passengers killed by deep vein thrombosis. A third of the patients, who were aged between 28 and the late seventies, had flown to Heathrow from Australia in economy class seats. Evidence gathered in the hospitals closest to Gatwick Airport indicates that doctors there see 100 people a year who suffer from deep vein thrombosis, of whom about 8 per cent die or are dead on arrival. Further research, as reported in *The Observer*, suggests the likelihood of 3,000 cases a year of flight-related DVT in Britain, with 300 deaths. Even this conservative estimate renders the likelihood of death from a flight-related blood clot a greater risk than from an air crash.

A study at a clinic at Narita Airport in Tokyo has shown that about 150 passengers each year receive treatment for suspected blood clots, and 25 have died in eight years. The study also shows that risk increases with alcohol consumption, obesity and age, those who die having an average age of 64. A French report of 1999 disclosed that doctors were treating an average of 12 passengers each year for clots at Charles de Gaulle and Orly airports.

Such figures are suggested as being tips of icebergs since it can take days or weeks for symptoms of DVT to appear, by which time passengers are dispersed and patterns cannot be extrapolated. In this respect co-operation from the airlines to assist necessary research would appear vital. Yet it is reported that British Airways has declined to take part in DVT studies proposed by Guy's, King's and St Thomas's Hospitals and Newcastle University. In 1993 Qantas rejected the proposal for a similar study to be undertaken by the University of New South Wales.

Pressurisation problems?

Research from the Haematological Research Laboratory, Ullevål, Oslo, published in *The Lancet* in November, found that concentrations of compounds associated with clotting had increased to between two-and-a-half and eight times the initial levels when healthy men were placed for eight hours in a low pressure chamber – which created the air pressure of 7,000ft above sea level, as used in aircraft cabins. The study suggested that rapid exposure to air pressure in aeroplane cabins activates coagulation, and that such activation probably contributes to the increased risk of venous thrombosis.

Recently, UK research has been conducted to determine if pressurised air in a cabin could make passengers more susceptible to developing blood clots. Drs Peter Barrett and Richard Dawood, undertook studies on four flights, and found that oxygen levels in the blood fell. Subsequently, according to the *Daily Telegraph*, British Airways admitted 'problems' with the Boeing 777, its newest wide-bodied jet, which flies

5,000ft higher than most other planes.

People flying back from skiing holidays need to take particular care, especially if they have broken a leg.

New European norms?

The European Commission is setting up an expert group to investigate the health risks of flying for long distances in cramped conditions, paying particular attention to low pressure, seat pitch and cosmic radiation effects. Airlines could be forced to provide more legroom for passengers in aircraft cabins under regulations proposed by the EC, which would inevitably increase the cost of air travel. In January British ministers indicated that they would support such proposals. Lord Macdonald, the transport minister, was to meet the airline industry in February to discuss the plans, which will also require air operators to publish figures on punctuality, cancellations and complaints. The Commission wants to see 'league tables' on customer satisfaction: complaints about cramped seating would be one of a number of indicators for inclusion. The Commission believes that such tables, which could be introduced as early as this April, would help passengers to make more informed decisions when planning air travel. The US Department of Transport already compiles league tables which include the number of complaints each American airline receives.

In February, MPs were to vote on a back-bench ten-minute-rule bill to require airlines to co-operate with studies into DVT. Although it had little chance of success, the Bill was intended to increase the pressure on the industry. Campaigners for DVT victims were planning a mass lobby of Parliament in a bid to maintain pressure on the Government to act to reduce the risk.

Conclusion

Perhaps airlines and governments should see the debate on DVT as an opportunity rather than a threat: an opportunity to reduce aircraft payloads by providing more space for passengers, and to raise fares, thereby rationing environmentally harmful air travel and at the same time increasing the well-being of those who do travel. Unfortunately there are obvious flaws in such an argument:

- It is élitist and exclusionary in seeking rationing by ability to pay. Yet (a) doesn't that happen already, and (b) isn't it central to environmental economics that the polluter pays?
- Despite the coming generation of 'super-jumbos', reduction of the passenger capacity of aircraft in order to provide more leg room and exercise space might simply generate an increased number of flights to sustain the equivalent level of passenger traffic.

In direct environmental welfare terms, the number of travellers believed to succumb to DVT particularly through air travel, while not insignificant, is a fraction of the thousands killed and injured on our roads every year. The external costs of such carnage, alongside those of deleterious atmospheric emissions and physical land use impacts, should keep the need for effectively, and holistically, tackling the road traffic question

Moving towards sustainable construction

A.J. Vetter, Robert Weston and Stephen Martin

The Egan Report – a wake-up call

In July 1998, the Construction Task Force, under the Chairmanship of Sir John Egan, published 'Rethinking Construction', commissioned by the Deputy Prime Minister, John Prescott. While praising the industry at its best, the report raised deep concern that, overall, it was under-achieving in areas such as profitability, cost-effectiveness, health and safety, defect rates, construction time, investment in capital, research and development and training.

