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In this issue:

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ies INFORMATION

IAQM

The launch of the new Air Quality Management group took place on 14th November 2002 and this is now formally constituted as a specialist division within the Institution. After some initial delays in establishing criteria for separate entry to the division, the processing of applications from both existing and prospective IES members is taking place.

The IAQM division has its own committee, with representation on the Institution Council, and will be charging a separate and additional subscription to fund a programme of specialised activities.

PI insurance scheme

Our arrangement with the insurance brokering firm of Marsh for PI insurance cover for members at discounted rates has been running now for several years.

We have recently been advised that the insurers, Beazley, have recommended changes in the original wording to bring it into line with recent legislation (Housing Grants Act, Third Parties Act, Condam regulations and others). Some new sections have also been added to cover Prosecution Defence costs, Breach of Confidentiality and Infringement of Copyright. New exclusions have also been added.

Diary dates for 2003

13 March: Education Committee	10.30
13 March: AGM &Council	13.30

Noise Action Day

Noise Action Day this year will be Wednesday 4 June 2003. Last year over 200 organisations took part and the day received wide media coverage. The National Society for Clean Air and Environmental Protection is inviting interested parties to get involved and help to promote practical solutions to everyday noise problems.

Information on how to participate can be obtained from the NSCA, 44 Grand Parade, Brighton BN2 9QA Tel: 01273 878781; Email: *mstevens@nsca.org.uk*

The Voice of the Future 2003

The Royal Society of Chemistry is organising a major initiative this spring with the objective of strengthening links between the scientific community and Parliament. Entitled The Voice of the Future 2003, younger scientists (primarily those aged from their early twenties to their mid-thirties) drawn from all disciplines, whether in industry or academia, are invited to London to meet Members of Parliament on the House of Commons Science and Technology Select Committee. The event will be held within the precincts of the Palace of Westminster and will feature a Science Question Time, rather like the BBC TV Question Time, and will enable the younger scientists taking part the chance to put any questions they like to a panel of MPs.

Those interested in attending should contact: Julie Smart, Assistant Parliamentary Officer, Royal Society of Chemistry, Burlington House, Piccadilly, London W1J 0BA; Fax: 020 7734 1227; E-mail: *smartj@rsc.org*

Responses

Responses by the Institution have been submitted to the following consultation documents:

- New Draft Environmental Information Regulations (DEFRA)
- PPG23: Planning and Pollution Control (ODPM)
- Amendments to Conservation Regulations (Welsh Assembly)
- Review of the Planning Enforcement System in England (ODPM)
- Habitats Directive and Land Use Planning Regime (DEFRA)
- Strategic Environmental Assessment Directive (ODPM)
- SSSI: Encouraging Partnerships (Welsh Assembly).

Contributions

The Environmental Scientist aims to provide a forum for members' contributions, views, interests, activities and news, as well as topical feature articles. Articles of up to 3,000 words should be submitted to the Editor, Environmental Scientist, PO Box 16, Bourne, PE10 9FB, three weeks prior to publication in the last week of January, March, May, July, September and November. Views expressed in the journal are those of the authors and do not necessarily reflect IES views or policy.

Advertising

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

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

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editorial TIME FOR A NEW LOOK

The Environmental Scientist has been published in the same format since its inception in 1992. It was therefore felt that a change both in appearance and in layout would be timely. So we now have a new cover and a somewhat altered layout including the new feature of an editorial. It is our ambition to expand the content, primarily by the inclusion of more, or longer, feature articles. This is constrained however by both budgetary considerations and by the number of suitable articles that we receive for publication. In the latter case we are, to a great extent, dependent on the Institution membership for it is on that source that we rely for many of our feature items.

Where possible, it has been and will continue to be the policy to concentrate on particular topics or themes in an edition or a number of sequential editions and often these will concentrate on topical issues of importance. In this context we have, over the past year, included numerous articles on the foot and mouth epidemic, agriculture and the food chain and rural issues. This whole area of debate has been front page news and highly controversial in the political arena and therefore merits what we hope has been scientifically informed comment in our pages. It is not inappropriate that the Professional Practice for Sustainable Development project (PP4SD) sponsored by the Institution has included in the second phase a development for the land based professions. Agriculture and rural development will feature strongly in this work.

In common with many of our peer professional institutions a continuing theme has also been that of sustainability and sustainable development. Highlighted by our own Burntwood Memorial Lecture in 2000 and more recently featured in the summit conference in Johannesburg in August 2002 this has become a central consideration in all our activities.

None more so indeed than in our work with nine fellow institutions to create and promote the new umbrella environmental body the Society for the Environment. The launch of the new Society last October is reported later in this edition and at the time of going to print we are in the throes of becoming a limited company and also engaged in the preparation of an application for chartered status. These are indeed busy times!

One of the strengths of the Institution over the years has been in its involvement in education, in particular in the higher education field. This too is reflected in our editorial policy to feature news and information from this sector and to promote the involvement of the students and graduates in the environmental disciplines. Two significant items appear in this edition, firstly a feature article from StudentForce and secondly a paper (in summarised form) from a Sussex University graduate which won fourth prize in our John Connell Memorial Award competition last year. We hope to publish more articles such as this and encourage our younger scientists to publicise more of their often excellent, interesting and informative work. **RAF**

feature THE SCIENTIFIC CINDERELLA

PROFESSOR HOWARD DALTON FRS,

Chief Scientific Adviser to DEFRA, wonders if agriculture is really a scientific Cinderella

The officers of the Parliamentary and Scientific Committee felt that agriculture was something of a Cinderella sector when it comes to benefiting from science. I was asked to say to what extent this feeling is justified. Having given the matter some thought I hope to be able to demonstrate that the feeling expressed is somewhat wide of the mark.

I propose to address some of the many issues suggested by the Officers of the Parliamentary and Scientific Committee. These are as follows:

- An overview of DEFRA's science
- Sustainability
- Adapting agriculture to a changing climate
- Biodiversity
- Chemicals in agriculture
- GM research
- Livestock science
- Horticulture R&D

I have chosen the topics because of their current interest and their power to illustrate the use of science to benefit agriculture.

DEFRA's science spend

- The science spend for DEFRA is about £268m per annum; just over half of this is R&D (and roughly £70m of it related to agriculture). The remainder covers monitoring, surveillance and advice.
- The spend for former MAFF science areas was about £105m in R&D annually, £75m on surveillance/monitoring.
- Most DEFRA-funded agriculture R&D is strategic or applied. 'Near market' R&D is mostly funded directly and privately by the sector, or funded through levies collected by sector bodies – amounting to about £28m/30m.
- DEFRA's agriculture R&D serves to inform Departmental policies, provide foresight, and underpin statutory/regulatory duties.
- DEFRA spend on agriculture is about the same in percentage terms (in relation to industry gross value) as the OECD average.

A range of pressures influence how we must prioritise our efforts:

- The nature of the problems we face: research into TSEs, food borne zoonoses and TB/cattle is on the increase, whilst there is less emphasis on pesticides/productivity, milk and milk products, and cereals
- Responding to a more evidently driven public agenda, with farming increasingly being seen as a deliverer of public goods.
- Responding to new 'fork to farm' pressures with increasing consumer interest in organic farming/environmental claims, food chain integrity, traceability, etc.

Sustainability

DEFRA has lead responsibility for promoting sustainable development across government, within the UK and internationally. Four objectives must be met to achieve sustainable development:

- social progress which recognises the needs of everyone;
- effective protection of the environment;
- prudent use of national resources; and
- maintenance of high stable levels of economic growth and employment.

We have been funding a Sustainable Development Research Network to identify sustainable development research needs that will help us meet our departmental objectives. The DEFRA publication 'Working for the Essentials of Life' sets out our long-term vision.

Challenges to be overcome will include developing a more environmentally friendly grassland agriculture and reducing ammonia emissions from livestock.

Adapting agriculture to a changing climate

We have published a Climate Change and Agriculture booklet, which gives details on the possible effects of climate change on UK agriculture, building on the 1998 scenarios from the Climate Impacts Programme.

- Identifying the impacts on crops

Climate change will alter the potential for different crops to be grown in the UK. Increased CO2 concentrations are mostly beneficial to crops, whereas temperature and rainfall effects could be both beneficial and detrimental. The effects of possible increases in storminess could have significant effects on the risk of crop loss. The extent of sea-level rise will determine the amount of agriculturally productive land lost through loss of land or salinisation of groundwater. We also envisage that new crop varieties may need to be selected which would be better suited to different climatic conditions.

- Identifying the impacts on grasslands and livestock

DEFRA-funded research has identified that climate change will directly affect grass yields and forage production and indirectly affect other crops and their potential to provide economic and sustainable returns. It is unlikely to change the suitability of different livestock types in the UK, but disease transmission is likely to increase through both the enhanced growth rate of pathogens and increased abundance of existing and new insect vectors.

