Sustainable development and social inclusion

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Towards an integrated approach to research

Edited by Malcolm Eames

With Maria Adebowale

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The Sustainable Development Research (SDR) Network is a DEFRA funded initiative, co-ordinated by the Policy Studies Institute (PSI) in London in collaboration with the Centre for Sustainable Development (CfSD) at the University of Westminster and Centre for the Study of Environmental Change and Sustainability (CECS) at the University of Edinburgh. The Network's goal is to contribute to sustainable development in the UK by facilitating the better use of evidence and research in policymaking. For further information visit: www.sd-research.org.uk

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Professor David King is currently Chief Scientific Advisor to the UK Government and is Head of the Office of Science and Technology. He was appointed as Lecturer in Chemical Physics at the University of East Anglia, Norwich, in 1966, and moved to the University of Liverpool in 1974 to take up the Brunner Chair of Physical Chemistry. He became Head of Department in 1983. In 1988 he moved to his current position at Cambridge as 1920 Professor of Physical Chemistry and held the headship of the Chemistry Department from 1995 to 2000. In 2001 he was elected to a fellowship in Queen's College and an honorary fellowship at Downing College.

Professor John Lawton trained as a zoologist at the University of Durham. He was awarded a Personal Chair at York in 1985. In 1989 he founded, and was appointed Director of, the NERC Centre for Population Biology at Imperial

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Dr Peter Phillimore is a Senior Lecturer in Social Anthropology at Newcastle University. After doing fieldwork in north India for his PhD at Durham, he worked with Professor Peter Townsend at Bristol University doing research on health inequalities in the north of England. This led to a particular interest in Teesside and its industrial environment, and a series of

projects and papers examining first the impact of air pollution on health and later the politics of pollution. He is currently working with Tanja Pless-Mulloli on a comparative project exploring 'cultures of risk' in petrochemical centres in Germany and Scotland, funded by the Economic and Social Research Council and the Anglo-German Foundation.

Dr Tanja Pless-Mulloli works as a senior lecturer in the Department of Epidemiology and Public Health at Newcastle University. She is an environmental epidemiologist with a background in biology, medicine, and environmental public health. She joined the team at Newcastle from her native Germany in 1993, where she conducted environmental epidemiology work with strong community participation. She became interested in the contribution of social exclusion to the links between air pollution and health in her work on the health of people living near industry. Another research interest is the perception and communication of risk in communities living near industry.

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Professor Chris Wood is co-director of the EIA Centre and Professor of Environmental Planning in the School of Planning and Landscape, University of Manchester. He has had an interest in environmental planning for 30 years. He has been involved in environmental impact assessment (EIA) and strategic environmental assessment (SEA) research and training since 1974 and has a particular interest in the relationship between EIA and SEA and land use planning. He was a member of the Foresight Environmental Appraisal Task Force. He is convenor of the Royal Town Planning Institute's Environmental Planning and Protection Panel and co-editor of the journal *Impact Assessment and Project Appraisal*.

1 Introduction and overview

Malcolm Eames

Aims and objectives

This report seeks to ensure that a strong 'social component' is reflected in the emerging 'agenda' for UK sustainable development research.

Particular objectives of the report are to:

- provide a basis for dialogue between researchers, research funders, policy makers and other stakeholders concerned with environmental and social exclusion/ regeneration issues

- promote the effective integration of social, economic and environmental/resource elements in research to support sustainable development

- encourage UK funding bodies to support such integrated research

- evaluate the Sustainable Development Research (SDR) Network's contribution to developing this agenda

- review the proceedings of the SDR-Network's 2001 annual conference through the 'lens' of social exclusion/ inclusion.

Structure of the report

The rest of this chapter gives an overview of the SDR-Network, introducing its aims, objectives and current activities. The definitions of some of the key terms used in the report are also given.

Chapter 2 gives a critical assessment of the links between sustainable development research and social inclusion, based on a desktop review of the SDR-Network conference papers, UK government policy documents, and interviews with key stakeholders.

An analysis is presented of the strengths and weaknesses of the SDR-Network, and of the potential for developing inclusive participative research with socially and economically excluded communities.

The section draws together key recommendations for:

- the SDR-Network and the wider research community

- research users, including government policy makers and others involved in sustainable development projects

- research funding bodies.

Chapter 3 gives updated and edited versions of the papers from the SDR-Network conference. The full versions of these papers are available in pdf format on the SDR-Network's website (www.sd-research.org.uk).

The Sustainable Development Research Network

Sustainable development is all about integration and this network is an excellent example of taking an integrated approach to solving multi-dimensional problems and cross-cutting issues. (Elliot Morley, DEFRA Minister, SDUK conference, May 2002)

The SDR-Network was established in spring 2001 with the goal of contributing to sustainable development in the UK by facilitating the better

use of research and evidence in policy making. The Network promotes high quality cross-cutting research that integrates the environmental, social and economic pillars of sustainable development.

Aims of the SDR-Network

- Monitoring and mapping research relevant to the UK Sustainable Development Strategy
- Fostering a network of organisations with an interest in sustainable development research
- Facilitating the flow of information about current and planned activities
- Identifying specific gaps in knowledge, and assessing research opportunities
- Promoting sustainable development research activity by influencing funders and research organisations.

The Network is a DEFRA-funded initiative, coordinated by the Policy Studies Institute (PSI) in London in collaboration with the Centre for Sustainable Development (CfSD) at the University of Westminster and the Centre for the Study of Environmental Change and Sustainability (CECS) at the University of Edinburgh.

The Network's Coordinating Team is assisted by an academic Advisory Group that contributes to the strategic development of its activities, and a User Forum that serves as an interface between research and policy making.

Over its first year much of the SDR-Network's efforts have been directed towards identifying current knowledge gaps, research opportunities and policy needs, with the objective of influencing the priorities of major funding bodies.

The Network's first annual conference took place in December 2001 (see Chapter 3), and an extensive consultation process informed the publication of the Network's first report: *A New Agenda for UK Sustainable Development Research*. This present document provides a companion volume to that report, which can be downloaded at http://www.sd-research.org.uk/sdrnreportforweb.pdf.

Terminology

The following paragraphs outline the definitions of some of the key terms used in the report.

Sustainable development

Sustainable Development is development that meets the needs of the present without compromising the ability of the future to meet its needs.
(World Commission on Environment and Development, 1987)

This 'classic' definition of sustainable development has been accepted by the UK government, which further defines such development as 'ensuring a better quality of life for everyone, now and for generations to come' (DETR, 1999a).

Objectives of the UK government strategy for sustainable development

- Social progress which *recognises the needs of everyone* (emphasis added)
- Effective protection of the environment
- Prudent use of natural resources
- Maintenance of high and stable levels of economic growth and employment.

Source: DETR (1999a).

Sustainable development research

Sustainable development research refers to integrated cross-cutting research designed to support sustainable development policy making and practice. In the past, such research has not always succeeded in integrating all three – environmental, social and economic – pillars of sustainable development. The SDR-Network therefore adopted a broad inclusive definition, stating that:

> Sustainable Development Research is ... concerned with at least one of the environmental objectives (i.e. 'resources' or 'environment') plus at least one of either the 'social progress' or 'economic growth' objectives of the UK strategy. (Eames, 2001; original emphasis)

Chapter 2 explores whether this 'environment plus' approach pays sufficient attention to the social aspects of sustainable development.

Social exclusion

This term commonly refers to the condition of communities, groups and individuals who are economically and/or socially disadvantaged. People living on low incomes within affluent societies are an obvious category, as are people from black and minority ethnic communities living within majority white populations. Other dimensions that may lead to people being left out of the socio-economic and political mainstream include age, disability and gender.

In the UK social exclusion is often analysed by measures of deprivation across the six domains of income, employment, health, education, housing and service access.

Social inclusion

The term 'social inclusion' typically refers to the objective of measures that seek to address the sort of disadvantage and disengagement indicated above.

Regeneration

At its simplest, regeneration is defined as a process of change and development by which policies, programmes and projects revitalise or rehabilitate deprived geographical communities by creating buoyant local economies, improving degraded built and natural environments, promoting community involvement and educational opportunities, and improving living conditions and 'quality of life'.

2 Towards a socially inclusive sustainable development research agenda

Maria Adebowale

Introduction

Since 1997 a central theme of government policy has been a commitment to promote social inclusion and bring traditionally disadvantaged groups back into mainstream society. Efforts have also been made to integrate social progress objectives into the UK's approach to sustainable development.

This is reflected in, for example:

- the modernising local government agenda, and establishment of the Social Exclusion and Neighbourhood Renewal Units

- the sustainable development strategy, *A Better Quality of Life*, and choice of headline indicators for sustainable development.

More recently, the 'liveability debate' has focused attention on ensuring liveable conditions that can maintain the dignity and needs of all.

At the European level too, some important legislative and regulatory changes have found their way into UK policy. Most notable perhaps are the Human Rights Act 1998, the 1998 UNECE (Aarhus) Convention on Freedom of Information, Public Participation and Access to Justice in Environmental Decision Making, and the Local Government Act 2000.

The need to balance environmental, social and economic objectives is thus a prominent and recurring challenge across all areas of government policy. Equally clear, however, are the competing priorities and practical dilemmas that arise from the simultaneous pursuit of economic growth, environmental protection and social progress. How to achieve 'the balance' is therefore one of the crucial preoccupations of policy makers and their public and private sector delivery agents at every level of government.

Sustainable development research can do much to inform these debates: identifying the problems; providing the evidence for what works and what doesn't; and stretching the parameters of our understanding of what constitutes sustainable development. The SDR-Network's co-ordinating role provides a unique opportunity to drive this agenda forward. However, this report argues that, in order to successfully address these challenges, the Network must ensure that the exploration and analysis of the social dimensions of sustainable development are central to the research activities it promotes.

The report begins by reviewing the conceptual linkages between sustainable development and social inclusion, giving particular attention to the need to consider questions of social equity within the developing research agenda. The strengths and weaknesses of the SDR-Network are then assessed, the scope and content of its first conference reviewed from a social inclusion / regeneration perspective, and the potential of additional areas for future research highlighted.

Next, the relevance of two of the fundamental principles of sustainable development – public participation and access to information – are explored, and suggestions made as to how

sustainable development could be made more relevant to excluded communities *through the research process itself*. Finally, some lessons and recommendations for key audiences – including the Network itself – are outlined.

Joining up the social, economic and environmental

The concept of sustainable development has always had at its heart the principles of promoting equity and equality.

In 1972, the UN Conference on the Human Environment clearly stipulated that any agenda for sustainable development needed to integrate the rights of people to a healthy and productive environment. A decade later the Brundtland Commission identified the following strategic imperatives:

- reviving growth

- changing the quality of growth

- meeting the essential needs for jobs, food, energy, water and sanitation

- ensuring a sustainable level of population

- conserving and enhancing the resource base

- reorienting technology and managing risk

- merging environment and economics in decision making.

Running through these imperatives are the themes of equality of opportunity and social inclusion, linked to a core concept of need – essentially the needs of the world's poor 'to which *the overriding priority* should be given' (World Commission on Environment and Development, 1987; author's emphasis). It is therefore a fundamental contradiction to the principles of sustainable development to believe that it can be achieved without improved social equity and social progress.

However, prior to 1997, the social progress dimension of sustainable development went largely unrecognised within UK policy: the emphasis was on high economic growth, environmental protection and prudent use of natural resources. Busy in the simplistic fight of ideologies – *environmental protection versus economic development* – few stopped to see that the people most affected by the consequences of environmental and commercial decision making were not only alienated by this increasingly narrow debate but were insufficiently protected by environmental or economic policy.

This 'environment–economy' framing is still all too often evident in research on sustainable development issues, leaving multiple gaps in our understanding of the conflicts and synergies between social inclusion and the environmental and economic components of sustainable development. This lack of integration is not helped by the fact that environmental concerns often receive little prominence in mainstream socio-economic research.

Decisions affecting sustainable development are therefore made in the absence of the information and evidence that would inform a socially inclusive policy approach – and this may end up being to the detriment of the original policy intention. The failure to recognise and address the social impacts of introducing an escalating environmental tax on fuel can be cited as an example of this, leading to a policy U-turn that benefited neither the economy, the environment, or social progress.

Equity and differential impact/access

Over the last few decades, international forums on sustainable development – Brundtland in the 1980s, the Rio summit in the 1990s, and most recently the Johannesburg summit – have done much to galvanise discussion of how the unsustainable practices of wealthy nations may impact upon poorer countries. Rio in particular did much to highlight the linkages between poverty on the one hand, and environmental degradation and economic policies on the other.

However, the inequality of access to environmental 'goods' (i.e. healthy living conditions) and the inequitable impacts of environmental 'bads' (i.e. pollution) are not just global North/South concerns. They are highly relevant to social inclusion debates within the UK.

Obviously, as one of the wealthiest countries in the world, the UK does not witness the worst extremes of poverty seen in parts of the developing world. Nevertheless, in spite of its relative affluence, social and economic exclusion has grown in the UK. For example, the number of children living in households with incomes below 50 per cent of the average increased by 35 per cent between 1979 and 1997.

The government's response since 1997 has been to publicly commit itself to improving the quality of life of the poorest sections of UK society. However, its actions to date have largely been economic (minimum wage, employment maximisation through measures like New Deal, neighbourhood improvements through measures such as the Single Regeneration Budget). Action to reduce the negative impacts of environmental degradation on poor communities has been slower to come forward.

Despite this caution, there is growing interest in the links between social exclusion and the environment, and understanding these links must be an important component of developing genuinely socially inclusive sustainable development policies. Although research in the UK on the negative impacts of environment on poverty and vice versa is still in its early stages, there is evidence to show that environmental impacts and access are inequitably distributed, and that this uneven distribution is linked to social exclusion (ESRC, 2001). The box below highlights some recent research findings.