The drivers for change detailed by the Egan Report were in the areas of: committed leadership, a focus on the customer, integrated processes and teams, a quality driven agenda and commitment to people. Delivery processes requiring urgent attention, it suggested, were: product development, project implementation, partnering the supply chain and production of components.

'...we are not inviting UK construction to look at what it does already and do it better,' concluded the report, 'we are asking the industry and Government to join with major clients and do it entirely differently. What we are proposing is a radical change in the way we build. We wish to see, within five years, the construction industry deliver its products to its customers in the same way as the best consumer-led manufacturing and service industries. To achieve the dramatic increases in efficiency and quality that are both possible and necessary we must all rethink construction.'

The industry's impacts

For many years, while the global debate on sustainable development heated up around it, the UK construction industry appeared to remain quietly aloof. Yet it has a vast impact. For instance, construction consumes some 260 million tonnes of primary aggregates per annum, creating around seventy million tonnes of waste – half the UK's total – much of it ending up in landfill. Buildings, once completed, go on to account for a full 50 per cent of total energy consumption.

What is most surprising about this is that construction and its products are more palpably present in our lives than most other industries. Just about everyone spends a large part of their lives living, working, studying, sleeping and enjoying leisure activities in buildings. Furthermore, the construction process is one of the most visible of all industrial activities.

The overall sense conveyed by the construction industry has been that of a rather outdated, somewhat tarnished ocean-going liner whose immense size has rendered it incapable of any agile response to changes around it. But there are exceptions...

Tarmac's strategy & The Natural Step™

Tarmac Group took the strategic decision in 1994 to tackle head-on what was then still generally known as

'the environmental agenda'. An Independent Advisory Panel of specialists was established and it published an Environmental Policy, going on to create the foundations for the corporation's first Corporate Environmental Report (CER). Since 1994, four CERs have been produced and an exhaustive programme of environmental management, training, project and site management tools has been developed.

Carillion PLC is the construction division which was formed by the de-merger in 1999 of Tarmac Group into two parts: construction and extraction. One of the key elements of Carillion's sustainability programme has been its continued engagement with The Natural Step™ (TNS) as a Pathfinder Partner, a relationship originally developed prior to the de-merger. The TNS framework is a scientifically rigorous framework, and is based on the working of natural systems, within which development can be assessed as genuinely sustainable or not. TNS is an international network, operated under licence in the UK by Forum for the Future.

The TNS framework is based upon four 'System Conditions' refined over several years' intense collaboration among scientists, business people, educators, politicians and communities:

System Condition 1

Substances extracted from the Earth's crust must not systematically increase in nature. This means that in a sustainable society fossil fuels, metals and other materials are not extracted at a faster pace than their slow redeposit into the Earth's crust.

System Condition 2

Substances produced by society must not systematically increase in nature.

This means that in a sustainable society substances are not produced at a faster pace than that at which they can be broken down in nature or redeposited into the Earth's crust.

System Condition 3

The physical basis for the productivity and the diversity of nature must not be systematically diminished.

This means that in a sustainable society the productive surfaces of nature are not diminished in quality or quantity, and we must not harvest more from nature than can be recreated.

System Condition 4

We must be fair and efficient in meeting basic human needs.

This means that in a sustainable society basic human needs must be met with the most resource-efficient methods possible, including a just resource distribution.

Working with the TNS framework, Carillion has developed Sustainability Action Plans (SAPs) which have been applied at two 'test bed' construction sites in the UK: a social housing scheme in Bradford and the Princess Margaret Hospital Relocation project at

Swindon. The Swindon SAP addresses numerous inter-related areas including:

- transport
- health and safety
- energy
- labour
- raw materials & extraction
- waste
- quality
- compliance with legislation
- community
- image and the 'licence to operate'
- supplier partnerships

A stake in the ground

Carillion began construction in 1999 of a new 56,000 square-metre acute general hospital on the outskirts of Swindon to replace outdated facilities near the town's centre. The company's leaders recognised that this was an opportunity to make a difference – the Sustainability Action Plan could begin to live up to its name.

The application of the TNS framework for Carillion and its suppliers was still in the early stages of development as the hospital project got under way, yet it was surprising to see how much could be achieved through collaborative thinking and action.

As the learning process unfolded and understanding of the issues began to deepen, three key points emerged. Firstly, there was a great deal of enthusiasm for the initiative among the individuals directly involved. Secondly, such an approach might soon be a prerequisite for success in the industry, since the community at large would accept nothing less, withholding the 'licence to operate' from those who failed to address the sustainable development agenda. Thirdly, this was an opportunity to test in practice the social aspects of sustainability in action. Much has been done in the past to address ecological challenges – and these would certainly be given a high priority in this project – but a hospital also has a clear and crucial social role.

TNS recently researched and produced a report, *Sustainable development and related issues in the NHS*, from which it emerged that there has been very little attention to full sustainable development in this area. Issues such as community health, preventive health, links between transport and respiratory disease and road accidents, for example, all present themselves for deliberation and action in such a venture as this.