- The effects of weeds, pests and diseases on agriculture

The rate of evolution of weeds will increase under hotter and drier conditions. Herbicide tolerance may become more common and the range and abundance of many native pests and diseases may change. DEFRA's role in undertaking surveillance and eradication procedures is likely to become increasingly important in this area and will consume a significant part of our research expenditure.

Utilisation of biodiversity

The natural enemies of pests are an important component of the biodiversity in crops, field margins and other habitats on farms. We need to be able to manage a balance of sufficiently abundant natural enemies that keep pests in check without the need for insecticides, whilst preventing their own populations building up to damaging levels. We are exploring strategies that permit harmonization of these two conflicting effects, such as careful management of pesticides and the use of managed strips to encourage natural enemies through current collaborative research with Industry (LINK).

DEFRA's Arable Stewardship Pilot Scheme has demonstrated how science plays a major role in the development of policy and is likely to be a model for future biodiversity policy development.

Chemical inputs

Whilst there is a continuing need for the control of crop pests, diseases and weeds, concerns over persistent and broad-spectrum pesticides fuel a demand for new, less-toxic chemicals and alternative methods. Current DEFRA

research is seeking alternative strategies based on increased use of plants bred (conventionally or, possibly, by GM) to be resistant to pests or diseases, and biological control using natural predators.

These alternatives to chemical pesticides are intended to be components of Integrated Farm Management (IFM). IFM provides a system of agriculture which is (a) sustainable for the environment, (b) profitable over the long term, (c) encourages biodiversity and (d) produces safe affordable food. IFM leads to a reduction in inputs (40% off pesticides, 15% off fertilizers, 10% off operating costs) and a reduction in yields but a concomitant increase in gross margins of 2% on average compared with conventional agriculture, and with tangible environmental benefits.

GM research

The Government and Department recognise that the use of GM technology and products could produce benefits to society if applied safely and responsibly. Our research programme is directed towards (1) providing the underpinning science required to realise this potential and (2) providing the necessary science base for evaluation, and minimisation, of the possible risks to the environment and the public health associated with the use of this technology. We recognise this causes considerable public concern, and the Government's priority is, and always has been, to ensure that GM organisms are only approved if they are judged to be safe, both for consumers and for the environment.

A major investigation of whether cultivation systems involving herbicide tolerant crops have a significant effect on biodiversity (the Farm Scale Evaluations (FSEs)) is currently underway. These data will enable us to evaluate any risks to the environment and human health from the release of GMOs.

DEFRA-funded GM research covers all areas of agriculture and includes, for example: identification of genetic markers associated with quality traits in both livestock and crops for use in marker assisted breeding programmes to improve both their quality and vigour; the development of safe transformation technologies; and vaccine development for livestock diseases.

Livestock science

Genetics research by MAFF has improved animal performance in all the UK livestock sectors over the past 25 years, and is now being used to improve animal welfare and to reduce their impact on the environment. Genome mapping is helping to speed up the process and to allow a more focused approach to selection for important traits. Further, more sophisticated rationing programmes are being developed that better reflect the needs of the animal, with automated delivery systems that assess these needs in real time and supply an appropriate ration to meet that need. Development of technologies to sex semen is being used to improve the efficiency of cattle breeding, and in time will be extended to pig and sheep breeding.

Horticulture R&D

Consumers reap considerable benefit from an efficient and highly innovative UK horticulture industry. Scientific research is aimed at improving the sustainability and competitiveness of this industry whilst maintaining high standards of food safety and environmental care.

Our research programmes have led to reducing inputs (energy by 51%, labour by 67%) in commercial glasshouses which have contributed to a 50% reduction in unit cost of tomato production over the last 20 years and a concomitant doubling in yield. This has been achieved through

- reducing reliance on pesticides through the development of biological control techniques
- optimising glasshouse environments by enriching carbon dioxide levels
- improved understanding of crop physiology leading to crop nutrition tailored to maximise both yield and quality

Current research on identification of genetic markers associated with desirable characteristics for use in marker-assisted breeding programmes will further improve efficiency and productivity. Pest and disease forecasting and decision support systems are now used widely in sustainable 'integrated' production systems.

Conclusion

It is clear that agriculture has benefited from the substantial investment of public money in research, both historically and to come. But we do need to have a sense of perspective about how much of taxpayers' money should go into agriculture, and for which priorities. Farm numbers and farmer numbers are falling quite quickly. The average age of our farmers is now 57 years. Agriculture is ″1% UK's GDP, and farmers in the UK already benefit from CAP subsidies worth ca £3 billion annually.

Furthermore, the agenda is shifting: whilst farming is important, occupying 75% of the countryside, taxpayers expect a wide range of environmental/other goods to be delivered by farmers – the 'look' of the countryside, access, heritage, landscape, etc.

Finally, the 'science spend' demands are high and never likely to be completely satisfied, especially when compared with health, transport, crime reduction and education.

In spite of all this, it is my belief, supported by the evidence I have provided today, that agriculture is no scientific Cinderella. In reality, agriculture has been, and is, supported by a substantial research programme which has delivered benefits to the industry through improved profitability, and to the public through improved food quality and reduced impact of agriculture.

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feature AGRICULTURE AND SCIENCE

PROFESSOR JULIA GOODFELLOW
Chief Executive of the Biotechnology and Biological Sciences Research Council,

asks what relevance science has to agriculture

Science can play an important role in the development of sustainable agriculture in the UK. This role has to be seen within a complex context that stems from social and political considerations concerning the use of the countryside, management of the environment and the present EU policy of subsidising overproduction. Our current, often idealistic, view of the countryside and farming landscape is perhaps shaped in nostalgic association with a period in history that coincides with the Second World War. For some, this is the 'ideal' and contrasts dramatically with the technology-driven policies of the post-Second World War period which have led to increased productivity in both crop and animal based agriculture.

There is now an emerging view that agriculture should move towards a more sustainable future that is economically, environmentally and socially sustainable. This concept is endorsed in the policies emerging from DEFRA and in the Curry Commission report on the Future of Farming and Food (January 2002). If we take this as the future model, science now has an immense role to play in the areas of innovative agricultural practices, new crops and systems, and ecology of managed landscapes.

Today, science has a vitality and excitement that contrasts with the generally accepted depressing views of agriculture in the UK. This stems from the excitement and results emanating from the new post-genome biology era. The amazing development in biology over the last 50 years is illustrated by our knowledge of DNA, the blueprint of life. Next year will be the 50th anniversary of the revolutionary work of Watson, Crick, Wilkins and Franklin on the elucidation of the double-helical structure of the DNA molecule. We have developed the ability not only to understand the nature of the DNA code which governs the transition of DNA to RNA to make proteins, but also to automate the procedure by which we can read the code. We have now sequenced a number of important genomes, including those of human, fruitfly, rice, the model plant Arabidopsis thaliana, and the antibiotic-producing bacterium Streptomyces coelicolor.

This sequence information contained within our genomes is not an end in itself, but only the beginning of an adventure to understand which genes are switched on and off under different conditions. This informs us which proteins are made and also helps us to understand the functioning of protein molecules themselves at the molecular, cellular, tissue and whole organism level. This endeavour is called functional genomics and is possible through the development of a number of platform technologies specifically studying transcriptomics (what RNA is expressed), proteomics (what proteins are made), and metabolomics (the complement of all the low molecular weight molecules present in cells at a given time) – collectively known as the 'omics'.

The Biotechnology and Biological Sciences Research Council (BBSRC) and others are making considerable investment in this area through government funding in SR2000 and hopefully SR2002. The fundamental aim is to harness the information that we have obtained from sequencing genomes in order to understand and modify the function of organisms. One consequence of this is a vast increase in the amount of information which is available to biologists across a number of different areas. Thus the e-Science initiative, funded under SR2000, is essential in developing IT tools and infrastructure that enable biologists in laboratories to use this information effectively.

BBSRC is supporting a number of initiatives in the functional genomics area, including the Investigating Gene Function initiative which has allowed access to key technologies for a number of consortia or virtual centres that work on model organisms and commercially important crops and farm animals. An example of our increased understanding is that we can now control growth in a model plant, the weed Arabidopsis thaliana (thale cress), and so understand at the molecular level the 'green revolution' which led to a huge transformation in the production of crops in the developed and developing world through traditional breeding methods.

Other examples of research which will underpin sustainable agriculture are the development of much more tightly controlled pesticide use without loss of production, our increased knowledge of natural biodiversity in plants and animals, and work on farm animal genetics which can lead to breeding of animals with natural disease resistance. Such knowledge can be used in many ways. It is important to realise that although modern genetic modification techniques can be used to explore, *inter alia*, basic development and disease resistance, there is still a choice as to whether we use such techniques commercially. This basic knowledge will also allow us to use traditional breeding methods more effectively.