Environmental inequality in the UK

- People living in the 44 most deprived areas in England listed pollution, poor public transport and the appearance of their estate as major concerns about where they lived (Social Exclusion Unit, 1998)

- The 44 most deprived areas in England contain four times as many people from minority ethnic groups as other areas (Seraaj, 2001)

- Families living on incomes of less than £5,000 are twice as likely to live next to a polluting factory than families with incomes of £60,000 or more (FOE, 2001)

- Of all carcinogenic chemicals emitted into the air, 66 per cent come from factories in the most deprived 10 per cent of communities in England (FOE, 2001)

- Pollution is a major factor in poor health and health inequalities, with

over 24,000 people affected by environmental-related illnesses (Acheson, 1998)
- Child pedestrians from poorer communities can be five times more likely to be killed by vehicles than children from the most affluent areas (ESRC, 2001)
- Over 700,000 people in Scotland live in relative fuel poverty, spending more than 10 per cent of their income on heating (Scottish Executive, 2002)
- One in four older people living alone occupy homes with the worst level of energy efficiency (Scottish Executive, 2002).

Environmental 'bads' and equity

Correlations are thus emerging on the links between poverty and pollution (FOE, 2001); between air pollution and health (see paper by Pless-Mulloli and Phillimore in Chapter 3); and between road accidents, young children and poverty (DETR, 2001). Moreover, there is evidence to suggest that those on the receiving end of some of the environmental 'bads' (e.g. traffic pollution) are least likely to enjoy the associated social/economic benefits (e.g. car ownership).

Research on social inclusion and environment has demonstrated that there are ethnic dimensions within these externalities – caused in part by the high concentrations of black, Asian and minority ethnic communities living in deprived areas and low-income households. Some links have also been found between ethnicity and exposure to environmental risks such as hazardous substance consent sites (Walker *et al.*, 2000).

What is less clear in the UK context (though this is far better researched in the USA) is the degree to which ethnic descent and/or poverty compounds the social impacts and inequalities of unsustainable environmental, economic and social policy (West and de Silva, 1999). The same is also true of disability, age, gender and geography. There is thus much to be done.

Environmental 'goods' and equity

Research on access to environmental goods such as heating, housing, transport and green space also shows an unequal distribution between wealthy and poor communities. The government currently estimates that 4.5 million UK households live in fuel poverty (defined as spending 10 per cent or more of income to achieve adequate levels of warmth) and this contributes to an estimated 30,000 unnecessary winter deaths every year (ESRC, 2001). Fuel poverty throws up a number of questions related to housing quality, health and household energy consumption. The latter in particular raises issues of how to reconcile policies to reduce energy consumption (ostensibly good for sustainable development) with the needs of the fuel-poor.

Inequitable access to nutritional food, by way of cost and proximity of purchase, also illustrates the difficulties facing low-income households. Research suggests a number of reasons for this. Particularly the lack of local facilities and the impact of travel poverty/mobility constraints (Lucas *et al.*, 2001), which also diminish people's capacity to access mainstream jobs, education and social opportunities, and may put a simple trip to a supermarket out of their reach.

Inequitable access to green space is another issue that is coming to the fore in current policy debates (framed as improving quality of life and 'liveability'), and the government is also consulting on health inequalities. These developments provide a context receptive to the development of a socially inclusive sustainable development research agenda.

Developing the agenda
In the USA, the environmental justice movement, born out of the civil rights approach adopted by black and Hispanic communities to address environmental inequities, has been supported by a growing evidence base on the linkages between poverty and environmental policy. Amongst the real changes that have been made is the issuing of an executive order requiring regulatory agencies to audit their work against environmental justice indicators.

In comparison to the USA, the UK is at the early stages of developing the sort of political movement and the body of research evidence that could foster such developments. Socially inclusive and genuinely integrative research thus potentially has a vital role to play.

If sustainable development is to act as a key political driver in bringing the socially and economically excluded back into the mainstream, far greater attention will be required to map the current UK distribution of social, environmental and economic impacts. This could be a rich vein for research to provide information, data and evidence to help move sustainable development forward.

The SDR-Network

The following section reviews the work of the SDR-Network based upon the proceedings of its first annual conference and interviews with key stakeholders.

Strengths and weaknesses
First, the SDR-Network has a unique remit to act as a network for sustainable development research and, despite having only recently been established, has assisted in establishing links between different sectors within the research community. It also has a clear commitment to developing a socially inclusive research agenda, and has the ability to encourage those entering the field to hook in to the synergies between sustainable development and social inclusion.

Main strengths of the SDR-Network can be summarised as:

- a willingness to develop a sustainable development research agenda that embraces social inclusion issues

- a capacity to develop its membership outside of the traditional research community

- a growing reputation as a network with the potential to facilitate the delivery of high quality scientific advice and research

- good working relationships with the Research Councils, DEFRA and other government departments

- the potential to work with Research Councils, other funding agencies *and* communities to implement a socially inclusive sustainable development research agenda.

From a social inclusion perspective, concerns with the SDR-Network agenda lie largely with its current definition of what constitutes sustainable development research. The adoption of an 'environment plus' definition means that research within its ambit is allowed to exclude one of the three pillars of sustainable development, thus perpetuating the current neglect of social concerns. Moreover, unless the Network makes explicit attempts to include those who are commonly excluded, the opportunity to maximise synergies between sustainable development and social inclusion may be lost. The Network therefore needs to:

- build further links to the social exclusion agenda and organisations/agencies working with or for socially excluded communities

- give greater attention to the specific needs of socially excluded groups, such as women, Asian, black and ethnic minorities and disabled people.

This perspective on the strengths and weaknesses of the SDR-Network is confirmed by considering the proceedings of its first annual conference. Table 1 overleaf highlights the main social inclusion/regeneration themes dealt with in each of the conference papers, and identifies some of the research gaps and opportunities that remain to be addressed within the broad topic headings.

The edited conference papers can be found in Chapter 3 of this report. As the summary table overleaf shows, all of the papers presented did, in fact, have direct relevance to social inclusion/regeneration agendas. However, if the opportunities for a truly holistic

understanding are not to be lost, further linkages between issues could and should be made. This is not to imply that contributors did not/do not understand these additional synergies: rather, that the *agenda as a whole* needs to give them more prominence.

This need for integration is apparent in the SDR-Network's *New Agenda* paper, but it will be important to ensure that this is not undermined by the concentration of 'relevant' issues within just one of the four overarching themes set out: that concerned with 'environment and society'. In fact, as the paper itself makes clear, issues of inequality and inequity – social, economic, and environmental – run through and join up all four of the themes (including 'governance and regulation', 'social and technological innovation' and 'business and sectoral strategies').

Professor Lawton's paper on behalf of the Research Councils demonstrates a real commitment to taking sustainable development issues seriously and overcoming barriers to multidisciplinary research. However, much more remains to be done, particularly to promote interdisciplinary working and extend funding programmes to support cross-cutting research in areas such as spatial planning, environmental justice and health inequalities.

Given its focus on the need for scientific and technological research into new forms of sustainable energy, Professor King's paper has relatively little to say about social and economic research. However, the recent report of the Chief Scientific Advisor's Energy Research Review Group (OST, 2002), chaired by Professor King, did call for more socio-economic energy research and a new multidisciplinary national energy research centre. From a sustainable

Table 1 First annual SDR conference proceedings

Conference papers	Social inclusion/regeneration research themes highlighted	Other relevant social inclusion/ regeneration research themes
Opening address: sustainable energy	Energy efficiency	Community safety Participation, transparency and access to justice Socio-technological systems Spatial planning
A new agenda for UK sustainable development research	Spatial planning Environmental justice Socio-technological systems Participation, transparency and decision-making Capacity building Regeneration Gender and diversity	
Sustainable development research – a Research Council perspective	Participation Energy efficiency Rural economy Socio-technological systems	Environmental inequality Gender and diversity Health inequalities Spatial planning Transport
Towards a sustainable rural economy: lessons from foot and mouth	Employment Regeneration Participation	Food production Gender and diversity Access to food Spatial planning Transport Socio-technological systems
Pollution, social exclusion, equity and health	Health inequality Environmental inequality Employment	Participation, transparency and access to justice Tackling racism Regeneration, rural and urban Spatial planning Community safety Gender and diversity
Developing tools for sustainability appraisal	Participation, transparency and decision-making	Capacity building
Quality of life and sustainable development	Social progress Participation Employment	Environmental inequality Gender and diversity Access to education Health inequality Socio-technological systems

development perspective it will be important in broadening out the kind of socio-economic issues addressed to include issues such as: the social and distributional impacts of the different economic, regulatory and technological options for meeting future energy demand; overcoming current socio-economic and organisational barriers to the uptake of existing energy-efficient technologies; and wider aspects of demand management and reduction, such as the promotion of sustainable lifestyles. By casting the energy research agenda in this broad-based way, it is more likely that some of the problems that have beset energy policy in the past may be avoided.

Donaldson, Lowe and Ward's paper shows the rural economy as a complex but interdependent system with lessons of interest for the delivery of sustainable development research. The paper makes links between the rural economy, land use, regeneration, employment and the participation of farmers and others in the decision-making processes concerning 'rural issues' such as the foot and mouth disease crisis. There are a number of other synergies between the diversification of the rural economy and its impact on the socially and economically excluded communities living in rural (and urban areas) that could be explored. One such area would be the role of women, who have been identified as taking the lead in the diversification of rural enterprises. Another is the issue of food poverty and the production of accessible healthy food.

Although Pless-Mulloli and Phillimore's paper directly addresses the issue of social exclusion, its literature review reveals just how rare considerations of environmental factors are in studies of social and health inequalities.

Whilst not specifically mentioned in the paper, environmental justice is closely intertwined with research questions on health and pollution.

Wood highlights the potential of sustainability appraisal (SA) tools to improve integration of social, economic and environmental factors in decision making, and hence promote sustainable development. A key target for future research into SA tools should be their application to urban regeneration plans and initiatives, where there has all too often been a failure to take adequate account of social and environmental issues. Research is also required to facilitate the post hoc evaluation of decisions informed by SAs in order to improve the validity and robustness of the SA tools used.

Ekins and Levett's discussion of quality of life highlights the importance of creating social progress that recognises the needs of everyone. Understanding how people make consumption and lifestyle choices is key to this challenge.

Turning to participation issues, a number of the papers refer to the importance of engaging with stakeholders and, of course, this is to be welcomed. However, few give explicit consideration as to how excluded groups could be brought into this equation. If participation is to be extended beyond the 'usual suspects' – of experts and professionals working in the particular field – then further attention will need to be given to techniques for structuring citizen/expert dialogue, and ways found to counteract the imbalance in power and resources that different groups bring to the table. This is an issue that will be returned to below.

Opportunities and threats
Sustainable development is itself an all-encompassing theme. The uniqueness of the

Network and the nature of sustainable development leave numerous pathways that it could follow. In the midst of so many opportunities, there is a risk that its current commitment to exploring the social dimensions of sustainable development could be missed. In order to deal with this threat, two main steps suggest themselves. First, the SDR-Network needs to set a strategy over the next two to three years that will help to prioritise where its resources are most effectively used. Second, the strategy must be linked to long-term support and funding. This is particularly important if the SDR-Network is to build its capacity to work with multiple stakeholders.

There are potential conflicts between the needs of 'community' stakeholders and the institutional culture of traditional research. These included conflicts between:

- research that uses traditional methodology that focuses on the technical aspects of the process versus methodologies that focus on the social aspects of empowering communities

- the need to publish prestigious research papers versus the need for accessible user-friendly information.

The SDR-Network could play a role in smoothing these conflicts.

If the challenges ahead are to be met, there will be a role for research activity that applies the principles of sustainable development in engaging the people carrying the burden of the inequitable distribution of unsustainable policies in both the development of the research agenda and in the research itself.

Applying SD principles to research

The Brundtland Report, Agenda 21 and the UK Strategy for Sustainable Development embody a number of principles whose adoption by the SDR-Network could ensure that a social perspective was properly integrated into sustainable development research – definition and practice. At the heart of these documents is the notion of public participation and access to information in decision making, articulated through:

- the preservation of values that promote the protection and respect of any individual, group or community – in particular disadvantaged people

- the prioritisation of the democratic principle that all citizens have equal political rights and responsibilities

- the provision of resources and mechanisms which empower people, especially those who are disenfranchised or poor.

These same principles are illustrated in environmental justice, defined as ensuring that no person or group of people should shoulder a disproportionate share of the negative environmental impacts resulting from the execution of domestic and foreign policies and initiatives. It has been further defined by three objectives (Adebowale, Church *et al.*, 2001), echoing those above:

- the right to know (*the right to information*)

- the right to participate in decision-making processes (*the right to be consulted and participate in proposals, plans or activities*)

- the right of access to justice (*a guaranteed right to enforce the rights to know and participate via courts or other independent bodies*).

The SDR-Network should consider the extent to which these guiding principles of sustainable development are also relevant to the process of research. If research is to be made more valuable to non-traditional users, such as excluded communities, then greater emphasis arguably needs to be placed on:

- including social equity issues in the design and articulation of research programmes, projects and questions

- community participation in the design, management and dissemination of research activities

- the use of participatory research methods (such as action research).

Engaging excluded communities
Excluded communities can be engaged in research both by getting them involved in the research process, and by allowing communities to take part in or wholly control the setting of research questions and agendas. The former involves participation in any of the research stages (design, delivery or dissemination). The latter moves away from the traditional construct of research by putting control in the hands of the participants rather than leaving it solely with the researchers.

> **Range of stakeholder participation processes and outcomes**
>
> - Non-exploitative methods
> - Accessible information
> - Management and governance
> - Decision making.

Research that understands and engages in stakeholder participation is important for two main reasons:

- First, it draws in information from a wide range of interested parties allowing for more informed and effective outcomes.

- Second, it generates a greater commitment to ensuring the success of the policies and initiatives which it underpins.

Thus, for sustainable development, socially inclusive research could provide data, indicators and information that would allow policy choices to be made that support social progress and recognise the needs of everyone. Questions around what meets the needs of socially excluded people can only really be answered by including the perspectives of the people affected: thereby fully taking into account their views on main objectives and how to achieve them. This way of working is encouraged in current government thinking, including its modernisation agenda.

Some research methods can give control and management to socially excluded groups, so allowing for a 'bottom up' approach. Research used to increase community participation in this way is called 'action' or participatory research,

where the researcher is directly involved in encouraging and taking part in action for change with the research participants. The methodology is based on the belief that research can also be used to build knowledge, skills and capacity amongst those outside the traditional research community. This can be in some or all stages of the research process (see box).

Seven dimensions of action-led research

1 The content of the situation
   • providing data; the participants are informants
   • interpreting data; the participants are interpreters
   • planning change; the participants are planners and decision makers
   • implementation; the participants are implementers.