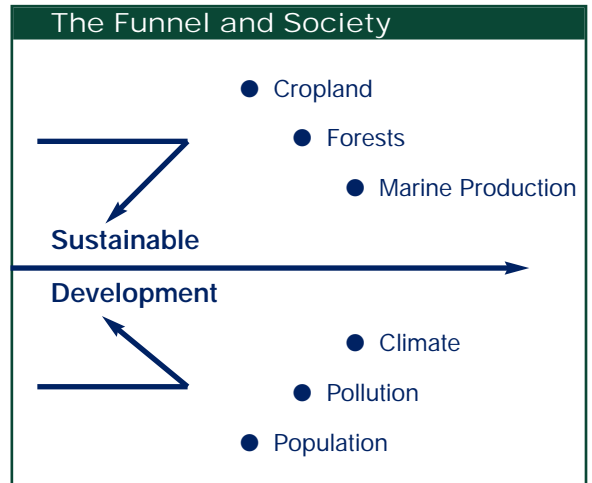
What does sustainability mean?

Clearly we all have an investment of some kind in attempting to create a sustainable world. Future generations and other cultures require careful thought and action from us now if they are to experience the same levels of health and prosperity that many of us enjoy today.

The most widely-used description of sustainable development is the Brundtland definition, which has been adopted by the UK government: '...development that meets the needs of the present without compromising the ability of future generations to meet their own needs.'

Forum for the Future, wishing to accentuate the bio-physical limits within which we must live, has proposed the following definition: 'Sustainable development is a dynamic process which enables all people to realise their potential and to improve their quality of life in ways which simultaneously protect and enhance the Earth's life support systems.'

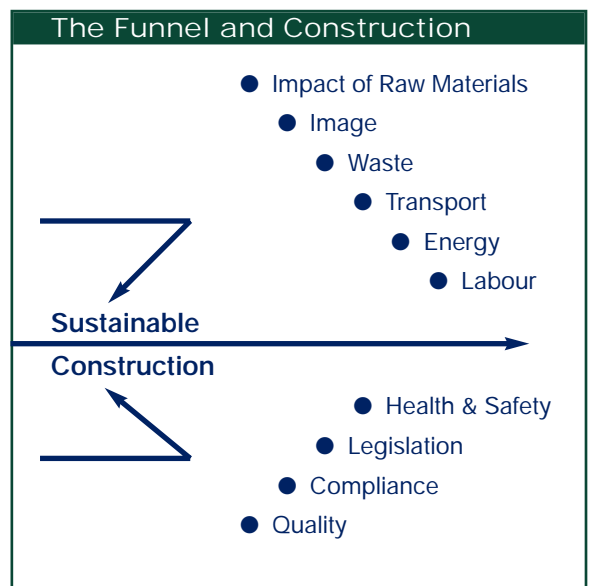
The Funnel: a metaphor for how society's activities reduce its ability to progress into the future



The backdrop – why do this at all?

'The Funnel' demonstrates powerfully the need for urgent change in the way businesses, governments and individuals relate to and operate within the world around us. Massive changes have taken place over recent decades: natural resources such as forests, oceans and productive land, for instance, have declined considerably, while population has risen exponentially.

This creates a diminution in what is often called 'environmental and social headroom' – our 'room to manoeuvre'. Failure to improve our understanding and actions in the field of sustainability might lead to our 'hitting the wall of the Funnel' with potentially disastrous consequences.



What is the meaning of 'Sustainable Construction'?

'The Funnel' as applied to the construction industry shows us where we need to direct our attention in order to avoid 'hitting the wall'. Apart from the ethical and altruistic reasons for addressing these issues, there might be a very high commercial price to pay if we do not take action. Companies' 'irresponsible' practice has already led in many cases to: tarnished reputations; PR disasters and loss of market share; costly encounters with increasingly stringent legislation; disaffected staff and low motivation; high energy, transport and waste management bills; poor Health and Safety performance; late and low quality delivery.

Prioritising a better quality of life

Attending to the issues identified earlier could mean:

- more investment in people and equipment for a competitive economy
- achieving higher growth whilst reducing pollution and use of resources
- sharing the benefits of growth more widely and more fairly
- improving our towns and cities and protecting the quality of the countryside
- contributing to sustainable development internationally.

These are the sustainable development aims set out in the government's publications *A better quality of life – a strategy for sustainable development for the United Kingdom* (May 1999). According to the subsequent document *Building a better quality of life: a strategy for more sustainable construction* the construction industry can contribute to the achievement of these sustainable development aims by:

- being more profitable and more competitive
- delivering buildings and structures that provide greater satisfaction, well-being and value to customers and users
- treating its stakeholders more fairly and respecting them
- enhancing and better protecting the natural environment
- minimising its impact on the consumption of energy (especially carbon-based energy) and natural resources.

One recurring theme which has emerged from much of the deliberation on sustainable development is that of 'Systems Thinking'. In a forest, many organisms co-exist in interdependent relationships whereby the waste from one species is used by others as raw materials. (You don't see many landfills in a forest!)