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students A FORCE FOR SUSTAINABILITY

By **ADAM CADE,** StudentForce

StudentForce have developed a model which can be used to link learning about sustainability with practising and promoting it with young people in the community and the workplace. Although there are many strategies, policies, charters and conferences promoting young people's participation in sustainability, there is still a long way to go before young people can be a real force for sustainability.

Young force for sustainability

Students can be a huge force for sustainability, especially as they leap the gap between school or college and full employment. They can do this through volunteering, group projects and paid projectwork for community and voluntary organisations, businesses, agencies and local authorities by practising and promoting sustainability. But employers and communities do not always recognise their value and potential contribution. However there are many examples of young people as the catalyst for boosting the local economy, community and environment. Our webpage *www.studentforce.org.uk/news.htm#latest* shows the sort of support we provide.

Unsustainable businesses

Young people can bring the new insights, openness, skills and understanding required to enable businesses to change to more sustainable practices and hence improve their image, employee pride, shareholder interest, competitiveness, efficiency and standards. But businesses do not always recognise the value of dedicated short-term projectwork, or the value of placements or work experience as extended interviews, or the value of bright young people. However there are many examples of projectwork that promotes sustainability, young people and businesses – a win-win-win relationship. Our webpage *www.studentforce.org.uk/pastprojects.htm* shows the many businesses and young people who have benefited.

Unsustainable local communities

Young people can be the lifeblood and future of their communities. The qualities of young people today will determine the quality of the communities they live in, in future. Their understanding, skills, interests, and values can ensure its sustainability and high quality. But older people who are key local power-holders do not always value, involve, resource or use young people, and are often seen by young people as their major barrier to active citizenship. However there are many examples of citizenship, volunteering and projectwork by young people that boosts the young people and the community.

Over the last three years we have worked with about 50 rural community groups and organisations to practise and promote local sustainability, by raising funds for them to appoint and manage young graduate project workers. Our most successful work with local communities has been where we have linked schools, community and voluntary organisations and businesses around a campaigning theme. The Corby Waste Not Partnership enabled all organisations in a small Borough Council to be supported by 34 young graduates each working for up to ten weeks to help promote sustainability through waste minimisation. A 125-page pack has now been produced describing and promoting Waste Not (See Waste Not Pack in Our Publications on *www.studentforce.org.uk*). We have also developed an approach to working with young volunteers who are trained to work in small teams checking and reporting on the environmental management of publicly-accessible premises, such as churches, pubs or clubs, so they can take the first steps to involving their staff or own members/volunteers in practising sustainability and then promoting it more widely. The Northamptonshire Community EcoCheck Scheme is described on *www.ecocheck.org.uk*.

Unsustainable local governance

Young people can be involved with local governance, whether in school, college, organisations or local councils, as a way of making more effective, inclusive, long-term decisions about ways of boosting the local economy, community and environment. But key local decision-makers often feel that age, experience and current power-holding are the main criteria for selecting new decision-makers to join their group. However there are many examples of such involvement.

Our new project Rural Youth Boosters will guide and support these key local decision-makers to involve young people as well as promote and practise more sustainability.

There is much written support for young power-holding with many endorsements to involving more young people in practising and promoting sustainability. Many young people's groups give the strongest support, for instance youth delegations to the Earth Summit. Agenda 21 speaks specifically of engaging youth in environment and development decision-making:

> 'It is imperative that youth from all parts of the world participate actively in all relevant levels of decision-making processes because it affects their lives today and has implications for their futures.'
>
> *– Chapter 25, Agenda 21, World Summit on Sustainable Development, 1992*

Young people are entitled to participate. The UN

Convention on the Rights of the Child makes it clear that children and young people have the right to:

- express an opinion and to have that opinion taken into account, in any matter or procedure affecting them (Article 12);
- obtain and make known information unless it violates the rights of others (Article 13);
- access appropriate information and education especially if it promotes their social spiritual, moral well being and physical and mental health (Article17)

UN Convention on the Rights of the Child.

One of the major barriers to young people's participation in local decision-making that affects their lives is the behaviour and values of older groups of local people, for example parish councillors or management committees of community centres. Our main objective now is to change the behaviour of key groups of older local decision-makers so they can value, involve, resource and use young people more effectively to promote sustainability.

Unsustainable educational institutions

Schools, colleges and universities are often poor at involving young people in local governance, poor at developing real project work, through work experience and placements, with local businesses and communities, poor at linking careers to sustainability, poor at working with local communities to practise sustainability. Central government educational priorities can often draw these institutions away from long-term meaningful engagement with businesses, communities and other organisations. Reductionist teaching is reinforced by subject boundaries and departmental territories.

Educational institutions, however, may be the best places to awaken interest, establish norms, and lay basic building blocks by making controlled links with the outside world. There is much written by universities in support of practising and promoting sustainability and community outreach, as well as learning about it. For example two university networks support partnership and community outreach.

The student body is a powerful and neglected force in the local community.

Committee of Vice-Chancellors and Principals

Copernicus-Campus mobilises the higher education community around the theme of sustainability and supports higher education institutions in Europe in the implementation of issues on sustainable development. The main instrument for furthering this mission is the University Charter for Sustainable Development.

Sections 7 and 8 of the 10-part charter state:

7. Networking: Universities shall promote interdisciplinary networks of environmental experts at the local, national, regional and international levels, with the aim of collaborating on common environmental projects in both research and education. For this, the mobility of students and scholars should be encouraged.
8. Partnerships: Universities shall take the initiative in forging partnerships with other concerned sectors of society, in order to design and implement coordinated approaches, strategies and action plans.

Copernicus-Campus Programme: The University Network for Sustainability (*www.copernicus-campus.org*).

Sustainability requires holistic shared learning. In many ways policies and promoters of active citizenship in schools are closer to sustainability than either environmental education or development education. In many ways the study of ancient civilisations, such as Greek and Latin, can introduce the principles and ethics of sustainability in a usefully holistic way. Rudolf Steiner Schools in Sweden, and other countries, and the Folk High School movement in Denmark, have both developed approaches to education and communal living that get close to linking sustainability by learning about it, whilst practising and promoting it.

Unsustainable young people

Young people, with their ambitions for mass, fast, fashionable, throwaway, long-distance consumerism can be a real barrier to sustainability. Young people, with their anti-social, selfish behaviour, can be a drain on communities and local services. Young people with their inexperience, inappropriate skills, misunderstandings can be a time-consuming drain on businesses and employers. But there must be a powerful force and voice of young people to practise and promote sustainability who will change the culture, values and behaviour of their peers and the next generation of young people if we are to achieve any of the aspirations of the current generation for a better quality of life.

Unsustainable careers guidance

Young people can improve their understanding of career opportunities which support sustainability through a wide variety of rewarding jobs by practising and promoting sustainability. But careers guidance for young people often fail to practise, promote or showcase sustainability as a key factor for young people in their career choice.

There is no Career Fair specifically for sustainability, no Careers Service specifically for sustainability. Careers literature and Careers Fairs are some of most profligate forms of marketing in their use of energy, generation of waste (plastic bags, thick booklets, polystyrene cups, giveaways, mass lighting and huge displays), and promotion of unsustainable transport. Some universities, such as Cambridge and West of England, have Alternative

Career Fairs which, for example, showcase voluntary organisations and include volunteering.

At StudentForce we are currently developing some new approaches to career guidance, for example using telephone conferences, with up to ten young people together on the phone for up to an hour with a specialist from an employment sector or professional body able to answer questions and present ideas and opportunities.

Unsustainable gap years

Gap Years between school and university are increasingly synonymous with the Grand European Tours of the 19th century when rich young people went on long travels to open their eyes and change their lives. It is gratifying to see the Earth Summit conducting an impact assessment of its 65,000 delegates but how much do Gap Year providers encourage their gappers to assess their impact in terms of sustainability? How much do they change other people's lives for the better? Gap Year provision is now a significant tourist industry. There are a huge number of companies and charities providing Gap Year experiences, at considerable cost, in increasingly remote communities, and often with slim, very western support services. We have a challenge to promote Gap Year experiences in the gapper's own backyard but really changing lives for the better. CVS do this very well by developing and supporting volunteering opportunities in disadvantaged neighbourhoods and schools.

Unsustainable work experience

Young people, both the more and less academic, often benefit considerably from a short period of work experience, either at 14 or 16 years old, or as part of more vocational study at 18 years old (e.g. GNVQs). However the work is not often seen in terms of sustainability, or given the same introductory emphasis as health and safety. However a checklist and review of the experience could often benefit from more reflection on the sustainability of the office, workshop or factory procedures. Awareness of resource efficiency, based on voluntary self-assessment, is at the top of the government's environmental agenda. So this would be an ideal opportunity to introduce it.