2 The research process
   • managing the process of data collection and interpretation; the participants are facilitators
   • designing the overall study; the participants are researchers or co-researchers.

3 Process, content, or both
   • being kept informed about the study and its implications; the participants are recipients only.

Source: Dick (1997).

Some organisations have taken a lead by supporting research in which the users are active participants. For example, the Community Fund provided finance to the Women's Environmental Network to run a UK-wide project which aimed at assisting women outside of the research community to map their local area showing individual cases and clusters of breast cancer. Amongst the Research Councils, the Engineering and Physical Sciences Research Council (EPSRC) has funded the project, 'Society and Scientist'. A series of seminars specifically aimed at improving dialogue and partnerships between the research community and non-traditional research users from socially and economically excluded groups (Capacity, 2002). One of the aims of which is to develop a consortium made up not only of interdisciplinary researchers, but also of community representatives and organisations to work together in future research projects.

Action research is sometimes criticised within the academic community as lacking the degree of rigour and objectivity of more traditional research methods. However, these reservations need to be set alongside a broader understanding of what the approach hopes to achieve and the additional benefits it can bring. For sustainable development – where social progress is one of the guiding principles – these advantages could be significant.

Lessons and recommendations

A number of lessons emerge from this analysis.

For the SDR-Network
Overall, the messages for the SDR-Network are positive. The conference papers, policy reviews and interviews with relevant decision makers suggest a clear role for the SDR-Network in facilitating 'socially inclusive' research within the context of sustainable development.

To do this, however, the SDR-Network must manage a shift from research centred on 'environment plus' to research that has social equity as a central theme. This means amending the Network's current definition of 'sustainable development research'.

The SDR-Network also needs to be accessible to communities, groups and organisations that are outside the traditional research sector. This will mean developing dialogue with community-led networks in order to meet the needs and interests of those groups most affected by social exclusion (and, as discussed above, negative environmental impacts).

The SDR-Network's ability to deliver in this area will be highly dependent on building its resources. This will involve gaining long-term funding over and beyond its present income, and developing a strategic understanding of the role it could play *vis-à-vis* social inclusion. Within available resources, the Network should develop systems of prioritisation that recognise the importance of social equity.

For policy makers
Successful integrative sustainable development and social inclusion policies are based on unlocking and understanding the commonalities of the inequitable impact and distribution of environmental policy, initiatives and law on socially and economically excluded people.

Socially inclusive research requires a 'people-based approach' as its central principle. In practice this should mean that initiatives have a social dimension and, where possible, use methods that allow for the participation of socially and economically excluded communities.

If policy makers are to reap the benefits that participative research can bring – including the increased likelihood of ownership and commitment by communities themselves – then they need to encourage the use of such methods and be realistic about the time and resources required. Forecasting emerging policy areas will therefore be important in providing reasonable timeframes for high quality outputs.

For research funders
Funders need to review their funding remit through a sustainable development lens by developing their own sustainable development strategy. They need to develop a clear understanding of what sustainable development is and how it impacts on their work programmes.

A number of the papers presented to the first conference welcomed initiatives by the Research Councils to encourage multidisciplinary research. All, however, stated that more needs to be done. Taking into account the complex nature of sustainable development, it is suggested that multidisciplinary work in this area should be the rule rather than the exception. This will require a commitment to the provision of training and opportunities for researchers to develop careers in multidisciplinary research; a commitment to funding for research delivered by non-traditional research users (such as individuals and groups from socially and economically excluded communities); and developing a dialogue between researchers and communities on best practice for working together to deliver robust and meaningful evidence.

The funding bodies and Research Councils have the potential to develop socially inclusive

sustainable development research by ensuring that their funding criteria support work that can demonstrate synergies with and between social inclusion, the environment and economics; by encouraging multidisciplinary research consortia consisting of researchers and non-traditional research users; and by opening up funding streams for participatory research methods. They should also review whether their cultural and institutional structures create barriers to achieving this sort of change and, if so, work within the research community to overcome them.

Sustainable development research has great potential to underpin integrated policy initiatives that encompass the dimension of social inclusion. However, to fulfil this potential, it needs to be supported by long-term funding strategies from *all* funding sources that recognise the contribution it can make. In doing so, the strategies need to take into account the extended timelines required if genuine research partnerships between communities and researchers are to be facilitated.

Concluding recommendations

By way of conclusion, three broad recommendations stand out from the discussion above:

- First, that social inclusion/social equity should be given greater prominence within sustainable development research, and sustainable development should be given greater prominence in single 'social inclusion' research areas. Research councils, community networks and relevant policy makers should develop detailed guidance on how this could be done. The SDR-Network could potentially play a crucial facilitating role in this.

- Second, the use of 'non-traditional' research methods should be given greater support from funding bodies, in particular participative research which works *with* excluded communities rather than *on* excluded communities. Again, this could be facilitated and encouraged by the SDR-Network.

- And finally, a transparent strategy for the long-term funding of sustainable development research should be developed between government, Research Councils and other funding bodies in partnership with researchers, charitable organisations, community networks, etc. Without this – and without the assurance of some degree of longevity for the Network itself – strategic planning will be problematic.

3 Edited papers of the first annual Sustainable Development Research conference

Opening address: sustainable energy
David King

My involvement in sustainable development arose originally from research at the Chemistry Department in Cambridge, where I was Head, into depletion of the stratospheric ozone layer over the Antarctic. Working with the Mathematics Department, our team was able to produce a complete model of what was happening in the stratosphere, including the reaction of CFCs and ozone (O_3) in the presence of sunlight. Once the presence of ice crystals had been factored in, a remarkably good agreement was obtained with monitoring data on the depletion of the ozone layer. This work led to the Montreal Protocol restricting the use of CFCs throughout the world. It provided a model for dealing with other environmental problems, including the most pressing facing the world today: global climate change.

The challenge of global climate change
The forecasts of climate modellers, endorsed by the Intergovernmental Panel on Climate Change (IPCC), clearly show that, without further action, average global temperatures will soon be higher than they have been in the last thousand years. This will take us into uncharted territory. Because of the time lag between causes and effects in the climate systems, we can do little to alter the next twenty years of warming. It is within our scope, however, to avoid the more extreme impacts of global climate change that threaten us over the longer term. That would depend upon massive international collaboration exceeding what has

recently been achieved in the negotiations on the implementation of the Kyoto Protocol.

We are facing sea level rises of a significant magnitude. We also face increased rainfall and an increased frequency of storms. How are we going to tackle such problems?

Future world demand for energy
As a society, we need to look at alternative ways of using energy. Of course, we should begin by considering how to use energy more efficiently. That, however, may be insufficient in itself. We must also take account of the sources from which our energy is drawn.

Figure 1 shows Shell's forecast from a few years ago of the future availability of various energy sources. It illustrates how there is going to be a reduction in the availability of oil and other fossil fuels. Furthermore, even if we did not face the prospect of such diminishing resources, we would still have to consider the impact on our global climate of continuing to burn fossil fuels at current rates. We are going to have to find an enormous amount of renewable energy capacity to meet the predicted growth of energy demand around the world.

Whilst one may argue with the detail of this forecast, it nevertheless illustrates that the world is facing a major problem in terms of future energy demand, particularly if levels of carbon emissions are to be reduced.

The Kyoto targets and beyond
The Kyoto Protocol is just a first step towards the reduction of global carbon emissions we

Figure 1 Shell 'Sustainable Growth Scenario'
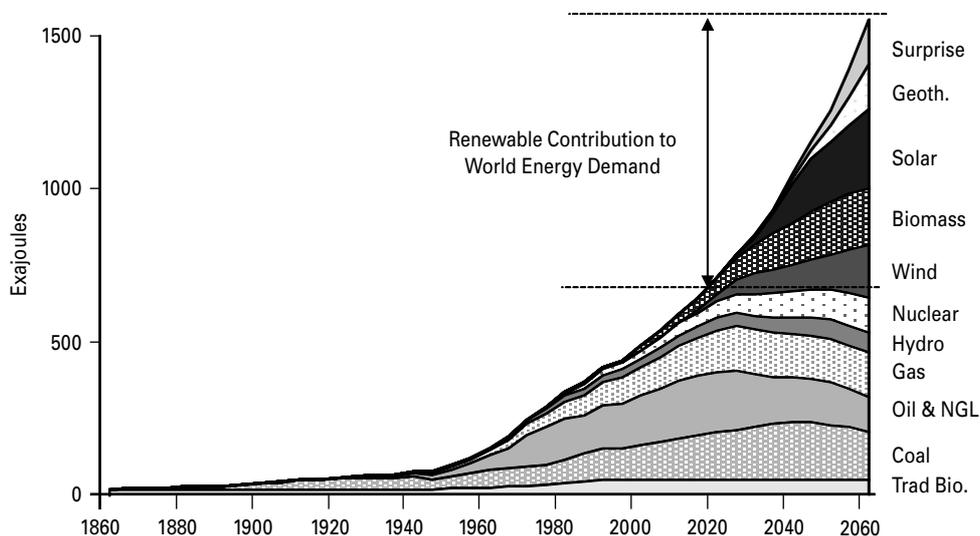
Source: Shell, The Evolution of the World's Energy Systems, 1995.

need to achieve. The European Union's target under the Protocol is an 8 per cent reduction in greenhouse gas emissions by 2008–12, compared with 1990 levels. Within that, the UK's binding target is a 12.5 per cent reduction. The UK government also has a target of achieving a 20 per cent reduction in CO_2 emissions (compared to 1990 levels) by 2010. We are already close to achieving the 12.5 per cent target this year. But this is largely due to the so-called 'dash for gas'. The UK made an easy transition from coal to gas (which has a lower carbon content). The next stage is going to be considerably more difficult.

The Royal Commission on Environmental Pollution (RCEP) has suggested that we aim at a reduction target for CO_2 emissions of 60 per cent by 2050. In the longer term, I believe we should be aiming towards much lower emissions. Fossil fuels could still be used, but the resulting CO_2 would have to be removed

from the atmosphere through sequestration technology.

Research into new energy technologies

In view of these problems, the UK needs to maintain a very broad menu of sustainable energy options. Cross-cutting technologies will be important. Although I am about to focus on one particular potential energy source, I want to stress that we should not now be trying to pick winners. We must invest in research into a range of alternative and renewable energy sources. This was the conclusion of a review of UK energy research which I chaired last year and which fed into the wider review of energy policy by the Cabinet Office's Performance and Innovation Unit (both published on 14 February 2002). Whilst emphasising the importance of a broadly based research strategy, my review identified six key areas in which increased support for research could have a particularly

significant impact on progress towards a low-carbon economy. They were: CO_2 sequestration; energy efficiency; hydrogen production and storage; nuclear power; solar photovoltaics; and wave and tidal power.

The prospects for nuclear fusion

Perhaps controversially, I now want to focus on nuclear fusion. This, of course, is an energy technology which has yet to be realised – but, if it were, it would offer an enviable prospect of clean, sustainable energy. Nuclear fusion is the process that provides the sun's energy and so indirectly sustains all life on earth.

Fusion research has been conducted widely around the world, and has been promising much over the last fifty years. There is little doubt that Europe is currently the world leader. The Joint European Torus (JET) experimental reactor is at Culham, Oxfordshire, so the UK is a major contributor to European research activity and well placed to benefit from it.

A fusion reactor produces energy by heating deuterium and tritium to a temperature of around 100 million degrees centigrade so that a plasma (in which the electrons are separated from atomic nuclei) is formed. The fusion of the deuterium and tritium nuclei releases helium, energy and a neutron. The process is sustained as the neutron bombards the lithium blanket surrounding the reactor, and so produces tritium. The helium ash from the process is not radioactive, so we avoid the problem of radioactive waste associated with current nuclear fission technology.

The JET reactor at Culham has effectively achieved its objectives. In particular, it is releasing energy comparable to that applied externally to heat the plasma. Obviously, a commercial reactor would need to generate far more energy than it took in.

The next step is to build a larger version of JET, called ITER (International Thermonuclear Experimental Reactor). This would sustain the

Figure 2 A fusion reactor

Fusion – the fuel cycle of an operating reactor

The materials problem:
How to contain the hot plasma and fast neutrons
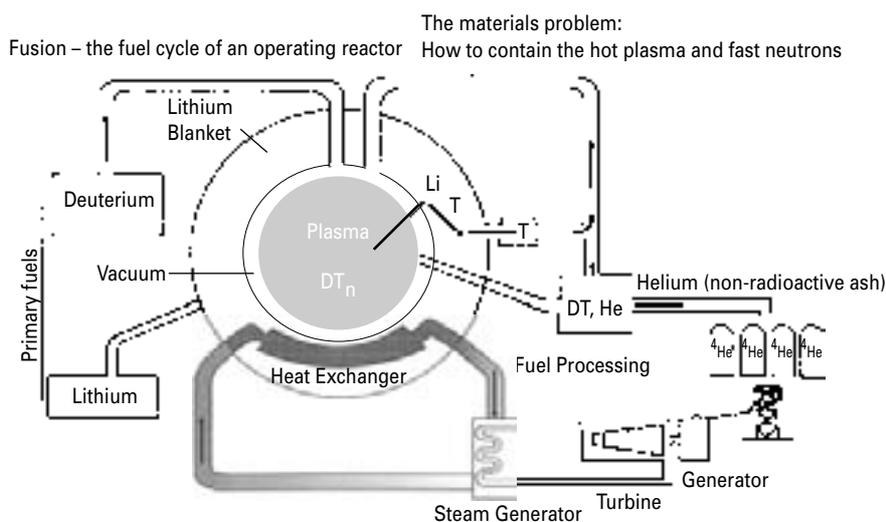
heating of the plasma whilst generating at least ten times more energy. It has already been designed in a collaborative effort by the European Union, Japan, Russia and the US; the US withdrew from the programme in 1999, but may rejoin. The cost of building ITER is estimated at €4 billion. The UK has been exploring actively how to accelerate progress.

One of the major research problems concerns the materials required to withstand the heat and neutron fluxes inside a commercial fusion power station. It is proposed that a high-flux neutron source be built so that materials could be tested to destruction. If this were done in parallel with the building of ITER, the timescale for achieving a commercial reactor could be significantly reduced to 25 to 30 years.