Thinking like a forest

The Systems Approach applies as much to information as to materials flow. The Movement for Innovation (M4I), an implementation programme which emerged from the Egan process, emphasises the need for the many parties involved in a construction project or geographical region to exchange information with each other in order to optimise overall performance.

An example of the Systems Approach in action is the

recycling of biodegradable waste at the Princess Margaret Hospital Relocation project. Working alongside composting specialists Hinton Organics Ltd, Carillion have created a plan to manage 'green waste' at a recycling centre within the construction site. Instead of being landfilled, timber offcuts, cardboard packaging and other biodegradables are sorted into separate containers and then chipped and composted *in situ*. The products of this process can then be deployed as fertiliser or mulch as part of the landscaping element of the scheme. This saves money which would otherwise be spent on transport, labour, landfill tax and the purchase of landscaping materials from outside.

It also creates employment and training opportunities for local people and prevents the creation of greenhouse gases which are produced as organic material decomposes in landfill.

Partnerships and information exchange

The Egan Report lays considerable emphasis on the development of partnership arrangements. It goes on to stress the importance of forging long-term relationships in this area in order to foster interdependent learning and exploit mutually beneficial opportunities for improved quality and efficiency.

Carillion not only endorses this way of thinking, it also sees such a programme as being central to the achievement of its sustainable development goals. Obviously, it is impossible to deal effectively with the environmental and social impacts of an organisation's activities if there is no dialogue or collaborative action with suppliers. Those who are 'upstream' will be providing goods whose manufacture, transport and deployment on site all have major sustainable development implications. Likewise, those suppliers dealing with waste and other 'downstream' elements of a design will clearly be key players in an overall drive towards sustainability.

With this in mind, Tarmac Group had established a Supply Chain Task Force in 1997 in order to 'develop a clear policy statement on Supply Chain Management through undertaking a pragmatic analysis of the area'. The task force was created as one of several aimed at addressing strategic sustainability issues facing the organisation. 9

Editor's Note:

The above article was first printed as part of a publication for Carillion PLC entitled *On being a good neighbour – moving towards sustainable construction* and is reproduced with the kind permission of the authors. It is proposed that the principles expressed in this article be developed further with leading figures in the construction industry through a conference this summer which is expected to be held at the new Earth Centre in South Yorkshire. Further information can be obtained from Robert Weston at Groundswell Ltd – e-mail: info@geeswell.u-net.com

Outcry as US reneges on Kyoto treaty

The US President's refusal to ratify the Kyoto treaty, insisting that the American economy must come before tackling climate change, has generated worldwide condemnation.

The European Union decided to send a mission to Russia, China, Iran and Japan in April to test support for the treaty after its rejection by George W. Bush.

European Commission President Romano Prodi said in a statement: 'I am very concerned and disappointed about the apparent decision by the US administration to withdraw from the Kyoto Protocol. This is no longer simply an environmental issue.' He added that the US move was 'hard to understand.'

France, China, Japan and Norway all joined a chorus of protest against Bush's abandonment of the treaty. However, Australia said it understood US concerns that developing countries should be included in the accord limiting greenhouse gases.

Jacques Chirac, the French President, addressing the UN Commission on Human Rights in Geneva, called on all countries to implement Kyoto. 'At a time of global warming and of a disturbing and unacceptable challenge to the Kyoto Protocol... of spreading deserts and an

impending freshwater crisis of major proportions, how can we affirm the right to a protected and preserved environment, the right of future generations?' Chirac asked.

China also denounced Bush's decision. 'The US announcement that it will not meet its emission reduction duties, citing the lack of obligations on developing countries, violates the principled rules of the Kyoto Protocol and is irresponsible,' its foreign ministry said.

And the Japanese Prime Minister Yoshiro Mori wrote to the US President urging him not to ditch the Kyoto pact.

President Bush has said the idea of limiting carbon dioxide emissions is unfair to the United States and 'does not make economic sense for America.' The US, the biggest producer of man-made

Institution joins protests

The Institution of Environmental Sciences shares the widespread concern over the decision by President Bush not to ratify the Kyoto treaty. In common with a number of other organisations and individuals, the IES has joined in an e-mail protest expressing this concern directly to the White House.

carbon dioxide emissions, has signed the Kyoto accord but the Senate has not ratified it.

The agreement calls for all industrialised nations to cut emissions of five harmful greenhouse gases, including carbon dioxide, by over 5 per cent by 2010.

Diplomatic criticisms were echoed by angry newspaper comment from around the world. In the UK *The Guardian* described Bush's decision as a 'Taliban-style act of wanton destruction,' drawing a parallel with the demolition of ancient statues in Afghanistan.

In Tokyo the *Shimbun* slammed the 'great-power greed' of a country of 'mass production, mass consumption and mass waste.'

The French daily *Liberation* said: 'It is at their risk and peril that the Americans forget that no country is an island which can live in ignorance of the rest of the world. And he who sows gas risks reaping, well before the climate warms, hostile opinions and an explosive diplomatic isolation.'