We have used our Community EcoCheck Scheme, described above, to provide structured work experience of checking and promoting resource efficiency in many publicly-accessible premises.

Model for change

We have developed a model for sustainability with young people which is being used as a baseline check, as a learning agenda, as a campaigning tool, as a measure of change, and as a prompt for ideas about practising and promoting sustainability by young people and their hosting employers or communities.

It helps us focus our attention on sustainability – boosting and linking the local community, economy and environment. It also helps us focus and develop our approach to shared learning with young people which links learning about sustainability with practising and promoting it in the wider local community.

Sustainability and Young People Model

This model has four elements

1. linking the economy, community and environment to boost them together
2. scaling from the personal to the global level
3. by developing skills and understanding, ensuring basic needs, spreading power and participation, building on values, culture and heritage
4. enabling young people to link learning about, practising and promoting sustainability.

Sustainability is about boosting the local economy, community and environment.

Linking the model by scaling from the personal to the global level and by developing skills and understanding, ensuring basic needs, spreading power and participation, and building on values, culture and heritage.

Enabling young people to link learning about, practising and promoting sustainability so that it is reinforced holistically, by boosting education-community and education-business partnerships, developing more short-term opportunities for work experience, placement, volunteering, group projects, and developing and resourcing promotional campaigns with young people.

Partners and funders

We always work with partners from the local community who can identify opportunities for project work or volunteering or group projects by young people. We are always keen to work with European partners who have compatible values and interests. We have promoted sustainability through EU INTERREG North Sea 2c, LEADER and European Voluntary Service partnerships. Currently we are looking for European partners in career guidance and paired placements through LEONARDO.

Practising our message

We see equal opportunities, health and safety, quality and environmental management as very related issues and policies. This close relationship is recognised by the ISO Standards, by followers of corporate social responsibility, and by the latest Earth Summit. We have a sustainability policy, backed by a Sustainability Management System and associated procedures. Our commitment to quality management as a central route to more sustainability is illustrated in our publication Quality for Wetlands and People. This links quality management with wetland management, public participation, and sustainable tourism. It is available on *www.eurowetlands.com*

Sustainable behaviours

Sustainability relies more on the way people behave, and their impact on other people and the earth, than on how or what they learn. Skills, understanding and values are traditional elements of learning and education. Competencies are probably a better way of bringing these three elements together in terms of practising sustainability in the community or workplace. However, behaviour is a more useful, measurable element of practising and promoting sustainability. Personal behaviour, especially the recognition and management of emotions and their impact on other people, is central to sustainability.

Competencies

In terms of practising sustainability, especially in the workplace, competencies are a more useful notion than skills, understanding or values.

To practise and promote sustainability young people need to be good or competent in many ways:

Good Coordinator. Competence and willingness to manage and integrate resources.

Good Strategic Thinker. Competence to think in the long-term, seeing the whole picture.

Good Negotiator/Mediator. Competence to prevent conflicts or resolve those that flare up, make deals, arbitrate and mediate disputes. Competence to develop win-win relationships between teams, partners and local authorities.

Good Facilitator/Trainer. Competence and willingness to facilitate interactive, participative meetings, telephone conferences and workshops. Competence to design and deliver training, based on need.

Good Interviewer. Competence to recruit and interview potential new staff fairly and confidently.

Good Project Manager. Competence and willingness to manage and balance resources of time, money, equipment, staff and partners. Shows good judgment, resourcefulness, adaptability, and ability to deal with crises. Competence and willingness to focus on objective and outputs, prioritise through planning and reviewing, translate ideas into services.

Good Leader. Competence to initiate and coordinate the efforts of a network of people; to review other people's performance and respond appropriately; to motivate, compliment and creatively complain about team; to judge issues about health, safety and equal opportunities.

Good Counsellor. Competence and willingness to help others sort through their problems and issues. Competent at detecting and having insights to other people's feelings, motives, and concerns.

Good Communicator. Competence to present, summarise and negotiate.

Good Promoter/Campaigner. Competence and willingness to engage face-to-face assertively and confidently with householders, employees, community, church and school groups on sustainability in a light-hearted, clear and assertive way. Appropriately dressed. Competence to use IT for promoting. Understanding of principles and issues of sustainability.

Good Teamworker. Competence to work as part of a team, often working in pairs, and with a peer team leader. Willingness to work in and adopt the culture and values of the host organisation. Competence and willingness to motivate others, cooperate with others, help others resolve conflicts, solve problems. Competence to empathise, recognise and respond fittingly to people's feelings and concerns, by reading and managing emotions.

Good Organiser and Time-keeper. Competence to manage time to make appointments, arrange events, displays, presentations and record time. Competence to use IT for organising and time-keeping.

Good Listener. Competence to listen and build on interests of audience in order to promote sustainability. Competence to respond appropriately to colleagues, partners, clients and customers.

Good Recorder and Evaluator. Competence to record interviews methodically, and develop creative, innovative, relevant ideas justified by records. Competence to evaluate based on consistent and methodical recording; to evaluate sustainability and public participation; and to use IT for recording and evaluating.

Good Server. Competence and willingness to analyse customer needs, record and act on complaints and compliments. Competence and willingness to serve the employing organisation, its vision and values.

Good Learner. Competence and willingness to learn new skills, procedures and information quickly and to help others learn. Willingness to use projectwork experience to develop personally and professionally.

Values

The most important values for practising and promoting sustainability in the community and the workplace can be related closely to the values held by some organisations i.e. equal opportunities, health and safety, quality, customer care, accountability, sustainability, partnership and cooperation. Obviously, in personal terms these values can be closely linked to spiritual and ethical values. StudentForce's values are that we want to be: Sustainable – Flexible – Open – Respectful – Cooperative – Educational – Demanding (SFORCED). All these relate closely to our policies.

Interpersonal intelligence

This is central to real partnerships, cooperation and teamwork, all central to sustainability from the local to the global level. It involves five main elements:

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news THINKING ON CLIMATE CHANGE REVEALED

We have to begin taking steps now to prepare for climate change, says a new report on government responses.

The Impacts of Climate Change: Implications for Defra is the first result of an exercise to examine how government departments should adapt to the UK's changing climate in the future.

The Government says climate change could have a wide range of effects on the environment, society and the economy, from international issues like overseas development to domestic matters like transport and tourism. It is also sending a strong message to public and private organisations that climate change is an issue which they should be taking seriously too.

Defra says we have already taken measures to adapt to climate change in priority risk areas such as flood management and water resources. Now it is time to ensure we take account of climate change in developing policies to preserve the natural environment on land and at sea, and respond to the potential for new risks such as the emergence of new pests and animal diseases.

Defra says it is tackling the scientific uncertainties by adopting a forward-looking approach to managing risks. The report provides a model of how other organisations can assess what climate change might mean for them.

£5.2m boost for community energy

The Government has awarded £5.2m in grants to help pay for ten new energy-saving projects to heat low-income households, hospitals and other public buildings.

The payments are from the £50m Community Energy programme, which helps to reduce energy bills and combat greenhouse gases and fuel poverty.

The ten successful schemes will cut carbon emissions by 4,000 tonnes a year.

Grants include £880,000 for a community heating network in Chesterfield, run on methane gas from a landfill site, and £93,222 for the Royal Southampton Hospital, the first hospital scheme funded through the programme.

Edinburgh University gets a grant of £1,630,948 to provide more than 30 buildings with CHP in place of steam heating.

Other successful bids came from Rotherham Borough Council, Midlothian Council, Woking Borough Council, Portsmouth City Council, University of Manchester Institute of Science and Technology, University of Dundee and the London Borough of Croydon.

The programme prospectus is available at *www.est.org.uk/communityenergy* or by calling 020 7222 0101.

UK government supports campaign to save the elephant with £60,000 cash injection

A global monitoring system to crack down on illegal trade in elephant products has been given a £60,000 cash injection by the UK Government.

The announcement by Elliot Morley, the Nature Protection Minister, follows decisions at the November conference of the parties of the Convention on International Trade in Endangered Species (CITES) to put in place a rigorous regime to control trade in ivory stockpiles.

Under the agreement, three southern African countries (Namibia, Botswana and South Africa) will each be permitted to make one-off sales of limited amounts of their ivory stockpiles, but not before May 2004, and only then if a series of strict conditions have been fulfilled, and verified by the CITES Standing Committee.

The UK hopes that other countries will follow its example and support the campaign to save the elephant.

Mr Morley has also announced he is writing to EU Commissioner Franz Fischler demanding action to cut the number of cetaceans being accidentally killed by fishing gear.