Obviously, a great deal more research is required, but I believe the effort is justified by the potential outcome. Fusion would emit no greenhouse gases, and we have abundant supplies of deuterium (from seawater) and lithium (from the earth).

Future challenges

Energy consumed by the transport sector in the UK continues to rise, despite the fact that we have cars which use less petrol to travel more miles. We need to move away from vehicles that emit CO_2. The hydrogen fuel cell is already at an advanced stage of development. Buses and depot-serviced vehicles operating in city centres may provide an initial market for fuel-cell-powered vehicles. It is anticipated that cars using this technology will start to reach the market in 2003 or thereabouts on a small scale – at least in California – although it may be at least 2010 before they start to reach the roads in any significant numbers in Europe. In the

meantime, hybrid vehicle technology – in which, for example, an internal combustion engine can be combined with an electric motor – could reduce fuel use and CO_2 emissions by up to 50 per cent.

Although there is a lot of R&D effort directed at the on-board conversion of methane, methanol or petrol to hydrogen, the current industry view is that the first fuel-cell-powered vehicles on the market will be fuelled direct by hydrogen. In California and Germany, hydrogen fuel stations are already being set up on an experimental basis.

Hydrogen to fuel the transport system of the future could be produced by electrolysis of water using electricity from the national grid – but that would greatly increase the demand on the grid. Obviously, it would make little sense to meet that demand by increased use of fossil fuels.

We must continue to work hard to develop renewable energy sources. With increased support for research, there is a greater likelihood of dramatic breakthroughs. But I do not think we can take for granted that these will be achieved quickly enough for us to meet all our needs for non-fossil fuels over the next twenty or thirty years.

I have highlighted the contribution which could be made by nuclear fusion, but even the most optimistic people, such as myself, feel that 25 years is the shortest timescale in which we may expect to see working fusion power stations.

I believe, therefore, that we need seriously to consider whether nuclear fission technology should be re-harnessed as an alternative to fossil fuels in the shorter term. Clearly there are major problems associated with the technology in

terms of radioactive waste. Indeed, my review of energy research recommended that, in relation to nuclear energy, priority be given to research into the handling and disposal of waste that has already accumulated from the operation and decommissioning of fission power stations.

These are difficult challenges, and society as a whole must be engaged in the debate on how to face them. But I am increasingly convinced that that debate must move forward as a matter of urgency if we are to overcome the threat of global warming and build a sustainable future for our planet.

A new agenda for UK sustainable development research
Malcolm Eames

The following paper provides a summary of the research priorities and policy recommendations developed by the SDR-Network. It is taken from the Network's report *A New Agenda for UK Sustainable Development Research* (2002): an updated and revised version of the consultation document presented at the first annual Sustainable Development Research conference in December 2001. Copies of the full report are available via the SDR-Network's website at www.sd-research.org.uk.

Needs, opportunities and priorities
The SDR-Network's analysis of current knowledge gaps, research opportunities and policy needs for cross-cutting SD research was organised around four distinct but interrelated themes (governance and regulation; environment and society; social and technological innovation; and business and

sectoral strategies). Particular attention was also drawn to two sets of generic issues (appraisal and evaluation tools; and data and indicators).

Governance and regulation
The use of science in policy-making: effective use of scientific knowledge, and management of uncertainty, is vital to understanding current and future impacts of human activities and hence effective governance for sustainable development. Improved epidemiological surveys and environmental monitoring and surveillance, 'integrated' environmental and socio-economic models, futures studies and scenario techniques all have an important role to play here, particularly in identifying ecological limits, and setting strategic objectives and frameworks for regulation.

Scaling issues include questions such as how best to reconcile the differing temporal and spatial scales of environmental and political processes. For example, within our increasingly multilevel governance system, what is the appropriate balance between 'top-down' and 'bottom-up' policy processes, and how should the principle of subsidiarity be applied? There is a particular need for research to address the question of how regional scale governance can best contribute to sustainable development given the increasing importance of this tier within the UK.

Policy integration is acknowledged as a corner stone of sustainable development. But what is the most effective balance between institutional specialisation and integration? For example, is sustainable development best served having separate regulatory bodies responsible for protecting the interests of the environment and consumers, or should such

functions be integrated? More broadly, how can competing policy objectives best be reconciled and integrated approaches implemented, and how should policy and institutional integration best be measured, assessed and evaluated?

Spatial planning potentially provides an important framework for integrating environmental, social and economic considerations. Research questions include: to what extent does the current planning system contribute to environmental injustice? How can ecological limits best be defined and operationalised in the context of spatial planning? What role could the planning system play in improving the integration and management of factors such as energy, transport, waste, biodiversity, land-use, employment and social capital? What legal and institutional changes would be required for the planning system to play such a role, and what will be the impact of the current proposals for planning reform in England?

Spatial or 'territorial' planning also has an important contribution to make in managing regional scale changes in the use of land and other environmental resources, such as those resulting from the current changes taking place in UK agriculture, from broader changes in demographic and trade patterns, or from the impacts of global climate change. The regional scale 'integrated' modelling and assessment tools, supported by robust baseline monitoring data, will be essential to this task.

How effective are *legislative frameworks*, such as statutory requirements to promote sustainable development? What are the factors shaping legislative agendas, and where is new legislative action required as opposed to improved implementation and enforcement?

What are the legislative barriers to sustainable development in the UK? How will local authorities' new 'power of well-being' be interpreted and what will be the impact of human rights legislation with respect to environmental and sustainable development issues? Can overseas aid be used as a lever to strengthen legal frameworks that support sustainable development in developing countries? What developments in international law are needed to support sustainable development on a global basis?

What is the most effective balance between *regulation, economic instruments and voluntary action* in promoting sustainable development? How can the effectiveness of regulatory, fiscal and voluntary measures best be evaluated? What factors shape the public acceptability of such measures, and what is the most appropriate mix of different types of policy instrument under different circumstances?

Since Rio, the right of citizens to *participate* in environmental *decision making* has increasingly been accepted as central to the concept of sustainable development. But what does this mean in practice, in terms of access to information and the role of existing democratic processes? What participatory processes are appropriate under different circumstances? What constitutes participation and how should such processes be evaluated? How should issues of representation and accountability be addressed? How should community/expert interactions best be managed, and scientific knowledge mobilised? What weight should be given to conflict resolution and consensus, as opposed to the recognition of diversity, in the design of participatory processes? More fundamentally, does participation actually lead

to decisions that are more likely to promote sustainable development?

Environment and society

The links between *environment* and *social structures and processes* is the least well-developed aspect of both SD research and policy making. Economic welfare and development are integral to this theme, but these are not the only priorities.

There is a need for improved understandings of *community processes*. For example, does local environmental action improve social cohesion? Does participation generate social capital? How do communities respond to changing legal and institutional frameworks? How are voluntary sector organisations responding to the challenges of sustainable development, and under what conditions can the public sector best facilitate the work of NGOs?

What are the environmental and resource impacts of *regeneration and development*? How can the protection of biodiversity and economic development best be reconciled? What does the emerging discourse around 'liveability' mean for the environment? How can viable sustainable communities be fostered and developed in different contexts?

With respect to issues of *social inclusion*, there is a need to identify best practice for community initiatives integrating social, economic and environmental concerns, and to improve understandings of the environmental values and behaviour of different ethnic, cultural and economic groups. In particular, how do different individuals and groups balance economic need against environmental and health risks, and what factors shape *social perceptions of risk*, both to and from the environment?

How can research mapping *environmental injustice* in the UK better inform policy? To what extent are the socially excluded more susceptible to the adverse health impacts of pollution than richer sections of society, and to what extent are they disadvantaged in terms of access to environmental resources? What are the costs and benefits of addressing environmental and health inequalities? To what extent can regulatory and enforcement agencies currently address such concerns? Are legislative and judicial reforms, or new appraisal and evaluation tools, required? What role can risk compensation play? How can environmental policies and instruments be designed to better protect disadvantaged and excluded groups?

Research is also needed to inform UK policies aimed at reducing global poverty and inequality, and to underpin the development of more equitable and accountable international institutions and trading practices. This will include further work mapping the UK's ecological 'footprint' and the social, environmental and economic impacts of 'downstream' industrial activities.

What do we mean by *quality of life*? Is the concept useful? How should it be measured and communicated? What is the relationship between employment, labour productivity and quality of life? What is the relationship between (natural, semi-natural or built) environmental quality and quality of life? How important are intrinsic values, such as appreciation of nature, and material *consumption* in people's experience and assessment of their quality of life?

How can the impacts of consumer *behaviour* best be assessed? What are the barriers to more sustainable *lifestyles* and how can such lifestyles best be promoted? What contribution can

consumer-led 'solutions' such as green consumerism, local purchasing and voluntary simplicity make and how should these be evaluated? What roles do factors such as education, public policy, technology, the media and popular culture play, both in shaping existing lifestyles and generating behaviour change? How can environmental and sustainable development issues be *communicated* more effectively?

Social and technological innovation
The transition to a sustainable economy will inevitably require significant innovation in *socio-technological systems* – systemic changes in the technological processes, artefacts, and associated social attitudes and behaviours that shape our lives. Integrated environmental and socio-economic modelling and scenario techniques again have a role to play in illuminating both the scale and direction of the necessary changes. Equally, the question of the extent to which technological innovation can accommodate resource and ecological constraints must also be seriously addressed.

In addition to scientific and engineering based research, development and demonstration projects to develop cleaner, more sustainable technologies, research is also required to investigate the social, economic and political dimensions of such *innovation processes*. How should innovations in resource productivity (factor 4/10), de-materialisation (from products to services) and materials substitution (to use renewable or less hazardous materials) be evaluated? How can technological change be directed towards the goal of sustainable development, and what role should government play? What are the barriers to the uptake of more sustainable technologies and

how can inertia in socio-technological systems best be overcome? Are 'incremental' or 'step' changes in technology required, and how could necessary step changes in infrastructure technologies be promoted and financed? There is also a need to develop improved methodological and theoretical frameworks that can help us to understand not only the social dimensions of technological change but also the potential of social innovation, and the conditions and processes that govern it.

One of the principal frameworks for approaching these issues is provided by the discourse of *technological risk*. Specific issues requiring further attention include: novel approaches to balancing risk aversion and innovation such as the use of insurance mechanisms to promote innovation in sustainable technologies; and the implementation of 'precaution' through the concepts of variety, reversibility, vulnerability, adaptability and resilience in the design and management of socio-technological systems. Further consideration should also be given to the development of 'ecological' approaches to precaution and risk, within the context of interdisciplinary research aimed at operationalising the precautionary principle.

More broadly, further work is needed to understand the long-term challenges of *managing macro socio-technological systems*, at the scale of national energy, water and transport infrastructures and entire cities, semi-urban and rural regional economies. The conceptual and empirical relationship between technological *innovation and productivity* also requires critical attention. For example, what are the theoretical and practical tensions between: resource and economic efficiency; the durability of goods and

employment; labour productivity and sustainability; and partial vs. whole system productivity?

Business and sectoral strategies
Research is also needed to inform *business and sectoral strategies*. Much of this work will need to be undertaken in close collaboration with industrial and business partners.

With respect to the *corporate sustainability* agenda, further work is needed to develop and illustrate the 'business case' for sustainable development (SD). The effectiveness of existing tools, such as environmental management and auditing systems, supply chain management, environmental and social reporting, etc. also require rigorous evaluation. Corporate SD champions need effective, instrumental models of organisational learning with which to change behaviour, as well as appropriate performance indicators for different businesses. They also need access to understandable and relevant environmental information. Despite the best efforts of the scientific community, such access remains problematic. Social scientists have an important role to play in developing tools and techniques to improve the transfer of scientific knowledge to business and the wider community.

The need for sector-specific applied research to address problems and provide solutions in existing priority areas, such as energy, waste, transport, and the rural economy, is widely established. Less well recognised is the need for research into the current and prospective role of the financial sector, as both driver and inhibitor of sustainable development.

Furthermore, the development of *sectoral sustainability* strategies requires that a number of generic questions be addressed. What models of sectoral 'good practice' exist, and how can such good practice be made the norm? Are current sector organisations capable of delivering change or are alternative institutional structures and legal frameworks required? How can sectoral targets best be negotiated, monitored and enforced?

Cross-sector issues include the need to better anticipate, model and evaluate the environmental and social impacts of pervasive technological and socio-political changes, such as the development of ITCs, e-commerce, globalisation, etc. Furthermore, prospective studies are also needed to examine what structural changes, both at the firm and sector level, the transition to a sustainable economy will require, and how these changes should best be achieved.

Generic issues
Integrated *appraisal and evaluation* – be it of decisions, policies, institutional frameworks or technological products and processes – is a common thread running though the four overarching research themes outlined above, as such research is actively required to examine the institutional factors that facilitate or inhibit SD appraisal and evaluation.

Despite recent progress, further work is also needed to develop robust methodologies, 'tools' and best practice guidance for integrated (sustainability) appraisal, applicable across a wide range of institutional contexts and problem settings. Networks are needed to allow researchers and practitioners to share knowledge and experience across organisational, disciplinary and sectoral boundaries.

Improved social learning for sustainability also requires much greater attention to

25

integrated *post hoc* evaluation studies and techniques. These are particularly poorly developed at the meso- and micro-levels, i.e. the evaluation of the sustainability impacts of specific decisions, policies and programmes.

Both SD appraisal and evaluation require the definition and collection of extensive and diverse sets of data and indicators. Whilst the routine collection and compilation of such *data* and *indicators* are not in themselves research tasks, there are a number of related topics, often at the interface between the environmental and social sciences, which are in need of further research. These include: methods of assuring input data quality; the definition of data and indicator needs (including work on environmental base lines); the interpretation of data and indicator information; the design of protocols and appropriate information systems. More generally there remains a need for interdisciplinary research to improve the presentation, modelling and use of scientific information in decision making.

Recommendations from the *New Agenda* report

The SDR-Network report made a number of specific recommendations to the research community, research funders, and policy makers/practitioners concerned with sustainable development issues. These are outlined below:

- The research community and both public and private sector funding bodies should review their existing programmes and future plans in light of the knowledge gaps, research opportunities and policy needs outlined in the report. Where possible these priorities should be taken forward though collaboratively funded research programmes, steered by committees including natural scientists, social scientists and research users. They should also pay particular attention to those areas identified as key priorities for future research, including: sustainability appraisal/evaluation; data and indicators; spatial planning; regulation, economic instruments and voluntary action; community processes; environmental justice; quality of life; consumption, behaviour and lifestyle; socio-technological systems and innovation processes; and corporate sustainability.