The Portuguese daily *Publico* said: 'It is not just the decision that is shocking... It is above all the brutal way in which it was announced; without the slightest discomfort, with the arrogance of those that think themselves owners of the earth.'

Climate change report confirms need for urgent action

John Prescott, the Deputy Prime Minister, called on world leaders in February to heed calls for action on climate change after a new international report warned of irreversible changes to the environment.

Significant changes to the world's climate systems, including extreme rainfall and more frequent droughts, with potential harmful costs to the global economy, society and environment, are the likely result of global warming according to scientists from around the world.

The report, from the Intergovernmental Panel on Climate Change, concludes that there is even stronger evidence that 20th century climate changes have had a discernible impact on many physical and biological systems.

This includes shrinking glaciers, thawing of permafrost, earlier emergence of insects and the decline of some plant

and animal populations.

The IPCC has already predicted that global temperatures will rise over this century by 1.4–5.8°C, much higher than previously suggested.

The new report highlights the major effects of such projections, including:

- increased flooding, due to more rain and rising sea levels;
- increased risks of disease, including malaria;
- greater risk of extinction for some species;
- damage to coral reefs, forests and alpine and polar ecosystems.

The rate of warming will be faster than has been experienced by the planet in the last 10,000 years and most people will be adversely affected even by small temperature increases. Predicted changes this century may also trigger more profound effects including eventual melting of

Arctic and Antarctic ice sheets.

Mr Prescott said: 'This report and others from the IPCC show that it is vital that we redouble our efforts to achieve a successful conclusion to international negotiations on tackling climate change.'

'We understand more than ever about the potential impacts of climate change, and we know enough now to convince us that we must act. The new report shows that we risk major irreversible changes unless we significantly cut emissions of greenhouse gases.'

The UK Government has already introduced a range of measures to cut greenhouse gas emissions, including the Climate Change Levy, a domestic emissions trading scheme to allow business to reduce emissions more cost effectively, and a new target to increase the proportion of electricity provided by renewable sources to 10 per cent by 2010.

£500,000 boost announced for biodiversity initiative

A £500,000 boost to safeguarding the UK's rare and diverse wildlife has been unveiled by the Government.

The National Biodiversity Network Trust will assemble biodiversity information into one national network, as well as making data from government research programmes widely available.

Over 60,000 people, many of whom are volunteers, routinely collect information about the state of biodiversity across the country. At present this information is registered through 2,000 national societies and recording schemes. The new network aims to bring together for the first time the effort and wealth of knowledge of volunteers, conservation agencies, research bodies and government agencies and departments.

This will help scientists, planners and managers assess the current status of biodiversity and determine future action required.

Speaking at the launch of the National Biodiversity Network Trust, Environment Minister Michael Meacher said: 'Over the last four years the Government has put action to conserve

biodiversity at the forefront of its policy agenda. I am delighted to confirm two year's funding for the National Biodiversity Network, which has already demonstrated its ability to deliver real benefits for the protection of biodiversity on the ground.

'The funding will help ensure that the crucial role the National Biodiversity Network Trust plays in assembling information to help assess the status of biodiversity will continue and further inform policies and actions on a regional, national and international level.'

The UK's commitment to safeguarding biodiversity was confirmed by the introduction of the Countryside and Rights of Way Act 2000, the first major piece of new wildlife legislation to be introduced in England and Wales for 20 years.

The Act introduces a statutory duty on all ministers and government departments to have regard to the conservation of biological diversity while carrying out their duties. It also requires the Government to publish lists of species and habitats important for conservation

Climate change agreements concluded

Energy intensive industry sectors have now signed more than 40 agreements with formal targets for cutting carbon emissions and tackling climate change, the Government has announced.

This largely concludes the negotiations for climate change agreements. DETR announced the first 15 sectors in mid-February. The energy intensive industries covered by the agreements will be eligible for an 80 per cent discount in the rate of Climate Change Levy, which came into effect from 1 April for all non-domestic energy users.

The agreements were sealed as new figures showed that emissions of greenhouse gases have been cut in the UK.

According to the latest headline indicator, emissions of greenhouse gases fell 6.5 per cent between 1998 and 1999, and have dropped 14.5 per cent since 1990.

Emissions of carbon dioxide, the main greenhouse gas, fell by 9 per cent between 1990 and 1999.

Lord Whitty, Energy Minister at the DETR, said the agreements would represent cuts in carbon emissions of over 2.5

million tonnes of carbon a year by 2010. and would go some way to helping the UK meet its Kyoto targets.

'Not only will businesses be helping to protect the environment, they will also reap the financial benefits of using energy more efficiently and cutting their energy bills. This is a win-win situation for businesses and for the environment.

'I would like to thank the sectors for the efforts which they have made to conclude these agreements and for their commitment to tackling climate change.

'We have now concluded agreements with almost all of the eligible sectors, including the largest energy users such as steel, chemicals, paper and cement.'