He said that if trials on new nets, designed to catch fish but let cetaceans escape, proved successful, he would work with British fishermen to implement this kind of gear, where appropriate, as a matter of priority.

Mr Morley added that he would press hard for the nets to be used in all relevant EU fisheries – and for rules to back this up.

Tighter controls on dioxin emissions

A new EU directive limiting levels of dioxins in air emissions from waste incinerators has come into force.

The Waste Incineration Directive set a new limit of 0.1ng/m^3 (i.e. no more than 1 part in 10 billion) in air emissions, thus addressing a gap in previous European legislation on municipal waste incineration, which had not set a limit for these emissions.

The Waste Incineration Regulations and associated directions to the regulators introduce stringent operating conditions and set minimum technical requirements for some 950 incinerators and co-incinerators, including large plant, such as municipal waste incinerators (of which there are 13 in the UK) and cement kilns, and other smaller plant like clinical waste incinerators.

info SOCIETY FOR THE ENVIRONMENT

Below is the press release issued at the launch of the Society for the Environment in October 2002. Lack of space in the November/December edition precluded earlier publication.

Society for the Environment (SocEnv)

Environment sector launches new umbrella body

Background

Ten leading environmental institutions and learned societies have come together to form a new umbrella body for environmental affairs. Between them they represent the primary environmental disciplines. The new body is the 'Society for the Environment' (SocEnv) – formerly known by the working title of CUBE (Chartered Umbrella Body for the Environment).

The society has been established following wide ranging discussions about the need for an authoritative environment sector body to co-ordinate the views, and speak with one voice, on cross cutting environmental issues and to regulate standards of professional practice.

Representatives of the ten institutions and learned societies involved have formed a steering group and signed a Statement of Intent (SoI) which commits them to working towards a set of goals. These goals will raise the status and profile of the environment profession while maintaining the identity of the constituent bodies. One of the key objectives and first tasks of SocEnv will be to submit a petition for a Royal Charter and to establish a new qualification of 'Chartered Environmentalist' (CEnv). Preliminary discussions with the Privy Council have already taken place on this matter.

Terms of Reference (ToR) and a Vision Statement for the new body have been agreed and work has now begun on a Business Plan. SocEnv will be a Company Limited by Guarantee in the first instance, and a Board of Directors from the ten founder bodies will be established under the Chairmanship of Mr Will Pope.

Membership of SocEnv will be available to qualifying environmental organisations so the present membership of the society is expected to increase and this will be encouraged. The current list of constituent bodies is as follows:

Chartered Institute of Wastes Management (CIWM)
Chartered Institution of Water and Environmental Management (CIWEM)
Institution of Agricultural Engineers (IAgrE)
Institute of Ecology and Environmental Management (IEEM)
Institute of Environmental Management and Assessment (IEMA)
Institution of Environmental Sciences (IES)
Institute of Fisheries Management (IFM)
Institute of Professional Soil Scientists (IPSS)
Institution of Water Officers (IWO)
Royal Meteorological Society (RMS)

Statement of Intent (SoI)

We are exploring the concept of an association of professional bodies recognised as an authoritative independent organisation representing members in all environmental disciplines. This we have designated as 'Society for the Environment' (SocEnv).

Our aim is to reach a formal arrangement for SocEnv which will go beyond a simple co-ordination of our affairs; our first task as the Founder Constituent Bodies of SocEnv shall be to agree:

- a vision statement
- terms of reference
- a timetable

all based on the significant progress made by Founder Constituent Bodies to date.

We agree that:

- the identities and pre-eminence of our respective professional sectors must be preserved; SocEnv shall embody mechanisms which bring us together under one umbrella, whilst at the same time allowing the identities of the constituent bodies to be maintained and their primacy and centres of specific excellence to be recognised and enhanced;
- we shall continue to seek the inclusion in SocEnv of other professional bodies which have a significant interest in the environment;
- the final agreement shall be subject to the approval of our members, and we individually reserve the right to withdraw from this process.

We shall ensure that the outcome of this process will add value to the service and support of our members and not add unnecessary burdens on membership fees.

We share the goal of establishing the qualification of 'Chartered Environmentalist', or an equivalent designation, in addition to the existing opportunities for our members. Such a status would be achieved by a process comparable with those of other organisations that award Chartered Status to individual members. The criteria for 'Chartered Environmentalist' will be based on:

- education
- training
- experience
- professional and ethical conduct.

This qualification will be awarded under the auspices of SocEnv which will be the custodian of the Charter.

It is important that all members of constituent bodies are encouraged to participate in the affairs of their constituent bodies and hence the new body itself, thus assisting in the delivery of the agreed Vision Statement,

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education EVENTS IN JOHANNESBURG II

In our last edition we described various education events at the world summit in Johannesburg last August and the topics that were discussed. In this second article we reproduce the overview report of the content of those discussions.

Meaning

The first theme that you would expect to arise is what we actually mean by Education for Sustainable Development. Or EE etc – what does it actually do and therefore why is it important?

Surprisingly this was not the main focus of discussion of any event. People were more interested in case study projects and what you could learn from them. The main area of interest and focus was what processes could take the education for sustainable development agenda forward and thus take significant steps towards sustainable development.

There were two main areas of discussion around the meaning of education and sustainable development, HOW we educate and WHAT we educate (the content of education). The first exemplifies engaging people in sustainable development and focuses on process, whilst the second was looking at issues such as access to formal education, HIV and peace.

This report will focus more on process in meaning and in furthering ESD because it is not attempting to showcase all the case studies presented but pull together generic ideas and ways to move forward.

As has been discussed on numerous occasions there is no one meaning for education for sustainable development; it is not an easy concept to define. What makes it especially hard is that the concept of sustainable development also doesn't have a globally unified concept. There is also a problem of what the words' definition mean, which becomes increasingly hard to do when you place education in a cultural framework. We still however need a sense of it. As people discussed it through the broadest sense, it seemed people in the ESD community did. They were happy to move on and discuss how words can now move towards action, even though we all know there is no one formula to education. This reflects the main focus of Johannesburg as the implementation of sustainable development. Having set the WHAT at Rio, it's now the HOW time.

The main belief was that education should not just inform people or 'stuff' their minds by transmitting knowledge but give them the tools to reflect critically, activating our thoughts. Therefore it will stimulate our creativity in new ways, to increase our capacity of awareness so people's individual power to expand their minds is awakened by education.

'Learning to be, to do, to know and to live together with respect for the environment that sustains us.'

It was considered important to sustainable development, as it creates a knowledge society that can understand the problems and how they relate to them. Throughout all these events education was continually quoted as the world's greatest resource for enabling sustainable development and creating this paradigm change is needed so that we have a new way of thinking and acting. 'A transformation', to create a broad process of social change and social learning.

Challenges

The key challenges that arose will be examined, so the 'how' can be tackled.

Even though there was a broad understanding of what was meant by ESD in the education community in Johannesburg, the underlying challenge that still faces the ESD process at large is the misunderstanding of the word education more globally. This derives from a problem of language but also communicating the message and meaning. One of the issues addressed was formal and traditional thinking on schooling, which is reflected in the WSSD Programme of Action, however not reflecting the real focus of ESD. Alongside this, education is often found to be compartmentalised not only in the UN SD process but also within governments and organisations, which is a result of a lack of systems thinking.

Practical issues such as the global shortage of teachers were identified as problems; however the underlying limitation in many countries is the overall level of poverty. We were reminded on several occasions that it is not just poverty in the developing world that is stopping education reaching sustainability. In our current worldwide system we currently learn to be unsustainable: we all have to take responsibility.

A huge barrier is held within political systems. This was exemplified at the Summit through the concepts of ESD being continually referred to in ministerial statements and Multi Stakeholder Dialogues yet rarely quoted explicitly. Consequently it has low political priority and funding and governments have not and are not engaging with the issue and acknowledging it properly.

Education policy was perceived as still having gaps in failing to deal with the issue of ESD. Echoing the position of five years ago, some people were still calling it the 'forgotten priority'.

This problem doesn't only limit itself to the politicians and decision makers but also other stakeholders who have a low level of trust both inside the ESD community, who mistrust others around them, and civil society at large still doesn't understand how the problem relates to them.

So what is the next step forward? A common question that was asked is 'How do we influence decision makers and educate people about what we in the ESD community do whilst also identifying people who do not know they

are working on education towards sustainable development?'

To answer this question, solutions to overcome the barriers and challenges were put forward in abundance through showing previous lessons learnt and looking at ways to move forward.

Lessons learnt

Flagging up all the problems might give the impression that nothing has happened, however, much has been achieved and done over the last ten years. Although the major problem was targeting the perception of ESD we have also seen that the messages are getting clearer. A lot of work has to be done on moving towards more transformative learning, looking at new methods of learning whilst engaging teachers and developing curriculum. Based on case studies demonstrated at the Summit, there is a lot of innovative work within education happening across the world, not only in formal settings but also within community engagement and business awareness. One significant development identified several times was the use of the Earth Charter as an educational tool for sustainable development.