- Research Councils and government departments that sponsor science and engineering R&D programmes should routinely incorporate strong socio-economic and environmental components into their programmes. This is particularly the case for research programmes in areas such as energy, transport, waste, resource-use and agricultural production where there is growing awareness of the need for sustainable solutions.

- The Treasury should ensure that the need to provide appropriate support for cross-cutting SD research is recognised in the government's 2002 Spending Review.

- The Office of Science and Technology and the new Research Councils UK Strategy Group should ensure that sustainable development objectives are properly integrated into all of the Councils'

activities, and should instigate measures to remove institutional barriers to interdisciplinary research in this area (e.g. by 'ring fencing' specific resources for the support of cross-cutting SD research).

- The Higher Education Funding Council (HEFC) and the Research Councils should review the provision of research training and career paths for both natural and social scientists, with the objective of improving the provision of appropriately skilled personnel capable of undertaking high quality cross-cutting SD research. Specific measures to encourage the movement of experienced individuals between academia, consultancy, public administration and business should also be actively considered.

- The Research Councils and government departments should examine the overall balance of their expenditure to ensure that sufficient support is available for data collection, monitoring and indicator development, including the production of accessible web-based resources.

- The Research Councils, government departments and industry bodies should commission research synthesis and systematic reviews to improve the use of existing knowledge and support evidence-based policy making and practices that are oriented towards sustainable development.

- DEFRA should support the development of clear guidelines and standards for SD research synthesis and systematic reviews so as to ensure that policy makers and

practitioners can have confidence in their findings.

- DEFRA and the DTI should consider commissioning a review of the current provision of research dissemination and consultancy services for sustainable development, so as to ensure that relevant research findings are made widely available and integrated into professional development, training, outreach and advisory services.

Sustainable development research – a Research Council perspective
John Lawton

The UK government's Sustainable Development Strategy aims to deliver economic growth, whilst maintaining a healthy population and a healthy environment. This is a huge challenge, which will require more than political will. It will need to be underpinned by excellent and relevant science.

It is clear that the government is taking this challenge seriously. Promoting sustainable development across government is a key aim of the new Department for the Environment and Rural Affairs. In his foreword to the Cabinet Office report *Resource Productivity: Making More with Less*, the Prime Minister announced the government's desire to shift the UK economy onto a more sustainable footing, for example by using resources more efficiently. Also in November 2001, the Chief Secretary to the Treasury announced that Departmental Spending Review proposals, targets and innovation strategies, including those of the Research Councils, should reflect the government's

sustainable development objectives. We should take great encouragement from this, but also recognise that more needs to be done to promote the huge opportunities that sustainable development could offer UK industry.

The challenge now for the UK Research Councils and their communities is to develop new and innovative ways of working together with other stakeholders to help deliver the sustainability agenda. Together we need to identify and invest in national and international priorities for sustainable development research and training. Two key priorities that we believe we should focus on are sustainable energy and the rural economy. We also need to create and support new communities of scientists able to undertake work at the difficult interfaces between the physical and socio-economic sciences, and invest in transferring the outputs and outcomes of research to develop sustainable solutions. Research Councils are already supporting a significant range of research, training and exploitation activities but we recognise that in the past we have tended to work within the 'research silos' of traditional disciplines.

We are beginning to break down the barriers between Research Councils, particularly in building on the outcomes from the government's 2000 Spending Review, and in developing multi- and interdisciplinary proposals for the next Spending Review in 2002. The new Research Councils UK Strategy Group (RCUK) will strengthen this approach. This body will enhance our collective leadership and influence, and is expected to develop a 10–15 year roadmap of opportunities for UK science. Sustainable development objectives will no doubt be a major consideration in shaping this roadmap.

Energy supply, in all its forms, is arguably the fundamental issue on which the sustainable development agenda will succeed or fail. It has been predicted that over about the next three generations fossil fuel reserves will decline, whilst a growing world population and economic growth will mean increasing demands for energy. Over the same period, the Intergovernmental Panel on Climate Change (IPCC) predicts that increased CO_2 and other greenhouse gas emissions will push up global temperatures by between 1.4 and 5.8 °C. We will see significant rises in sea level, more stormy weather conditions and changing rainfall patterns.

The challenge to the UK, and the rest of the world, is how to fill the predicted energy gap with a secure and affordable energy supply, whilst minimising CO_2 emissions and contributing to sustainable development. This, in the view of many scientists, is the key issue confronting human beings at present, and it is unquestionably a key issue on the sustainability agenda.

Although the Kyoto Protocol sets agreed limits on greenhouse gas emissions for developed nations, huge uncertainties remain about if and when the protocol will be implemented. Even if the emissions targets are met, this is only a small step in the right direction. The Royal Commission on Environmental Pollution estimates that the UK and other nations may need to reduce their annual emissions by 60 per cent by 2050 – that is within one generation. This is a huge reduction in CO_2 emissions, and will be very difficult to achieve. The challenge for the sustainability agenda is to uncouple economic growth from energy and resource usage. Moving toward this

goal, by making better use of resources, is a key component of the government's agenda, but to achieve it will require significant technological and cultural changes.

The Cabinet Office's Performance and Innovation Unit has recently undertaken a major review of energy policy on behalf of the government. This includes an assessment of future research and development needs, led by Professor David King, the government's chief scientist. Research Councils were directly engaged in this review, and we have also been working with a wide range of stakeholders and funders, including the DTI and Carbon Trust, to identify the research and development priorities for sustainable energy. These have been developed into proposals for a new cross-Council initiative 'Towards a Sustainable Energy Economy'.

The aim of this proposed programme is to give the UK access to a secure, safe, diverse and reliable energy supply at a competitive price, whilst meeting the challenge of global warming. One of the suggestions is that we should create a new Centre or Centres of Sustainable Energy Research, bringing together experts in the technological, social, economic, environmental and health aspects of energy. The Centre(s) would act as a UK and possibly European focus for world class sustainable energy research. The priorities it might tackle could include carbon management from the burning of fossil fuels, sustainable renewable energy such as wave and wind power, energy markets, public acceptability, equity and risk. If funded, this Centre would complement the work of other groups such as the Carbon Trust and would build on the existing multi-disciplinary research already funded by the Research Councils, particularly the Tyndall Centre and the Engineering and Physical Sciences Research Council's (EPSRC) new SUPERGEN initiative.

The Tyndall Centre for Climate Change is a unique collaboration between nine UK research institutions that provides the national focus for interdisciplinary research on climate change. The Centre is funded by the Natural Environment Research Council (NERC), EPSRC, the Economic and Social Research Council (ESRC), and the Department of Trade and Industry. It brings together physical and social scientists to further the understanding of causes and consequences of climate change, and to identify, develop and evaluate sustainable responses. The Centre supports an ambitious programme of research and knowledge transfer activities including exploring and evaluating mechanisms for reducing carbon emissions from fossil fuels, looking at the effectiveness of low carbon energy systems and the social and economic barriers to their introduction, and predicting long-term shifts in energy demand and consumption, and their links to climate change.

Launched in November 2001, EPSRC's 'Sustainable Power Generation and Supply' (SUPERGEN) initiative is a new programme which will support consortia of researchers, stakeholders and users to study ways to overcome the challenges of generating and supplying sustainable power. Priority themes include electricity networks and grid connection, biomass and biofuels, marine energy, and hydrogen technology. This portfolio of activities shows that Research Councils are now beginning to work collaboratively to support sustainable energy research, and that we can help the UK move towards a low carbon economy.

Another key priority that needs to be addressed collectively by the Research Councils is the future of the rural economy. Over 76 per cent of UK land is used for agriculture, an industry which employs 500,000 people. Over the next 10–20 years there are likely to be major shifts in agriculture and rural land use. These will be driven by changes in government and EU policy, climate change, and socio-economic pressures such as urbanisation and industrial development, exploitation of natural resources and the need to conserve our natural and archaeological heritage.

At present the way the UK countryside operates is unsustainable on environmental and socio-economic grounds. Despite investing billions from the Common Agricultural Policy (CAP) in agriculture, we have seen a massive loss of biodiversity, increasing groundwater pollution, and farmers going out of business. We have a lose–lose situation.

CAP reforms are likely to move from subsidising production to payments that meet social and environmental objectives, resulting in significant changes in the ways the land is farmed. In future we could see a more mixed approach to farming combining high intensity crops, organic crops, GM crops, non-food crops (for energy, biofuels and biomaterials), and non-agricultural activities. This will require us to change the way we think about farming and rural land use. To help with this, we need to develop socio-economic models, carry out some large-scale field trials and to develop exciting and innovative new ways of working with rural communities. Of course it is not possible to draw a line between urban and rural land use, and any programme of work would need to reflect urban sustainability issues.

At present the Research Councils are developing proposals for an integrated, multidisciplinary research programme on the rural economy and land use. Working with DEFRA and the devolved administrations in Scotland and Wales, this research aims to predict and evaluate the impacts of changes in a range of social, economic, political and environmental drivers on the rural economy. The science outcomes will help underpin government policy making to deliver a thriving rural economy, meeting social, economic and environmental objectives, by reducing risks and uncertainties.

Although the Research Councils are being proactive in developing new interdisciplinary research programmes, there is a real need to ensure that we have enough trained scientists, social scientists, engineers and economists in the UK who have the expertise to tackle the complex, multidisciplinary challenges of the sustainable development research agenda.

Research Councils have a very good track record of training students within traditional disciplines, but we need to do more to train individuals capable of working across these areas. NERC and ESRC already support a joint studentship scheme to enable postgraduate students to work on environmental research problems requiring a combined socio-economic and environmental approach. We are currently supporting 60 young people to work on projects as varied as the impact of climate change on regional economies, urban air pollution and the design of cities, and social and environmental impacts of Agenda 21.

However, we need to be more focused if we are to provide further training and recognised career paths at the boundaries of traditional

disciplines, and to tackle priority issues where novel interdisciplinary approaches are required, as they are in the sustainable energy area. We will need to review these objectives in the light of the Roberts Review on the provision of postgraduate training, published in early 2002.

Research Councils also recognise that effective transfer of research outputs and outcomes to business, policy makers and other users is an essential part of the sustainable development research agenda. We have to encourage users and potential users to participate in strategy and programme development, and ensure that we have effective knowledge transfer mechanisms built into research programmes at the outset. Research Councils already support a number of activities including LINK programmes, Faraday Centres and business plan competitions, but we need to do more. One exciting new idea is the Sustainable Technologies Initiative (STI), funded by the DTI, EPSRC, ESRC and Biotechnology and Biological Sciences Research Council (BBSRC), and aimed at improving the sustainability and competitiveness of UK business. Over five years £18 million will be invested in collaborative research aimed at decoupling economic growth from damaging the environment.

Within the Research Councils we recognise our responsibilities in helping to deliver the sustainability agenda; we want to build on our successes and ensure that sustainability is woven into all of our activities from the earliest stage of priority setting and programme development. By working together we will make a significant contribution to supporting research, training and knowledge transfer for a sustainable future.

Towards a sustainable rural economy: lessons from foot and mouth
Andrew Donaldson, Philip Lowe and Neil Ward

Introduction
The recent foot and mouth disease (FMD) crisis in the UK has provided an opportunity to evaluate conceptions of the rural economy in current policy. The nature of the rural economy as a complex interdependent system has been dramatically laid bare. A harsh spotlight has been cast on the role of expertise in the framing and execution of public policy. Moves toward rural sustainability must take into account the composition of the contemporary rural economy and the perceptions of consumers.

Conduct and impacts of the foot and mouth crisis
An outbreak of foot and mouth disease in the UK was confirmed on 20 February 2001. A disease-control strategy that was 'ultra-precautionary' was adopted (see MAFF/DETR, 2001, para. 2) in order to protect the farming industry. This coincided with predominant news values (particularly, the strong visual images of animals being shot and pyres of bloated carcasses) in determining the media's treatment of the crisis as an animal plague visited on the country. Confronted with these grisly images and asked to stay away, the public obeyed, avoiding contact with farm animals, but also with market towns, village pubs and shops, country hotels and visitor attractions too.

FMD compounded many of the economic pressures being experienced by the agricultural industry in the UK. Over nine thousand farms were left with no livestock; many more farms

were adversely affected financially by movement and export restrictions, and there were knock-on effects on livestock-related activities. However, the crisis also resulted in financial losses being incurred by other sectors. A telephone survey of rural firms in the North East of England in early April found that 40 per cent were adversely affected with 28 per cent suffering losses of more than 10 per cent of turnover. The worst affected sectors were hospitality, recreation and culture, transport, and land-based professionals and businesses: in each of these sectors a majority of rural firms were suffering (Bennett *et al.*, 2001).

Expert knowledge and outcomes of FMD

Foot and mouth disease has been known to science for centuries. The strategy for tackling the disease was devised by scientists and scientists oversaw the management of the disease. Yet there was a tension between two groups of scientists: animal health scientists/ veterinarians and epidemiologists. There is also a persuasive argument that a more fundamental failure was the diagnosis of the problem by policy makers.

Superficially, the problem was one of a highly contagious disease – but FMD is not a threat to human health and it is not even normally fatal to animals. From a public policy point of view, foot and mouth is entirely an economic disease. The ability of the agricultural sector to freely export (bestowed by disease-free status) has an economic value. However, in assessing the eradication campaign there is a need to consider the economic costs and benefits of alternative courses of action for the *whole* economy. Unfortunately, it seems that the problem was not defined in this holistic manner

but simply in terms of solving an agricultural problem – thereby imparting the bulk of the short-term costs to those outside the agricultural sector.

The way the campaign was conducted further exacerbated the rural economy crisis. Having effectively closed the countryside down at the start of the epidemic it proved a very protracted task to open it up again and attract back visitors (whom, it turned out, pose a negligible risk of spreading FMD). The grisly visual images of the eradication campaign served as powerful deterrents. However effective the eradication campaign was as a risk *management* exercise, it was an exceedingly crude and largely counterproductive exercise in risk *communication*.

These points (as well as issues of administrative capacity and farmer resistance) are crucial aspects on which social science could and should have contributed. However, social scientists were not consulted and few of them pushed their views forward. There is no social scientist on the Royal Society inquiry committee. Where were the social scientists during the FMD crisis?