Out of a total of 40 sectors, only three have not yet concluded their agreements. The DETR will continue to work with these sectors to agree the details as soon as possible.

The 80 per cent discount in the rate of Climate Change Levy will protect the competitiveness of the energy-intensive sectors while giving them an incentive to improve energy efficiency further.

Hydrogen-powered buses to be tried out in London

Transport Minister Lord Whitty has welcomed Transport for London's announcement that the UK capital will soon be testing three hydrogen powered fuel cell buses – one of only nine cities where they are being trialled.

Lord Whitty said the Government would contribute towards the cost of the project.

'These state-of-the-art vehicles will give Londoners the chance to see and experience at first hand the future of clean passenger transport,' he said. 'I am confident the trial will be a success, and generate a lot of interest among other UK bus operators – and bus manufacturers also.'

Lord Whitty also highlighted other measures aimed at cleaning up London buses and taxis – fitting buses with particulate traps, fitting Routemaster buses with new engines built to meet modern emission standards and converting taxis from diesel to run on the much cleaner liquefied petroleum gas.

Deputy Prime Minister launches Carbon Trust

Business has a key role to play in tackling climate change, according to Deputy Prime Minister, John Prescott.

Without business commitment to developing low carbon technologies, long term reductions in greenhouse gas emissions would not be achieved, he said.

Mr Prescott was launching the Carbon Trust, a key part of the UK's climate change programme. It will promote research and development, and make available up to £200m over the next two years to help businesses invest in low carbon technologies. It will be funded by the proceeds of the climate change levy.

Mr Prescott said: 'The Carbon Trust will help business save energy and support new low carbon technologies.'

Martin Doughty named as chairman of English Nature

Martin Doughty has been appointed as the new Chairman of English Nature, the Government's statutory adviser on nature conservation in England.

Mr Doughty is currently Leader of Derbyshire County Council and Chairman of the Association of National Park Authorities but will give up these positions before taking up his new post.

He succeeds Barbara Young, who left English Nature last autumn to run the Environment Agency.

Sustainable development professionals: who needs them?

A conference report

Introduction

On 5th February 2001 the Institution of Environmental Management and Assessment and Sustainability First hosted the *Sustainable Development Professions: who needs them?* conference at the Institution of Civil Engineers. The event was designed to open a debate on the desirability of establishing a sustainable development profession and was attended by 120 people. The debate was welcomed by Michael Meacher, Minister for the Environment.

Summary of views presented

Professor Shirley Ali Khan set the scene by highlighting the findings of recent surveys of HE teacher education, engineering, business and design programmes which revealed significant sustainable development learning gaps; and by drawing attention to the current mismatch between the content of HE specialist environment/sustainable development programmes and the specialist competencies which employers need and are beginning to demand. She emphasised the need to raise the sustainable development competence of both environment/sustainable development specialist and non-specialist professionals.

She reiterated the challenge in the government Sustainable Development Education Panel's third annual report to key stakeholders (environment/sustainable development dedicated post-holders, professional bodies and course providers) to identify the competencies which characterise a sustainable development professional.

On the demand side three employers, (Ted Cantle, Chief Executive of Nottingham City Council; John Adams, Head of DETR's Sustainable Development Unit; and Phil Barton, Head of Communications, Groundwork UK) agreed that there was a need for sustainable development professionals to facilitate the mainstreaming of sustainable development. They were also in accord on which competencies such professionals should have. These are:

- an understanding of the interconnectivity of economic, environmental and social systems;
- an awareness of the wide range of sustainable development solutions, tools and techniques and a detailed understanding of some e.g. management systems standards, reporting, appraisal, indicators;
- organisational knowledge;
- an understanding of the contribution of different sectors to sustainable development;
- an awareness of sustainable development related legislation, policy and control mechanisms;
- influencing skills e.g. presentation, mediation, facilitation, partnership, leadership;
- strategic planning skills e.g. forward thinking, thinking across disciplinary boundaries;
- entrepreneurial skills e.g. new approaches to solutions, the ability to create demand for own skills;
- fund raising skills;
- general management skills;
- team working and team building.

There was a recognition that a combination of formal learning, self-directed learning and work experience would be necessary to acquire the above professional level competencies. Presenters generally agreed that a sustainable development professional should have both a personal and a professional commitment to sustainable development and a commitment to sharing knowledge.

Russell Foster (chief executive of the Institute of Environmental Management and Assessment) posed questions about how the sustainable development profession debate might influence current discussions relating to the establishment of chartered status for environmental professionals. Should we be looking at chartered status for sustainable development professionals as well as, or instead of, chartered status for environmental professionals? What are the benefits of chartered status? Which organisation would be best placed to steward professional

standards relating to sustainable development?

Professor David Eastwood explained how the science based Research Assessment Exercise descriptor (UofA201) encouraged the appointment of academic staff with environmental science based research interests, in order to maximise publication possibilities. He claimed that this was the biggest single obstacle to sustainable development teaching in specialist environment departments. In addition he noted that recruitment to specialist environment undergraduate programmes was in decline but that recruitment to specialist post-graduate programmes was buoyant. He emphasised the contribution which distance learning materials could provide in terms of support for sustainable development professionals.