Not only is there a lot of work happening but also there has been a lot of networking across the world from small communities working together to larger regional networks. Many are there to connect people to share ideas, experiences, best practices and innovation. A lot of networking was seen as being extremely beneficial to communities.

The amount of stakeholder input has been increasing, people are beginning to assert themselves and to slowly build awareness and in some instances people are beginning to plot future pathways. On a few occasions it was commented that we are in a stage of moving from an information/industry society to a behaviour and knowledge society.

However, there are still limitations and challenges to be faced. There was a positive attitude among the practitioners and workers in the field of ESD in Johannesburg who were suggesting ways they would like to see things move forward.

How – the future

The general feeling was that it was 'time to enter into new beginnings' and speed up the long walk to sustainability by elevating education to the highest level, creating a new vision and way of engaging with the issue. Thus synergy needs to be created, confidence built, so people's attitudes and habits could start to change and poverty can be combated. The solution was felt to be within our grasp if robust action oriented futures thinking took shape.

This ideal way of moving forward was backed up with concrete ideas on how this could be done through various processes and actions.

The overriding suggestions to emerge from these events was the need for a process that was built around a framework or Programme of Action that incorporated new strategies and very importantly partnerships to enhance the multiplier effect. Strong policy was also seen as essential. 'You cannot start with action but if you start with partnerships you have commitment and then action will follow.'

It was deemed of high importance to bring people together in some sort of network, so that they can communicate together, disseminate and share information, including examples of other projects, and best practices. This can therefore build on the past and people's experience. So we can work out what is happening and build up the larger picture. This can be done at all levels within various forums, local up to a global debate and learning space which everyone can contribute to. As seen, some of this is happening; however participants felt that we needed to move beyond small scale projects and scale up the action and make the system large and holistic.

Within the network the following issues were considered priority areas:

- Sustainable Development still needs to be integrated into the curriculum, which was also stimulated in the Programme of Action;
- The Education for Sustainable Development agendas need to be brought closer together;
- More training is needed;
- More resources need to be allocated;
- Indicators need to be developed alongside longitudinal studies of ESD creating a large step towards sustainability.

The networks and partnerships should be there so all the various sectors can be brought together and engaged. This especially should include the involvement of journalists, mass media and advertising to get the views and ideas out there. If you include that with business education and engagement you are already reaching a huge proportion of the society that is not reached yet. With 50% of the world aged under 25, youth mobilisation also has to be a priority. Many governments and international organisations spoke of a need for a multidisciplinary approach, working closely in partnership with NGOs and other organisations to forge new partnerships in a forum that captures the ideas of all the organisations whilst bringing together enthusiasm in a likeminded network.

It was seen as essential that people are listened to and have a place to feed into policy, instead of decisions being made for them. Not only do we need leadership from the highest level but also the building of a bottom-up network that contributes. It was felt that this meaningful

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education HEAVY METAL CONTAMINATION

FRANCES DU CORBIER of the School of Chemistry, Physics and Environmental Science at Sussex University describes the development of a biomarker for heavy metal contamination

The recent explosion in the characterization of genes leads to a potential for developing genetic biomarkers. To be useful, biomarkers selected should respond in a dose dependent manner to pollutants, and bioaccumulation should give an indication of the total exposure of the plant within its growing life to a heavy metal. Using molecular biological techniques, the aim was to isolate the metallothionein (MTII) gene from selected species and examine the variation in expression with location. The MTII gene encodes for the production of specific metallothionein proteins, the function of these is to sequester heavy metals. In animals most of these metals will be secreted, but sometimes they are stored where they cannot be harmful, such as lead stored within the matrices of the bones. Plants, on the other hand have few excretory mechanisms, so many have evolved an ability to concentrate heavy metals as a mechanism of defence against herbivores. It makes them unpalatable.

This project was based upon the hypothesis that increased expression of metallothionein encoding genes will occur following exposure to heavy metal contamination. It explored the possibilities of developing a biomarker for environmental contamination by aiming to find a correlation with degree of expression of the MTII gene in plants and suspected contaminated land or water. Plant species were taken from varying 'clean' and 'contaminated' locations in both the marine and terrestrial environments. Indicator species were chosen on the basis that they were widely available across differing environments, prolific and have dose dependent responses to pollutants in the environment.

A local industrialized ferry port (Newhaven Harbour) and a protected piece of coastal nature reserve (Hope Gap) were chosen as the marine environments, utilizing the algal species Fucus vesiculosis. Bladder wrack (Fucus vesiculosis) was selected because the MTII gene had recently been characterized (Morris et al 1999) and in research had shown that this species has an ability to accumulate metals from surrounding waters and sediments, particularly copper, cadmium and lead; along with a corresponding increased expression in the MTII gene. This suggested that this species had potential both as a biomarker and a remediation tool. In practice, it was found that the extraction of RNA from Fucus vesiculosis was problematical and that this species did not show potential as a simple biomarker. A better subject for these coastal and estuarine environments may be the common mussel Mytulis edulis. As well as being widespread and prolific, isolation of RNA from this species is straightforward.

'Clean' and 'contaminated' sites selected on land were allotments located at Ditchling and Brighton, East Sussex. The former were situated on the extremities of a small village that lies to the north of the South Downs. The underlying geology is a narrow strip of greensand and the topsoil is in excess of a metre deep. The latter were situated on the east side of the city subject to prevailing southwesterly winds that carry atmospheric pollutants in that direction. Two crematoria chimneys were located 20 metres from the Brighton sampling area and a hospital waste facility incinerator was also nearby. The topsoil was deep and well worked on both sites with a very similar pH of 7.5.

Members of the Brassicaceae (swede, brussel sprouts and turnip) were used as the species of choice for the terrestrial environment. Not only are many of the Brassicaceae food crops, but also samples were readily available at all the desired locations facilitating comparative assessments. Additionally some varieties have been successfully used in trials to clean up contaminated land, acting as hyper accumulators of certain heavy metals. Brussels sprouts (Brassica oleracea) have been used in trials at Rothamstead for the remediation of sewage sludge treated soils. These soils tend to be very high in zinc and Brassica oleracea is an accumulator of zinc. The hyper accumulator plants have a low biomass and/or slow growth rates, which gives them time to accumulate metals but also may pose a risk for humans along the food chain.

Swede and Turnip (Brassica napus napobrassica) are easily cultivated vegetables grown for human consumption and cattle feed, and are closely related to oil seed rape. These root crops concentrate certain metals, particularly lead in their tubers, where levels ten times higher than leaf concentrations have been found (Fergusson 1990).

Brassica juncea used in trials over a single cropping season produced a 28% reduction in lead content of soils in a contaminated area (Salt et al, 1998). The implication of this is that these food crops could also be concentrating these elements for human consumption.

Methodology

The project method initially involved RNA extracted from the selected species, using both traditional phenolic extraction and a modern minicolumn kit (Rneasy ®). Once

pure RNA had been obtained and quantified, primers were designed to isolate the gene of interest MTII. Primers are a small section of DNA code which can be used to isolate the sequence of interest within a gene. From this sequence an exponential replication of the segment can be achieved using a thermo-cycling technique (PCR-polymerase chain reaction). Having replicated the gene of interest using the PCR, a semi-quantitative assessment was made of the MTII expression. Quantitation was achieved by designing primers to isolate a gene common to all species ('a housekeeping gene') which could be used as an internal control indicator and compared with the differential expression of the MTII gene. The housekeeping gene used was a fragment designed from Genbank data encoding for species-specific rubisco (ribulose-1, 5, -biphosphate-carboxylase/oxygenase). This is a highly conserved gene encoding an enzyme essential in the photosynthetic cycle in plant and algal species.

MTII *Fucus vesiculosis* 300 bp PCR product
Forward:- 5' ATG GCG GGC ACT GGC TGC AAG 3'
Reverse:- 5' GCC GCA GCC GCA GCA GTC GTC 3'
RUBISCO *Fucus vesiculosis*. 516 bp PCR product
Forward:- 5' CGA ATC GTG TTG CGT TAG AAG C 3'
Reverse:- 5' TGT CCA TTC AAC ACT AAC AGC C 3'
MTII *Brassica napus* & *Brassica oleracea* 283 bp PCR product
Forward:- 5' TCT AAC TGT GGA TGT GGT TCC G 3'
Reverse:- 5' CAC ACA ATC CAC ACA TAG AAG C 3'
RUBISCO *Brassica napus* & *Brassica oleracea* 360 bp PCR product
Forward:- 5' ACA ACT GTG TGG ACC GAT GG 3'
Reverse:- 5' CTG CTC TAC CAT AGT TCT TCG C 3'
RUBISCO *Brassica napus* & *Brassica oleracea* 600 bp PCR product
Forward:- 5' ACA ACT GTG TGG ACC GAT GG 3'
Reverse:- 5' TAT CTC GGC AAT AAT GAG CC 3'

Quantified amounts of replicated DNA were run on agarose gels and visualised with ethidium bromide, a compound that binds to DNA and fluoresces under ultraviolet light. Using electrophoresis, PCR fragments can be separated and the results viewed, recorded and photographed under ultra violet light. Finally concentrations of the template RNA can be adjusted so that the intensity of the marker gene Rubisco is equalized across sample locations to enable a comparative assessment to be made of the degree of expression of MTII gene.