To some extent social scientists are constrained (as are scientists) by the pre-existing policy problematisation of any situation. The areas of expertise deemed applicable by policy makers and practitioners determine the ability of those who conduct research and generate knowledge to contribute in any given situation. The account of FMD given above aptly demonstrates the way in which the definition of a problem also defines those who are able to act and those who are acted upon (and those who end up as armchair critics). The initial definition of FMD as an animal disease problem

prioritised knowledge of the disease and sidelined knowledge of the rural economy.

The rural economy revealed

The above sections illustrate how the treatment of FMD as an *agricultural problem* compromised a much wider range of rural business activities and precipitated a *rural economy crisis.* What this crisis has revealed above all is how much the countryside has changed in recent years and how out of date are official and public conceptions. Both the major Committee of Inquiry and the economic analysis of the 1967 FMD outbreak considered solely its impact on the agricultural sector (HM Government, 1969; Power and Harris, 1973). In those days the countryside was largely a farming domain. Much has changed since then, with the great growth in rural tourism and leisure, in counter-urbanisation, in the urban–rural shift in certain types of employment and in the diversification of farm household incomes (a majority of farm households these days have some non-farming income). Yet public perceptions and official outlooks have not kept pace.

The UK public and government have been rudely awakened to the diversity of the contemporary rural economy and agriculture's minor role within it. Leisure and tourism, manufacturing and services are now the mainstays of rural economies. However, policy and official structures have failed to reflect this change, and still largely view rural issues through an agricultural lens.

While demoting agriculture, the FMD crisis has also revealed starkly the continuing dependency of the countryside on farming. The rural economy remains vulnerable to an agricultural crisis, and would have still been vulnerable even if the crisis had not been handled from such a single-minded perspective. This is because the predominant image of the countryside, which the crisis has tarnished, is a pastoral one based on extensively grazed landscapes. That is what the tourists and visitors appreciate. Agriculture's wider role in the countryside is thus mainly symbolic, aesthetic and ecological.

The particular sectoral incidence and geographical impact of the present crisis have highlighted the links between certain farming systems and the touristic countryside. Because FMD largely took hold in sheep, the heavily affected areas have been those with extensive grazing systems and picturesque landscapes (somewhat at odds with media commentary that FMD was another adverse consequence of intensive farming). What must be readily apparent now is that the public good benefits of pastoral farming in such areas far overshadow the market value of its tradable products.

More specific geographical dependencies and vulnerabilities have been revealed by the particular incidence of the FMD crisis. First, since the mid-1980s, on-farm diversification has been promoted as a means of strengthening rural economies and boosting farm incomes. Such non-agricultural enterprises have been particularly affected by the quarantining of farms, raising doubts over the wisdom of this strategy. Second, the FMD crisis has revealed the still narrow basis of the economy of some rural areas. The peripheral areas where the disease has hit hardest are heavily dependent on primary industries and tourism, and consistently rank as the most deprived rural areas in England (Countryside Agency, 2001). Future rural development policy must question

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the extent to which encouraging diversification from agriculture into tourism risks simply shifting local employment from one vulnerable sector to another.

The FMD crisis has raised profound questions about the relationship between agriculture and the rural economy, including how to secure sustainable agricultural livelihoods and how to promote more robust rural economies. The current system of agricultural and rural support was borne out of the priorities and concerns of the 1940s and 1950s for food security and improved agricultural productivity. There is now extensive support for a thorough review of the policy framework governing agriculture to reflect better the nature of contemporary rural economies.

New direction

The establishment of the Department for the Environment, Food and Rural Affairs (DEFRA) brings together agriculture, the food industry and fisheries with environmental protection, rural development, the countryside and wildlife. In many respects it represents a welcome 'joining up' of policy: responsibilities that were at the margins of former departments are now centre stage, including the environment, sustainable development and rural policy.

However, the new department retains strong links with producer groups, and some of the most pressing issues it faces are traditional MAFF responsibilities. It is imperative therefore that DEFRA represents the broad public interest in the spectrum of issues it covers and that the interests of the environment, food consumers or the rural economy are not subordinated to those

of primary producers. That depends upon political leadership sensitive to a new understanding of the role of agriculture in contemporary society. This no longer rests on agriculture's contribution to GDP (less than 1 per cent) or to employment (just 1 per cent). The more crucial consideration is that agriculture occupies and manages 80 per cent of the land: it thus constitutes the countryside and is the primary determinant of the state of the rural environment. Agriculture is also a vital and critical element in a food supply chain.

Agriculture, therefore, remains central to the new department, though not as a stand-alone economic sector, but in its relationship to the rural economy and environment on the one hand and the food supply chain on the other. The task ahead is to better integrate agriculture into these broader functions. However, the industrialisation and globalisation of agriculture have tended to detach farming from the rural economy and to marginalise or impoverish the rural environment. Certain consumer trends could help to reverse this process and foster a reintegration of agriculture into the countryside.

Successive farming-and-food crises have heightened consumer concerns about the provenance of food and food production, leading to demands for quality assurance, traceability, organic production, welfare friendly systems, and local and regional produce. These demands should serve to reconnect the final consumer with the primary producer by linking the qualities that consumers value in food to the methods used to produce it.

Production systems could be made environmentally friendly (gaining public support) and hence providing valuable attributes to the stock or crop. But to earn

income these attributes have to be marketed as distinctive products. One distinctive characteristic of any primary production is location. Turning this to competitive advantage requires the strengthening of the marketing chain to deliver an enhanced reputation of the origin of the product. This will require innovation and imagination in product development and new promotion and marketing systems, with an emphasis on increasing consumer perceptions of the authenticity and quality of the product package (Tregear *et al.*, 1998).

Towards an integrated rural development policy

Public support systems must be changed to assist this transformation, chief among them being the Common Agricultural Policy. Anachronistic production subsidies to farmers must be replaced with measures that assist the regeneration of rural economies overall. Under such an 'Integrated Rural Development Policy' the following arrangements would prevail:

First, markets would largely determine the income that farmers receive from growing crops and raising livestock.

Second, farmers would receive sufficient support for the environmental management functions of agriculture.

Third, rural development would be given much greater promotion, to assist in the economic adjustment of rural areas and to help improve rural incomes and employment.

The priority must be to ensure that local rural economies are more robust and versatile, and based on sufficiently diversified income sources. Multiple income sources for farm households are now a widespread feature of

British and European agriculture. Income sources from off the farm through some household members going 'out to work' (in, for example, farm contracting, the local service sector or a nearby town) are of much greater significance than non-agricultural income generated on the farm (through activities such as farm tourism or food processing). The implication is that to diversify farm household incomes, the most appropriate strategy is to stimulate diversification and economic growth in the rural economy. (Such a strategy has the additional benefit of assisting non-farmers too.) Thus the most pressing problems lie with those localities where the rural economy is too narrowly dependent upon agricultural production. It follows that the focus of intervention to promote rural development and employment should be the rural and regional economy and not the agricultural sector.

Pollution, social exclusion, equity and health
Tanja Pless-Mulloli and Peter Phillimore

Introduction
How do problems of pollution and exposure to environmental hazards intersect with issues of poverty and social exclusion? We were asked to provide a personal view of the current state of knowledge, the policy context, and approaches to reducing gaps and uncertainties in knowledge. We approach this task by reflecting on two enduring debates of the last century: research on inequalities in health and research on air pollution and health. We outline how evidence emerged over time and how our own work fitted within these evolving debates. We come to the topic from the perspective of

epidemiology and public health, which concerns itself with the distribution and determinants of disease in populations with the purpose of reducing ill health.

We argue that debates around inequalities in health and the health effects of air pollution have so far very rarely overlapped, in either academic or policy contexts. Moreover, there are currently few arrangements to facilitate such dialogue. But we also show where attempts at a dialogue have been made. Certainly for our part we have sought to explore such connections, as the title of one of our recent papers indicates: 'Lung cancer, proximity to industry, and poverty in Northeast England' (Pless-Mulloli *et al.*, 1998). Our work supports a judgement that inequalities in health reflect differential access to clean environments, in the same way that they reflect differential access to other kinds of material and social benefits.

Inequalities in health, research and policy in the UK

Past evidence

The persistence of health inequalities in the UK has been the driving force for much of the Public Health Movement and for Public Health legislation since the times of Edwin Chadwick's report on 'the sanitary conditions of the labouring classes' in 1842.

Major contributors to the debate throughout the twentieth century have been the 1942 Beveridge Report (Beveridge, 1942), the 1980 Black Report (Black *et al.*, 1982), its 1992 update entitled *The Health Divide* (Townsend and Davison, 1992; Whitehead, 1992), and the 1998 Acheson Report (Acheson, 1998). Recently *A Better Quality of Life: A Strategy for Sustainable Development for the UK* describes well how

health in the UK has improved while at the same time income and health inequalities have grown (DETR, 1999a). Research on inequalities in health burgeoned after the Black Report with fierce argument around measurement, methodology and causation. One strand of this work concerned the mapping of small area health inequalities using census indicators of wealth or deprivation to characterise the material conditions that underpin social inequalities. Peter Townsend, associated with one of the best known 'indices of deprivation' (Townsend score) was unusual in recognising that a missing dimension of such an index concerned the quality of the local environment (personal communication). He gave thought to incorporating a measure of local land-use as a surrogate for environmental quality. He recognised that polluted environments were unequally distributed, in a way that needed to be mapped on to other forms of social and material disadvantage. Our own later work on industrial air pollution in Teesside, which included data on historical land-use, supports Peter Townsend's initial insight.

Current evidence and research needs

Such glimpses towards the idea of encompassing pollution and the environment within the wider consideration of social inequalities were the exception. By and large debates around health inequalities have acknowledged environmental impacts only in broad terms. Take the 'Whitehead rainbow', which conceptualised the wider impact of environment on health at the outermost layer of influences, alongside culture and general socio-economic factors (Acheson, 1998; DOH, 2001). While the rainbow acknowledges a potential

impact, it scarcely models the synergies linking people's material circumstances, their health-related behaviour, and the wider environment of their neighbourhoods. We are still a long way from mapping and assessing how severely the impacts of economic disadvantage and social exclusion may be compounded or compensated by the impact of a polluted or favourable environment.

One example of an attempt to reconcile inequalities in health with consideration of economic development and environmental inequity comes from the sustainable development field itself. Corvalan and colleagues at WHO developed a 'health and environment cause–effect framework' and subsequently used this to develop indicators for monitoring policies (WHO, 1997; Corvalan *et al.*, 1999; DOH, 2001). These indeed cover both poverty and air pollution, but again crucially do not make allowance for the interaction between the two (WHO, 2000).

Attempts have also been made to estimate the contribution environmental influences make to health and mortality in populations. But they suffer from having to extrapolate from very limited amounts of data from only a few countries. In pursuit of global views they flatten out the localised variations which are critical to a deep understanding of the consequences of inequality in locations with concentrations of air pollution or social deprivation.

Our own work since the mid-1980s had initially highlighted marked differentials in the health of *similarly poor* populations. The poorest areas of Teesside exhibited consistently higher mortality than comparable areas of Sunderland (Townsend *et al.*, 1986; Townsend *et al.*, 1988; Phillimore and Morris, 1991; TEES, 1995). In a

fresh examination of the impact of industrial air pollution we investigated a wide range of health indicators (mortality, self-reported morbidity, GP consultations and cancer registration) in equally deprived areas in Teesside and Sunderland. Somewhat surprisingly we found that while health in all neighbourhoods was very poor compared to national levels, the *current levels* of industrial pollution in Teesside were not associated with differentials in acute ill health. In relation to mortality, however, we concluded, that for lung cancer (and less emphatically for other respiratory causes) the marked differentials between neighbourhoods among women under 65 years pointed to the contribution of industrial pollution in the past (TEES, 1995; Pless-Mulloli *et al.*, 1998; Bhopal *et al.*, 1998). Both conclusions – the absence of a gradient between areas linked to industrial pollution for current respiratory illnesses, and the presence of such a gradient for certain causes of death – were to prove controversial in Teesside.

The challenges in this kind of work related both to the epidemiological methods and to the fact that we were conducting the study in a setting where major industries still dominated the regional economy. We were dealing with complex mixtures of inter-correlated exposures, that varied over time; the relative risks from residential exposures were low compared to occupational and smoking exposures; and we had to rely on exposure and health data collected for other purposes. A climate of suspicion and distrust surrounded the reporting of this study (Phillimore, 1997; Moffatt *et al.*, 2000; Phillimore *et al.*, 2000) (see Box 1).

Box 1 Remarks about publication of the TEES study

Industry's concern one week before publication at a briefing:

'Industry causes lung cancer! Would you be happy with that headline?'

Local authority official on their attitude towards the research and its findings:

'I see my role in relation to the research … play it down … we don't need bad news about Grangetown … We need to breathe confidence into the area and attract industry, we need jobs.'

Community members:

'I don't believe that industry has no effect on people's health. I live here.'

'I wasn't interested because nothing ever gets done.'

Air pollution and health, research and policy in the UK

Early evidence and policy

In his historical record of air pollution in the UK, Brimblecombe quotes a document from as early as 1285 mentioning air pollution in London and its unequal distribution (1999). London was infamous for its fog: witness its attraction to the French painter Claude Monet. The first attempts to *quantify* the health effects of the London fogs were made in the 1920s (Logan, 1953), but the emergence of air pollution epidemiology was closely linked to the London fog episode in 1952. This was a landmark because of its scale, with an estimated 4,000 additional people dying following a four-day episode of extreme pollution in early December

(Logan, 1953; Anderson, 1999).

Early policy efforts were directed towards avoiding such 'killer episodes'. The Clean Air Act of 1956 led to the establishment of widespread monitoring networks for black smoke and sulphur dioxide. This monitoring documented the steady downward trend in annual levels of pollutants, which was rightly interpreted as a public health success story. However by focusing on this downward trend two important aspects were long ignored: the existence of variation across small geographical areas where local sources of pollution exist, and the link between the lower daily levels of pollution and health.