Summary of delegate views

Delegates generally considered it desirable to specify the competencies which characterise a sustainable development professional. They agreed that unless there was a senior sustainable development professional agitating for change at board level, there was little hope for mainstreaming sustainable development. However, they thought there was a need for employer organisations e.g. the CBI, Institute of Directors, Local Government Association, to play a role in generating demand. Some thought the introduction of mandatory sustainable development reporting by the Department of the Environment Transport and the Regions would increase the demand for sustainable development professionals. The identification and promotion of role models was also considered desirable.

Delegates considered the sustainable development competencies which speakers highlighted as relevant for sustainable development professionals to be appropriate, and thought it likely that professionals with these competencies would be employed by large companies, public sector organisations, and government. Questions were raised as to

whether the voluntary sector and small and medium sized enterprises would be able to afford them.

Delegates also considered it desirable to specify the competencies which characterise a sustainable development practitioner. They emphasised the value of practitioners in relation to policy implementation and their wish that sustainable development professionals should not be promoted as replacements for practitioners. They suggested that not all practitioners would have the desire or the ability to progress to professional status.

Delegates considered the integration of sustainable development principles into all professions to be absolutely vital, and a priority. While it was generally recognised that sustainable development competencies required by professionals whose work did not directly relate to sustainable development, but who nevertheless had significant sustainable development responsibilities would be different to those needed by sustainable development professionals in their own right, they were unhappy to see the development of any national recognition system for sustainable development competencies, which separated the two.

This preference to look holistically at raising the sustainable development competence levels of all professionals including specialist sustainable development professionals, was linked to the commonly held view that sustainable development professionals would be drawn from a wide range of professions.

It was also linked to fears that the establishment of a specialist sustainable development profession, which excluded other professionals, would result in the ghettoisation of sustainable development activity – though some felt that the low skills base of environment/sustainable development post holders had been at least partly responsible for the ghettoisation.

Delegates felt strongly that the traditional professional institution model discouraged 'joined up thinking', the root cause of many sustainable development problems, and that the home of sustainable development practitioners and professional standards should be a new kind of institution. This new kind of institution would have a much more interactive relationship with other professional institutions. It would provide sustainable development progression routes for non-specialist practitioners and professionals, as well as providing a straightforward

progression route from sustainable development graduate/post graduate to sustainable development practitioner to sustainable development professional, and provide routes in for environment practitioners and professionals.

Sustainable development is the overarching theme into which the environment fits.

Some delegates were in favour of the idea of establishing of a one-stop shop for sustainable development information and advice for anyone with significant sustainable development responsibilities at work. The development of sustainable development distance learning materials to cover the knowledge components of the sustainable development learning agenda for professionals and the collation of existing professional level sustainable development learning opportunities were also thought worthwhile.

Delegates from the further education sector emphasised the close relationship they had with the local business community and the important role they could

play in delivering practitioner level sustainable development education and training.

Conclusion

From the above the conference concluded that what is needed in broad terms is a national recognition system for sustainable development competencies for professionals and practitioners working explicitly in the sustainable development field; and for professionals and practitioners who do not work explicitly in the sustainable development field, but who have significant sustainable development responsibilities.

■ Any questions relating to the above report should be addressed to:

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Fax: 0208 366 4616

Email: alikhan@sustainabilityfirst.co.uk

An Institution view

Currently the Institution, through its involvement in the PP4SD project, shares a number of objectives with Sustainability First. This includes the need to define and agree the competencies required for both specialist and non-specialist practitioners in sustainable development. We do not, however, share the view for a need for yet another and single institution to represent this particular discipline. The requirements of sustainable development involve the participation of a very wide range of professional capabilities both environmental and non-environmental (legal, financial, medical, etc). All of these disciplines have a need to share in the development of SD skills and knowledge and this is a principle which underlies the ongoing PP4SD project.

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Developing sustainable practice in Africa – undergraduates at work

Carolyn Roberts FEnvSc FRGS MCIWEM ILTM

Students from the School of Environment at Cheltenham and Gloucester College of Higher Education will be participating in an unusual field class as part of their degree courses this academic year.

Normally students on courses such as Environmental Science, Water Resource Management, Natural Resource Management and Physical Geography are required to undertake a residential class in their second level of study, which is used to develop a range of skills and knowledge including how to undertake research projects, and skills in teamwork. They also learn particular technical methods, and those on programmes with a management dimension usually meet local managers, scientists and administrators. All the students are offered an opportunity to visit an area where the physical, cultural and managerial environment contrasts with that of Midland England, and previously destinations such as Andalucia, the Scottish Highlands, Hungary, and Malta have been available.

Traditionally, field courses have been critical in inspiring students to move into careers where their skills as applied scientists can be used; the college has an exceptionally strong employment record, and graduates regularly secure posts with the Environment Agency, water companies, businesses, voluntary and governmental organisations and environmental consultancies.