Primer Design

Primer design is the single largest variable in PCR applications and the single most important factor in determining the success or failure of PCR reactions. In an ideal world, correct primer design should give the amplification of a single required fragment of a certain size corresponding to the target region of the template molecule. If a primer is incorrectly designed there will be no product at all.

The size of the plant genome can be dramatically larger than animals; some higher plants have genomes greater than ten times the size of the human genome, thus the chance for repeated sequences of codes occurring in the plant genome is much greater. Current knowledge of plant genomes, which is still in its infancy, suggests that repeated nucleotide sequences within their genomes are probably commonplace.

All the primers (with the exception of Fucus vesiculosis metallothionein primer) were designed using a gene sequencing programme Gene Jockey II and data from Genbank.

Results

Fucus vesiculosis proved to be a difficult subject from which to extract RNA, possibly due to its high gelatin content. The Brassicaceae gave good yields of total RNA. Amplification of rubisco encoding gene appeared depressed in samples taken from the Brighton site, suggesting that these plants were not growing optimally in this location.

Appreciably different expressions of MTII were found in each location. Metallothionein expression was also more fragmented at the Brighton site, possibly indicating that a greater variety of metals were present in the soil. This project showed that expression of the MTII gene varied with location of plants. Further analysis using Atomic Absorption Spectrophotometry would identify the metals present at both Brighton and Ditchling.

Discussion

This PCR-based technique worked well (once optimised) for selected plant species, and with further development and refinement could serve as an indicator of heavy metals on contaminated soils. The development of a similar biomarker in the marine environment would be better served by the use of marine species such as the common mussel, whilst algal species may have a future in a remedial capacity the practicality of creating a simple biomarker from these species is limited by the experimental difficulty of RNA extraction.

Present methods of soil testing are laborious, expensive and sometimes irrelevant to levels of contamination within a plant. The ability of many plants (plenty of which are food crops) to concentrate certain metals is not considered when setting regulatory levels. The biological availability of heavy metals is more dependent on plant species than many other criteria.

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Learning & Teaching Support Network Subject Centre for Geography, Earth & Environmental Sciences

LTSN-GEES Residential Conference:
30 June-1 July 2003, Royal Court Hotel, Warwickshire

Call for submissions

The LTSN-GEES residential conference 2003 planning team are calling for papers, posters and good practice summaries that relate to the event's themes – linking teaching and research and undertaking research into teaching (pedagogic research).

- Deadline for all abstracts is 31 March 2003.
- Please visit: *http://www.gees.ac.uk/mainconf/resconf.htm* and follow the link to register and for submission guidelines.
- Free prize draw entry for all who submit an abstract!
- Early-bird places still available: register *now!*

Area Studies Network

The Subject Centre for Languages, Linguistics and Area Studies has launched its new Area Studies Network which aims to bring together colleagues with an interest and expertise in the teaching of area-related subjects. This network is being run in collaboration with five other Subject Centres of which LTSN-GEES is one. LTSN-GEES will be supporting the sharing of Area Studies-related resources, and has arranged a first workshop for 2 April that will focus on overseas residential field courses. Further information on the network can be found at *http://152.78.89.51/network.aspx* and details of the workshop can be found at *http://www.gees.ac.uk/osfw.htm*

Improving Provision for Disabled Students Projects

The projects to be funded under the HEFCE 'Improving Provision for Disabled Students' programme began in January 2003. Those that LTSN-GEES are particularly involved with are:

- Developing an Inclusive Curriculum for Disabled Students: The Case of Geography, Earth and Environmental Sciences: Geography Discipline Network.
- Science Signs: An online British Sign Language (BSL)/English glossary for Science Education: University of Wolverhampton.
- Accessibility of Online Learning in Specific Subject Areas: University of Durham

Employability Project

The employability project is getting underway with the appointment of a full-time researcher for one year. Dr Sharon Gedye, previously of Edgehill University College, joined us at the beginning of February and we are very pleased to welcome her to the team. Although her work will be focused on supporting Brian Chalkley's National Teaching Fellowship, there are many synergies with the LTSN-GEES employability project.

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- Recognising one's own feelings as they happen. This self-awareness of emotions is crucial to psychological insight and self-understanding.
- Managing one's own feelings appropriately. This enables optimism which is vital for sustainability.
- Motivating oneself. This enables creativity and productivity.
- Recognising feelings in others. This is vital for all aspects of development, regeneration and the care and welfare that are central to sustainability.
- Managing one's own and others' feelings to create good relationships. This social competence is the basis of being a good team worker, partner, leader or promoter.

It is up to the organisations, employers, communities and households that engage with young people out of school and college, in the evenings, weekends, holidays and just after leaving school and college to make the real links between living, working and continuous learning. It is they that can value, involve, resource and use young people to develop more sustainable businesses, and communities.

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participation should not be afraid of conflict but find common ground on shared values to build agreement in a professional manner. While bringing people together in a holistic program, it should be governed by openness, transparency, equity empowerment, experimental, locally relevant, globally realistic, cooperative, committed, comprehensive, lifelong and fair and open accountability.

Solutions

What therefore needs to happen to put these great ideas into practice? What is the framework? A minor idea flagged up was to create educators as a tenth major group in the UN system, however the major opportunity people identified was that of the Decade of Education for Sustainable Development to start in 2005. The Japanese proposed this in the Programme of Action. As it does not start until 2005, a lot of networking, partnership and development of concrete ideas needs to take place to ensure that the UN General Assembly adopts it.

UNESCO supported the proposal of a decade, committed itself to work with everyone to fulfil the dream and wanted NGOs to be a part of this. Strong advocacy will be essential to this process. One participant said that linking all these different approaches through bridge building made his heart soar. However, resources and strength will be needed to achieve this.

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which will embody our aims and aspirations. We will continue to seek to exploit opportunities to arrange joint meetings and activities for the mutual benefit of our members.

We aim to progress discussions as quickly as possible and in accordance with the agreed timetable.

We shall seek to have this Statement of Intent endorsed by our respective Councils at the earliest opportunity and in the meantime the Founder Constituent Bodies intend to continue progress towards the formation of SocEnv.

Terms of Reference (ToR)

SocEnv comprises representatives of Constituent Bodies with a focus on the environment.

All Constituent Bodies will be equal members of SocEnv including having equal voting status (each Constituent Body having one vote).

Each of the Constituent Bodies will retain their identity, institutional activities, and registered address. SocEnv will establish a separate registered address.

SocEnv will promote co-operation between the Constituent Bodies, encourage common interests and activities and create added value for all of their members through this partnership.

SocEnv will seek a Royal Charter that will allow the conferment of chartered status on suitably qualified individual members of Constituent Bodies – the designation being termed, 'Chartered Environmentalist' *pro-tem*. Award of a Charter will not preclude Constituent Bodes having or obtaining their own Charter. In developing a petition for a Royal Charter, SocEnv, under the guidance of the Privy Council, will also develop appropriate criteria for the chartered status of the individual members of the Constituent Bodies.

SocEnv will have the responsibility for matters arising from the Charter, including the criteria for the award of chartered status to individuals.

SocEnv will act as the principal focal point for its Constituent Bodies when dealing with external organisations in a proactive and reactive way where collective response is required. This will not prejudice the expressing of individual views by the Constituent Bodies.

Governance rules for admission, organisational structures and responsibilities and administrative functions are to be developed by the Council and incorporated in a full constitution.

The governance of SocEnv will be invested in a Council made up initially of two representatives from each of the Constituent Bodies who will normally be the President (or equivalent) and Chief Executive (or equivalent) of each Constituent Body, or their nominated representatives. SocEnv will be chaired by each of the Presidents (Chairmen) of the Constituent Bodies by rotation. The Chairmanship will be of 12 months duration. Council will be supported by a secretariat in accordance with arrangements to be agreed by the Council.

SocEnv will be resourced by each Constituent Body in accordance with a formula to be agreed by the Council of SocEnv.