Current evidence and research needs

There are broadly two types of studies linking air pollution and health: those that link short-term changes of exposure over time with daily counts of deaths or hospital admissions; and those that study the effects of chronic exposure on health with air pollution exposure varying between location (spatial variation) (Pope and Dockery, 1999). In the 1940s and 1950s there was little disagreement that high levels of air pollution such as those during the London fogs could lead to increases in disease and death. But it was not until the 1970s and 1980s that researchers started to explore the link between pollution *outside* such episodes and health. A breakthrough came from the development of time-series modelling in the 1990s. Several major studies found small but significant changes in daily mortality per unit increase in the level of air pollution (Pope, 1991; Schwartz, 1991; Dockery *et al.*, 1992), an association now considered causal. The current estimate of effect for the UK is 24,100 deaths brought forward or

additional annually (DOH, 1998). It is now crucial to establish the extent of life-shortening and how this is distributed amongst susceptible subgroups. The question whether poorer populations are not only more likely to be exposed but are also more susceptible due to pre-existing disease, impaired defence systems and inadequate use of health care has been seriously considered (Kunst, 1997).

The quest to discover the causes for the lung cancer pandemic has also influenced the course of this research. Once the strong link between smoking as a risk factor for lung cancer emerged, all air pollution epidemiology has been complicated by its magnitude (Doll and Hill, 1950; Wynder and Graham, 1950). The close link between the prevalence of smoking and socio-economic factors further complicates consideration of their influence in most epidemiological work, to the extent that it has too readily been assumed that the impact of ambient air pollution is negligible alongside such major causative factors.

Linking the two fields: old tensions, new thinking

In Victorian times, air pollution in Teesside symbolised economic growth and prosperity and it was regarded with a sense of pride (Briggs, 1968). This was clearly expressed in 1887 by the mayor of Middlesbrough saying to the Prince of Wales: 'If there is one thing more than another that Middlesbrough can be said to be proud of it is its smoke. The smoke is an indication of plenty of work – an indication of prosperous times … We are proud of our smoke.' Such attitudes did not outlast the nineteenth century, but those key public health officials, the local authorities' Medical Officers of Health, were used to reflecting on the trade-

off and tensions between employment and air pollution from industry (see Box 2).

> **Box 2   Extracts from annual reports by Medical Officers of Health**
>
> *'During the year the atmosphere has been very clear and the air pure owing to the fact that the large industrial works have been standing for most of the time … While we all deplore the fact that the trade of the district is so bad, yet I am of the opinion that with greater care when the industries are in full swing much of the polluted smoke may be prevented.' (MOH, Eston, 1921)*
>
> *'To judge by many activities in the area we seem to be on the threshold of major industrial developments … we cannot but wonder what effect this development will have on the health of the people.' (MOH, Eston, 1953)*
>
> Source: Phillimore (1997).

Yet years after the comments quoted in Box 2, it can still be difficult in particular towns and cities (as we know from personal experience) to draw attention to the cost in human health of links between environmental conditions and social conditions, poverty and pollution. It remains to be seen whether a recent initiative by Friends of the Earth will help force the issue more effectively (FOE, 1999). While at national or international levels it is probably becoming easier to speak of these links in general terms, to do the same in areas dominated by their location near industry is still problematic, not least because the issues are easily separated, and framed as job security versus environmental quality (Phillimore *et al.,* 2000).

However, new links are being made. In a rare joining of forces, the air quality and health field has recently seen the creation of fora where epidemiologists, toxicologists, clinicians and regulators engage with emerging evidence and its impact on policy. Research gaps have been identified, driven by policy needs. Moreover, since 1997 the UK has established evidence-based National Air Quality standards (DEFRA, 2001). The creation of interdisciplinary, multi-agency fora for debate has had an enabling role for policy makers, regulators and researchers, and such structures offer one way to incorporate a more rounded consideration of socio-economic factors into the air pollution and health research agenda.

Common themes, gaps, uncertainties and the way forward

Overall therefore there are parallel stories to be told about the emergence of inequalities and health, and air pollution and health research. While inequalities in health research largely ignored the possible contribution of environmental hazards such as air pollution, air pollution research gave socio-economic factors the role of confounders only, failing to consider their independent or effect-modifying contribution to air pollution and health links. We know that socio-economic factors are not distributed independently of air pollution exposure, that pollution is often an aspect of poverty and compounds it. What we do not know is by how much lives are shortened, how this shortening is distributed across the population, and whether the magnitude of effect varies by particle type. Both national studies and studies considering local contexts in

areas of known pollution and deprivation are needed.

Finally, central to the further development of this area of research will be the issue of communication of risk and uncertainty to the public, particularly after recent experiences around BSE and the foot and mouth epidemic. Distrust, stigma, inequality in access to information and disempowerment all contribute to how risks and uncertainty are perceived (Bush *et al.*, 2002; Crowley *et al.*, forthcoming).

There may now be a desire to move these debates forward, to clarify the extent to which poorer groups are disproportionately exposed to air pollution, and the extent to which their susceptibility varies from that of the richer sections of society. This requires structures to bring together relevant groups: we should learn lessons from the past, and strive to engage the Sustainable Development Commission with NHS Public Health Observatories, Research Councils, regulators and representatives of the public to discuss the methodological and contextual challenges. Multilevel, interdisciplinary, and multi-agency thinking will be required to design, conduct and communicate research, with the eventual goal of a more equitable, that is a fairer, distribution of health risks associated with environmental pollution.

Developing tools for sustainability appraisal
Christopher Wood

Introduction

The widespread acceptance of the utility of environmental impact assessment (EIA) in improving the quality of decisions about proposed projects has led to active consideration of, and growing practice in, strategic environmental assessment (SEA) or the environmental assessment of policies, plans and programmes (PPPs). This process (often termed environmental appraisal in the UK) is a consequence of the emerging awareness that project EIA may occur too late in the planning process to ensure that all the alternatives and impacts relevant to sustainable development goals are adequately considered (Wood and Djeddour, 1992).

The same arguments have been applied to the extension of SEA into integrated assessment or appraisal (IA), usually called sustainability appraisal (SA) in the UK, which involves the consideration of economic and social, as well as environmental, impacts. Interest in SA has increased since the mid-1990s because of the increased prominence of sustainable development within policy making and need to embed a proliferating array of PPP assessment techniques within a universal framework (Kirkpatrick and Lee, 1997).

Sustainability appraisal is concerned with bringing different forms of appraisal together prior to a decision being taken. SA is defined as:

> *A systematic and iterative process undertaken during the preparation of a plan or strategy which identifies and reports on the extent to which the implementation of the plan or strategy would*

> *achieve the environmental, economic and social objectives by which sustainable development can be defined, in order that the performance of the strategy and policy is improved.*
> (DETR, 2000a, para. 2.1)

The ultimate aim of SA, like that of EIA and SEA, is to contribute to decisions which render a particular policy, plan or programme more likely to promote the achievement of sustainable development. This aim can only be met by affecting the way decisions are taken during the development and implementation of the action. Parsons (1995, p. 468) has noted that 'the essence of integrated assessment is providing a systematic way of integrating knowledge across disciplines, thought styles, resolutions and degrees of certainty'. Like EIA and SEA, SA may involve screening, scoping, prediction, consultation and participation and the mitigation and monitoring of impacts. Clearly, tools are needed to achieve all these tasks.

This paper discusses SA research, SA practice, the role of SA in decision making and future development of the process. Conclusions are drawn.

SA research

Increasing attention is being paid to the development of SA methodologies (Ravetz, 2000a; Devuyst, 2001). Although SA is at a very early stage of evolution, it is likely that the pace of change in the field will be rapid as practice burgeons and more research is undertaken. However, PPPs rarely develop in a smooth linear fashion, and are not formulated and implemented in a vacuum, resulting in great uncertainty. Consequently, when appraising some actions, the focus of the appraisal effort is

constantly changing. Even if the SA is undertaken in a satisfactory manner, translating the findings into an output appropriate to decision makers may be difficult (Parsons, 1995; Ravetz, 2000a).

It appears that there are limitations to the extent that currently available assessment tools can be borrowed and applied to SA. High levels of uncertainty in forecasting potential sustainable development impacts compound such methodological problems, as does the fact that the data required to undertake a 'comprehensive' SA are difficult to obtain or may not exist.

SA practice

SA practice is not yet widespread, although examples of SA practice are becoming much more common. Devuyst (2000) suggested that, of all the SA tools that existed, internationally the checklist was most widely used in practice. In the UK, SA has been used in conjunction with regional planning guidance (RPG) documents and regional economic strategies and increasingly in relation to development plans (especially structure plans). Smith and Sheate (2001b), in a survey of 13 SAs of regional planning documents, found that the procedural and methodological approaches taken during the appraisals varied considerably. This was despite the existence of a DETR (2000a) guide outlining a generic good practice approach to SA. Counsell and Haughton (2001) found that UK SA reports had often utilised a matrix of ticked boxes, the performance of different options against broad objectives being summarised in the form of symbols. They suggested that the matrix had probably been over-employed in the SA of RPG but that text-

based SA reports were becoming more common.

In practice, each of the aspects of assessment has generally nominally been weighted equally with each of the others (DETR, 2000a) though environmental parameters have often outnumbered economic and, especially, social impacts (Counsell and Haughton, 2002). Nevertheless, the environmental assessment subsumed within SA to date generally appears to have been less formal and less rigorous than an SEA meeting the requirements of the European directive on SEA (Smith and Sheate, 2001a). The Environmental Appraisal Taskforce (2001) suggested that environmental, social and economic appraisals may need to be assessed separately and then be brought together during decision making to increase the rigour of SA.

Counsell and Haughton (2001, p. 21) described SA reports as 'rather bland and uncontroversial documents' and felt that there was a lack of stakeholder involvement in SA (2002, p. 17). As Hulme and Taylor (2000, p. 81) rather bluntly observed: 'the majority of integrated appraisals remain informed guesswork parading around as objective technical analysis'.

SA and decision-making

SA, as yet, appears not to have influenced decisions on RPG (or development plans) in any meaningful way. Smith and Sheate (2001b, p. 752) found that 'in many instances the appraisal may have had little real impact'. Counsell and Haughton (2001, p. 21) concluded that SA had 'not yet played the pivotal role in the decision-making process envisaged'. SA often appears to have been used as a one-off process, rather than being integrated into PPP formulation. SAs have often been used by stakeholders in preparing

evidence for public enquiries, however (Counsell and Haughton, 2002, p. 17).

In practice, notwithstanding the tools employed, the objective of 'high and stable economic growth' has dominated decisions involving SA. The problem may be that, to date, SA has been based upon environmentally and socially weak but economically strong interpretations of sustainable development. Some SAs have used economic growth figures as the prime indicator of 'sustainable development' to the detriment of social and environmental measures. This has hindered the process of 'integrating' rather than 'balancing' objectives by finding more environmentally sensitive ways to meet needs and improve the quality of life.

Further development of SA

The widespread use of different tools, many of which involve objective and systematic approaches, indicates that there is some confidence in the notion that the concept of sustainable development can be defined and measured. However, Parsons (1995, p. 470) noted that 'excessive and misleading precision' must be avoided in the treatment of the results of SAs, whilst Ravetz (2000b) has suggested that a comprehensive and definitive SA is not possible.

A range of constraints and difficulties facing the development and application of SA approaches has been identified. These may be summarised as:

- difficulties in defining the concept of sustainable development

- lack of political will

- lack of funding

- problems associated with the fragmented nature of the public sector

- limitations of available techniques and forecasting methods

- issues of data availability

- the diffuse nature of PPPs

- influence of SA outcomes on decisions (Parsons, 1995; Ravetz, 2000a).

Developing intellectually robust, usable and effective SA methodologies, techniques and processes will not be easy. For SA to be applied across all sectors of society and scales of human activity, the tools employed must obviously be flexible and adaptable to a broad range of circumstances. It is also important that the tools and procedures utilised are user friendly and that the outcomes of the sustainability assessment can be easily deployed. Particular attention must therefore be paid to the decision-making context into which the outcomes of the appraisal will flow. Ultimately, therefore, guidance focusing on generic best practice principles is likely to be more appropriate than promoting specific sustainability appraisal tools. It is also important that training and general awareness raising accompanies any guidance.

Research on the intellectual robustness of SA, on the usability of the process and its outcomes, and on the effectiveness of SA is likely to lead to fruitful results. Concentrating on SA tools will help to increase the reputation of SA. In addition, SA legislation, diffusion of best SA practice, capacity strengthening, improving data sources and greater stakeholder involvement in SA are necessary.

Conclusion

SA is embryonic. There are some who fear that the subordination of SEA to SA may ignore the lessons of the evolution of EIA (which was originally developed to ensure that environmental costs – previously neglected – were adequately considered in decisions). Nevertheless, although its very desirability has been questioned, SA appears to be becoming established. The success of SA is inevitably limited by the availability of appropriate tools to make robust assessments. There is a danger that potentially inappropriate tools may be taken 'off the shelf' in order to undertake tasks and that the development of new methods and procedures may consequently be threatened. To progress it is likely that both new tools and innovative thinking will be required.

A more holistic approach to problem solving, focusing on linkages and interactions between environmental, social and economic issues, is required. However, the economic, political and social climate within which any sustainability appraisal operates is fundamental. Politicians and senior bureaucrats in powerful departments are reluctant voluntarily to cede any role in the making of decisions to external environmental or other agencies. Whether or not part of a toolkit approach, the success of sustainability appraisal will ultimately be dependent on the enthusiasm of the political and organisational environment within which the process operates. Research in political science may be every bit as important as methodological research.

Quality of life and sustainable development
Paul Ekins and Roger Levett

Introduction

The UK government's Sustainable Development Strategy (DETR, 1999a) identified sustainable development as 'a better quality of life for everyone, now and for generations to come' (p. 8). To determine how far these objectives were being met, the government proposed numerous indicators (DETR, 1999b). Few would dispute that if all of these moved in the right direction the UK would have a higher quality of life.

In reality some indicators have got better and others worse. There is no guidance as to how to interpret such situations. This is not surprising. Quality of life is a very complex concept. Despite a huge literature, there is no definitive conceptualisation of 'quality of life', and even if there were it is not clear that it could be unambiguously measured. This paper seeks to identify pressing and interesting avenues for future research.

Quality of life considerations
Quality of life and economic growth
One of the government's key sustainable development objectives is the maintenance of high and stable levels of economic growth. It is worth asking why, given that:

- increased aggregate consumption in rich countries bears little relation to increased quality of life (for example, Argyle [1998, p. 33] reports that 'in the United States since 1946, average after-tax incomes have increased by a factor of four, but there has been no increase in subjective well-being')

- economic growth increases pressure on the environment and resources (see Ekins, 2000).