This year, Central Uganda has been added to the list of possible destinations for the students. However, the class is rather more challenging than usual, in that students will be participating not only in academic exercises, but also jointly running a development aid project to Kaliro National Teachers' College, in Uganda. Prompted by an existing Herefordshire schools' link, the School of Environment and Kaliro College have established a partnership, where staff and students at Kaliro have indicated a need for assistance in developing their computing facilities, and Cheltenham students can gain experience in environmental management. Ultimately the

Ugandans are keen to be able to access the WWW, which has the potential to minimise their difficulties in obtaining up-to-date information for teachers and teacher-educators. Currently, however, they have no WWW link, and only two elderly microcomputers. Moreover, the library stock is very thin.

Cheltenham-based staff and students have been successful in collecting 20 modern WWW-compatible computers, recycled from supportive businesses and the college itself. They have serviced and re-equipped them with appropriate software, and raised sufficient money to ship the computers out to Uganda. They have also collected about 1,000 modern textbooks appropriate for Ugandan teachers, and these too are waiting to go out. Fundraising activities have included concerts, quizzes, jazz evenings, sponsored swimming and raffles. Various charitable trusts have also chipped in, including the Leadership Trust and the college's own alumni. The students have also undertaken an IT Trainers course, and at the end of March, a group of 15 students and two staff will be going out to Kaliro to run a training programme for local staff and students. Some hardware peripherals are being bought locally (printers, for example), and this area of Uganda has reasonably reliable electricity supplies from the HEP station on the Nile at the outlet of Lake Victoria.

A prime focus of all degrees accredited by the Institution (as these are) is imparting understanding of the multiple dimensions of sustainability, not only as a scientific concept, but also its social and economic aspects. All degree programmes in the School of Environment at Cheltenham have this as a central core, and moreover intend to develop students' skills in multidisciplinary working. In this instance, however, the experience should be a practical, international and highly memorable one.

Academic content is not lacking. The Ugandan field course will have three academic themes:

- exploration of the meaning of sustainable development;

- the role of natural resource exploitation in development;
- the potential impact of information and communications technology in promoting economic development.

Alongside the IT training, students will be conducting a small research project on the changing exploitation of water resources in central Ugandan villages, being introduced to the problems of managing Lake Victoria's fisheries and vegetation, and exploring the possibilities of eco-tourism as a solution to community development in areas such as forest reserves with large primate populations.

They also select personal projects, working in small groups, and some will be looking at the potential of ICT initiatives in improving people's quality of life in the developing world. The synergies between the academic work and the development project should be really exciting. So far the students have been so enthused by this project that they have invested hundreds of hours in writing letters, organising events, passing an IT Trainers' course, packing books and computers, designing T-shirts and book plates, and liaising with sponsors. From a pedagogic perspective, it is hard to imagine a more effective means of engaging and challenging them.

After the return from Uganda, the next stage of the project will be to secure funding (through the efforts of the next cohort of students) to install networking facilities at Kaliro, and a link into the WWW. Support from businesses and individuals will continue to be sought.

The School of Environment is a large department offering Honours degrees and Higher National Diplomas in 21 subjects from Geology to Landscape Architecture, and Community Development to Garden Design. The college awards its own degrees at undergraduate and postgraduate levels, including doctorates, and is currently in the final stages of scrutiny by the Quality Assurance Agency for designation with a university title.

■ Carolyn Roberts is Head of the School of Environment at Cheltenham and Gloucester College of Higher Education.

New members

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

Mr G. S. Edwards	Recent Graduate, UWE Bristol	Mr Adrian Spence	Potable Microbiology Team Leader,
Mr A. O. Gbajumbol	Engineer		Severn Trent Laboratories
Dr P. Griffiths	Senior Scientist, SEPA	Miss K. J. Storey	Environmental Technician,
Mr A. D. G. Logie	Recent Graduate, University of Stirling		RPS Environmental Consultants
Mr N. J. Matthews	Student, Swansea Institute	Miss R. C. Veals	Environmental Protection Officer,
	of Higher Education		SEPA
Miss S. Roberts	Assistant Environmental Consultant,	Mr P. G. Walker	Environmental Protection Officer,
	Entec UK		SEPA

New E-mail and Web addresses

The IES now has new E-mail and Website addresses:

E-mail: ies-uk@breathemail.net

Website: <http://www.ies-uk.org>

NOTICE OF EGM

Notice is hereby given that an Extraordinary General Meeting of the Institution of Environmental Sciences will be held on Wednesday 13th June 2001 at the Grosvenor Office, 70 Grosvenor Street, London W1 commencing at 1.00 pm. The business of the meeting will be to ratify the proceedings of the Annual General Meeting held on Wednesday 7th March 2001.

Members wishing to attend should advise the Secretariat at least seven days in advance, by Monday 4th June at the latest.

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Diary dates for 2001

2 May	GP Committee	13.00
13 June	Education Committee	10.30
	EGM/Council	13.30
10 September	GP Committee	13.00

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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.

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