Initially all activities of SocEnv are subject to review and ratification by the individual Councils of the Constituent Bodies. (The Constitution will define the safeguards for subsequent operation).

Vision Statement

SocEnv aspires to be the leading and co-ordinating professional body in environmental matters and a pre-eminent champion of a sustainable environment. It will achieve this by nurturing and harnessing the combined resources, knowledge, expertise and achievements of its constituent professional and learned bodies and their members.

SocEnv will foster a culture of inclusivity and ethical behaviour for the common good. The identity of its Constituent Bodies will be maintained and their primacy and the centres of excellence within their fields recognised and enhanced.

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In the field environment organisms are exposed to a multiplicity of chemicals and stresses. By isolation of a single gene coding for the sequestration of specific metals, a more accurate image can be gained of their presence in the environment and perhaps more importantly the response relationship of the organism to exposure. The degree of expression of a gene as an indicator of the presence and biological availability of heavy metals in both plant and animal species requires further investigation, as expression may equally become depressed if the organism is stressed by a severely polluted environment.

With thanks to Dr J.Rotchell, my project supervisor.

References

Fergusson, J. (1990) The Heavy Elements: Chemistry, Environmental Impact and Health Effects – pub Pergamon Press.

Morris, A. *et al* (1999) Identification and characterization of a recombinant metallothionein protein from a marine alga, Fucus Vesiculosis – Biochem. J. 338, 533-560.

Salt *et al* (1998) Phyto remediation – Annual review of plant physiology and plant molecular biology. 49, 643-68.

ies NEW MEMBERS

The Institution is pleased to welcome the following new members:

Miss N. Abrams	Planning Assistant, SEPA
Ms K. Angmo	Postgraduate Student Swansea Institute of HE
Ms H. L. Arthur	Environmental Scientist Arup Environmental
Miss L. B. Bacon	Student, Swansea Institute of HE
Mr C. S. Batt	Consultant Hydrologist Waterra (UK) Ltd
Mr J. Bell	Consultant, EPA Ltd
Mr M. Burrows	Postgraduate Student Swansea Institute of HE
Miss R. A. Bust	Town Planning Consultant J. W. Molloson Associates
Mrs C.S.Chapman	Area Support Team Officer, SEPA
Mr P. N. Davies	Student, Swansea Institute of HE
Mr J. E. Dickinson	Archaeology Services, Archaeologist
Mr M. R. Eynon	Postgraduate Student Swansea Institute of HE
Dr G. D. Fenwick	Principal Consultant G. D. Fenwick Surveyors & Adjusters
Mr E. A. Fleming	Environmental Consultant Marenco Environmental Consultants
Mr H. Gibbon	Postgraduate Student Swansea Institute of HE
Mr R. W. Jones	Drawing Office Manager H3 OK Consultants
Ms E. K. Hamilton	Waste Data Officer, SEPA
Mr W. H. McBain	Senior Hydrologist, ARUP
Mr M. P. McSorley	Recent Graduate Manchester Metropolitan University
Mr J. E. Mape	Postgraduate Student Manchester Metropolitan University
Ms C. Mimnagh	Technical Assistant Parkman Ltd, Ireland
Miss L. Morrison	Recent Graduate University of Ulster
Mr A. J. Niven	Recent Graduate University of Ulster
Mr D. N. Pearson	Safety, Health & Environmental Manager, Rowan Foods
Miss J.L.Richmond	Postgraduate Student Swansea Institute of HE
Mr M. Ross	Senior Meat/Poultry Hygiene Inspector
Mr M. J. Sharratt	Postgraduate Student Swansea Institute of HE
Mr J. L. Stapleton	Postgraduate Student Swansea Institute of HE
Dr E. C. Stevens	Environment Information Officer SEPA
Mr G. E. Strachan	Independent Consultant
Mr M. J. Thomas	Postgraduate Student Swansea Institute of HE
Mr C. White	Hydrologist, SEPA

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Although much is possible, scientists have to balance their enthusiasm in several ways. First, there is a need for widespread discussion and dialogue over the commercial application of such technologies. The role of BBSRC-funded scientists is to provide the evidence base for government and society to make decisions. Secondly, much of this basic research, say in development of new vaccines for the treatment of animal or human disease, depends not only on BBSRC funding to provide the basic insight, but also the subsequent funding of the development stage that puts the science into practice. So although BBSRC can give the push into the applied area, it is necessary for DEFRA and industry to take up these ideas. Clearly what we need is a partnership in order that the insights from basic science can lead to improved quality of life and economic benefits to the UK.

This uptake by government departments and industry is essential, and a key part of BBSRC's mission involves promotion of knowledge transfer and innovation. The demand for funds for basic research is very high and the quality of applications from the biology community in the UK is very strong. Funds for basic research in agriculture are in competition with other areas such as basic molecular and cell biology. So whilst 20% of the BBSRC budget currently goes into the agriculture and food area, this may not be sustainable in the future if there is not a clear 'pull' from industry and uptake by the agriculture community.

Modern post-genomic biology can contribute in a number of important ways to developing sustainable agriculture within the UK. However, the application of such research has to be seen in terms of the willingness of industry and government departments to invest in the development of these research findings in areas of strategic importance and in the context of the social and political agenda surrounding UK agriculture.

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Moving? Changing jobs?

Remember to let us know your new address and telephone number without delay. Write to:

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

events CONFERENCES AND COURSES

17th March 2003
Education for Sustainable Development – The challenge for Higher, Further and Adult Education.
One day conference at Fulton House, University of Wales, Swansea (9am-4.30pm) Attendance free.
Booking Forms from: Dr Rolf Jucker, Keir Hardie Building, University of Wales, Swansea SA2 8PP;
Email: *r.jucker@swansea.ac.uk*

30 March-4 April
Taking Corporate Responsibility Seriously.
Five day residential course on business and sustainability at Schumacher College. Fees are £1,400 (company delegates) covering tuition, residential accommodation, food and field trip. Limited number of places at a reduced rate of £900 for individuals and representatives of NGOs.
Details: Schumacher College[1]

31 March
CL:AIRE Annual Project Conference 2003
University College, London £50-75
A conference looking at CL:AIRE contaminated land demonstration projects
Details: CL:AIRE, 7th Floor, Great Cumberland Place, London W1H 7AL
Tel: 020 7723 0806; email: *enquiries@claire.co.uk*

1-3 April
Natural Attenuation of Pollution;
short course at University of Sheffield; £750
Details: Dept of Civil & Structural Engineering[2]

2 April
'Overseas Fieldwork in HE' workshop; LTSN-GEES[3]

15-16 April
Human Health and Environmental Risk Assessment for Contaminated Land
Shrewsbury £395
A hands-on short course looking at risk assessment in line with the EA guidance.
Details: Environmental Simulations International Ltd, Priory House, Priory Rd, Shrewsbury, SY1 1RU
Tel 01743 280020; email: *courses@esinternational.com*

14 May
'Meeting the 50% target' (with LTSN Economics); LTSN-GEES[3]

13-15 May
Modelling Water Distribution Networks
Short course at University of Sheffield £750
Details: Dept of Civil & Structural Engineering[2]

19-20 May
New and recently appointed lecturers' residential workshop; LTSN-GEES[3]

3-6 June
Groundwater Flow and Transport Modelling
Short course at University of Sheffield; £875
Details: Dept of Civil & Structural Engineering[2]

4 June
Planning and the Environment
London £395
A conference looking at how planning affects the environment and the brownfield developer
Details: Certa (UK) Ltd, America House, 2 America Sq, London, EC3N 2LU; Tel 020 7903 6522; email: *info@certa.com*

4 June (TBC)
Workshop for Programme Leaders, theme TBC; LTSN-GEES[3]

29 June-4 July
Greening the Boardroom, Greening Society.
Details: as 30 March.

30 June-1 July
Teaching and Research; two-day residential conference on LTSN-GEES[3]

1-2 July
Human Health and Environmental Risk Assessment for Contaminated Land,
Cambridge £395. Details: as 15-16 April

1. Schumacher College, The Old Postern, Dartington, Totnes, Devon TQ9 6EA; Tel: 01803 865934; Fax: 01803 866899; email: *enquiries@schumachercollege.org.uk*
2. Deparetment of Civil & Structural Engineering, Sheffield University, Sir Frederick Mappin Building, Mappin Street, Sheffield S1 3JD; Tel 0114 222 5725; email: *j.a.chambers@shef.ac.uk*
3. LTSN-GEES, Room 509, The Money Centre, University of Plymouth, PL4 8AA; Tel: 01752 233 530; Fax: 01752 233 534; email: *info@gees.ac.uk*

New web site/e-mail addresses

The IES has a new e-mail address and our web site address has changed again:

- e-mail: **ies-uk@breathemail.net**
- web site: **http://www.ies-uk.org.uk**