One obvious reason for including economic growth as a key objective is because of its link to employment. But then why not make high, stable employment the objective instead?

Quality of life and human needs

The satisfaction of human needs is closely related to quality of life, and hence sustainable development. Needs have occupied an important place since the Brundtland definition of sustainable development as development that 'meets the needs of the present without compromising the ability of future generations to meet their own needs' (World Commission on Environment and Development, 1987, p. 8).

Numerous formulations of human needs exist, including Maslow's hierarchy (Maslow, 1954), supposedly universal conceptualisations (Doyal and Gough, 1991; Max-Neef, 1992), an explicitly cultural approach (Douglas *et al.*, 1998), and rejection of the idea of needs in favour of capabilities (Sen, 1993) and freedoms (Dasgupta, 1995).

There have also been attempts to broaden out conceptions of quality of life from just needs satisfaction (for example Mulgan, 1998; 6, Perri and Christie, 1998). However, there has been a surprising lack of connection between these theoretical formulations and recent work on sustainable development indicators. It might be interesting to bring them together to see how far the formulations differed in terms of operational measures, and how far the indicator sets overlook aspects of quality of life which theory suggests are important.

The components and indicators of quality of life

Components of quality of life may be derived either from expert opinion (e.g. from some theory of human needs), or by asking people directly to describe elements of their quality of life. Pacione (1982, p. 498) reports that 'lists of life concerns' from different sources are remarkably similar. Grayson and Young's (1994, p. 53) survey identifies six key quality of life themes, of such breadth and complexity that they note 'a thorough-going analysis of even one quality of life theme would be a major multi-disciplinary research exercise in itself'. CoR (1999, pp. 14–15) suggests a similar list and also distinguishes between four dimensions:

- the *level* of life in terms of material needs (e.g. health, food, employment and income) and the *satisfaction* felt by people with these; and

- the *quality* of life in terms of non-material life conditions (e.g. human relations, social, cultural and environmental conditions), and the *happiness* engendered by these.

CoR (1999) calls the level and quality of life 'objective' living conditions, and satisfaction and happiness 'subjective' living conditions. The same distinction is made by Pacione (1982) in respect of indicators, 'objective' being 'hard measures describing the environments in which people live and work', and subjective 'intended to describe the ways people perceive and evaluate conditions around them' (Pacione, 1982, p. 498), thereby bridging the gap between statistical descriptions of conditions and the sense of well-being they engender.

It would seem desirable for the largely objective approach taken in DETR (1999b) to be supplemented by research on how people subjectively perceive these themes and indicators as contributing to their well-being. This raises the question: how to deal with people's differing perceptions of the relative importance of different themes and indicators?

Different priorities in quality of life
In its discussion of human needs and sustainable development, the OECD noted 'the relative importance accorded to each of these [needs] will vary according to individuals and societies over time' (OECD, 2001, p. 57). This greatly complicates decisions as to how elements should be traded off in order to achieve a higher quality of life overall. Publications such as *British Social Attitudes* regularly contain studies of such differences in attitude (see for example Stratford and Christie, 2000; Park, 2000).

There is a rich research agenda, getting clearer insights into changing perceptions of quality of life between different groups of people over time, and defining relevant groups or 'communities of interest'. This should help assess overall differences in quality of life if some indicators were getting 'better' and others 'worse'.

Can different indicators of quality of life be combined into a single index? The essential procedure for the derivation of such an index is set out in DETR (2000b). First the different indicators under each dimension need to be appropriately combined to form a measure for that dimension. Then the different dimension measures need to be combined into an overall index. In each case the combination involves the transformation of the indicators or measures into a common metric before they can be combined, and consideration of whether the transformed indicators should be weighted to reflect relative importance. Weightings may reflect the views of citizens (as in Rogerson *et al.*, 1989), experts (as in DETR, 2000b) or policy makers. However, it is known both that weightings from these groups can be significantly different, and that this difference is likely to affect the calculated index (Gehrmann, 1978).

The many problems of weighting and aggregation, and lack of consensus as to how they should be resolved, caused the UK government to reject this approach (DETR, 1999b, p. 18) in favour of a set of Headline indicators. Perhaps further research could find a more synthesised and compelling way of presenting quality of life outcomes other than via the current Headline indicators.

Individual and collective choices in quality of life
Not all the elements of quality of life are either accessible to or can be adequately provided by individuals' choices. Some are the outcome of collective decision-making processes. Individual and collective choices and outcomes interact in two main ways.

Firstly, individual choices may have uncompensated impacts on others, e.g. externalities such as the congestion and air pollution caused by road traffic. Assuming rational (i.e. self-interested) human behaviour, externalities can only be addressed, and quality of life increased, through collective (i.e. government) action.

Secondly, through the collective provision of goods which increase individuals' quality of life, but which would not be available through their individual choices alone, e.g. the provision of public infrastructures, universal access to basic goods and services, and other inequality-limiting measures.

There is rich research potential in seeking to better understand the relative roles of individual and collective decisions in quality of life, and how current choices influence the choices available in the future.

Quality of life guiding policy
Pragmatism?
How can the contested concept of quality of life be brought to bear on policy making with some coherence and rigour?

Eco-efficiency of quality of life
One way is to sidestep problems of aggregation by concentrating on those *components* of quality of life most affected by policy. For example, distinguishing the quality of life goal of *access* to amenities and services from *mobility*, it becomes obvious that there are many ways to increase access while reducing travel – for example siting amenities nearer to users, making local amenities good enough for people to want to use them, or co-locating jobs, shops and recreations so people can satisfy several needs in one journey.

Most people would say their quality of life improved if they needed to make fewer, shorter journeys to get the same choices and life chances, and as a result they had more 'free' time, experienced less traffic and congestion, and those without use of cars were less disadvantaged.

This suggests that 'improving the quality of life within the carrying capacity of supporting ecosystems' might be achieved by decoupling 'quality of life services' such as access to amenities or comfort in the home from the resource-intensive means that industrial societies have adopted for meeting them. Furthermore, there is no logically necessary connection between improving at least some aspects of quality of life and economic growth as conventionally measured. However, establishing whether the concept of quality of life eco-efficiency is more than just a plausible metaphor requires answers to:

- How are 'quality of life services' to be chosen and defined? Could we know we had identified all – or even most – of the components? Does it actually matter?

- Can components be defined any more rigorously and certainly than quality of life in the round – e.g. doesn't constructing a common measure of *access* raise exactly the same problems of weighting and aggregation of non-commensurable quantities, subjectivity and multiple perspectives that bedevil a single measure of quality of life?

- Does the idea work for other policy areas – e.g. food and farming, where there are important facets of both quality of life and environmental damage?

- Does disaggregating quality of life risk 'un-joined-upness' – e.g. pursuing less transport intensity causing trouble in other policy areas?

Quality of life capital

Quality of life capital is based on the insight that it is the benefits and services people get from the environment, the economy and society that matter to them, not the things themselves.

For example if housing is built on greenfield land, it is not the hectares of land used that matters, but the biodiversity that may be displaced, the opportunity for tranquil strolling lost and the housing needs that may be satisfied. Thinking in these terms points to ways development can reconcile multiple needs (e.g. providing an alternative leafy corridor through new housing). Where different benefits unavoidably conflict, decisions should be informed by more detailed evaluation – how important is each benefit to the people affected, how scarce is it, could it be provided another way, etc. This provokes further research questions:

- Can the list of 'quality of life benefits' generated by the stakeholders involved in a particular exercise be justified in any formal way? Are any of them nationally or universally 'given', and how should these be articulated with more local concerns?

- Does the idea of substitution of *benefits* rather than *things* offer a middle way between 'strong' and 'weak' sustainability: human made capital can substitute for natural capital if and only if it produces the same quality of life services.

Influencing the meaning of quality of life

Where do quality of life preferences and priorities come from? How are they formed?

How can they be influenced? If people can be encouraged to find a fulfilling way of life that minimises environmental resource consumption, we have found a further way to 'improve the quality of life within the carrying capacity of supporting ecosystems'.

But this raises the spectre of government indoctrination. It can be argued that neoclassical economics' treatment of people's preferences as exogenous and sovereign is the best safeguard against ideological manipulation.

However, this assumes our society is a neutral, ideology-free backdrop, where what people believe and say they want is an undistorted reflection of what they really want. Proclamations of the 'end of ideology' and 'end of history' claim this. But the resurgence of ideological conflict, the glaring failure of market consumer society to provide even minimal subsistence to a third of humanity, and lack of evidence that it is making even the 'winners' happier than a few decades ago, make the belief that western consumer society is the apotheosis of human social development look hubristic and parochial.

Perhaps acquisitive selfish material consumerism is not the natural, universal goal of human existence, but merely the way our aspirations are channelled by our current social structures and relations. Moreover this channelling is deliberate and colossally funded. After decades of sophisticated and manipulative marketing and advertising persuading people that identity, success and happiness depend on the acquisition of novel branded goods, the survival of non-consumerist values at all is strong evidence that consumerism is not enough. Perhaps public programmes to make people want and value different things should

not be seen as a sinister interference in freedom and autonomy, but as an attempt to correct this bias.

This is not to claim that materialism is new. People have always yearned for gluttony and luxury. All that has changed is that now many of us can afford it. Cars and planes are technological realisations of atavistic dreams of speed and free movement. Thinking of them solely as practical tools misses the point. But modern societies routinely and systematically thwart many atavistic appetites (aggressive, sexual) for the common good. Restrictions for the sake of the environmental are just the same. Traffic rules already do this. The question is not *whether* to restrict people's impulses to drive fast, but by how much.

The distinction between *assets* and *benefits*, or between *needs* and *satisfiers,* offers a clue. The non-practical benefits of cars – prestige, status, self-image, and dangerous competition – have been achieved in all sorts of ways in different societies. Perhaps prestige is a need. But how prestige is demonstrated and what sort of *things* people compete over varies between places and times – and can legitimately be objects of policy. A society where the ambitious compete through elaborate tombs or artistic patronage has one less driver of unsustainability than one where competition is for the grossest gas-guzzling sport-utility vehicle.

Urgent research questions include:

- How do basic impulses and needs attach themselves to particular iconic objects?

- How can they be moved to others that are less damaging?

- How can governments legitimately seek to influence this?

- What is the status, and justifiable limits on, marketing and advertising?

Conclusion

This survey shows that quality of life opens up a rich research agenda. Although the question of which of the issues mentioned are the most important – and indeed which of them are valid at all – is itself a contentious research question!

References

6, Perri and Christie, I. (1998) 'On the good life', in I. Christie and L. Nash (eds) *The Good Life*, Demos Collection Issue 14. London: Demos, pp. 3–15

Acheson, D. (1998) *Independent Inquiry into Inequalities in Health* (the Acheson Report) (http://www.official-documents.co.uk/document/doh/ih/ih.htm). London: The Stationery Office

Adebowale, M., Church, C. *et al.* (2002) *Environment and Human Rights: A New Approach to Sustainable Development*. London: International Institute for Environment and Development

Anderson, H. (1999) 'Health effects of air pollution episodes', in S. Holgate, J. Samet *et al.* (eds) *Air Pollution and Health.* London: Academic Press

Argyle, M. (1998) 'Sources of satisfaction', in I. Christie and L. Nash (eds) *The Good Life*, Demos Collection Issue 14. London: Demos, pp. 33–9

Bennett, K., Phillipson, J., Lowe, P. and Ward, N. (2001) *The Impact of the Foot and Mouth Crisis on Rural Firms: A Survey of Microbusinesses in the North East of England*, Centre for Rural Economy Working Paper 64. University of Newcastle upon Tyne

Beveridge, W. (1942) *Social Insurance and Allied Services*. London: HMSO

Bhopal, R., Mofatt, S. *et al.* (1998) 'Does living close to a constellation of industries impair health? A study of health, illness and the environment in North East England', *Occupational and Environmental Medicine*, Vol. 55, pp. 812–22

Black, D., Morris, J. *et al.* (1982) *The Black Report*. London: Penguin

Briggs, A. (1968) *Victorian Cities*. Harmondsworth: Penguin

Brimblecombe, P. (1999) 'Air pollution and health history', in S. Holgate, J. Samet *et al.* (eds) *Air Pollution and Health.* London: Academic Press

Bush, J., Phillimore, P. *et al.* (2002) *Perception and Communication of Risk to Health from Foot and Mouth Carcass Disposal Sites: A Pilot Study*. University of Newcastle

Capacity (2002) *Society and Science*, Project Overview. London: Capacity Global

CoR (Committee of the Regions of the European Union) (1999) *Evaluating Quality of Life in European Regions and Cities*. Luxembourg: Office for Official Publications of the European Communities

Corvalan, C. *et al.* (1999) 'Health, environment and sustainable development: Identifying links and indicators to promote action', *Epidemiology*, Vol. 10, pp. 656–60

Counsell, D. and Haughton, G. (2001) *Sustainability Appraisal of Regional Planning Guidance: Final Report*. London: DTLR

Counsell, D. and Haughton, G. (2002) 'Sustainability appraisal – delivering more sustainable regional planning guidance?', *Town and Country Planning*, Vol. 71, pp. 14–17

Countryside Agency (2001) *Impact of Foot and Mouth Disease Update*, Report by DTZ PIEDA Consulting for Countryside Agency, August 2001

Crowley, P., Cummins, G. *et al.* (2002, forthcoming) *Scoping Study for the Northern and Yorkshire Public Health Observatory: Environmental Hazards and Health*. Northern and Yorkshire Public Health Observatory and University of Newcastle

Dasgupta, P. (1995) *An Inquiry into Well-Being and Destitution*. Oxford: Oxford University Press

DEFRA (Department of the Environment, Food and Rural Affairs) (2001) *The Air Quality Strategy for England, Scotland and Wales* (http://www.defra.gov.uk/environment/consult/airqual01/contents.htm). London: The Stationery Office

DETR (Department for the Environment, Transport and the Regions) (1999a) *A Better Quality of Life: A Strategy for Sustainable Development for the* UK, Cm 4345. London: The Stationery Office

DETR (Department for the Environment, Transport and the Regions) (1999b) *Quality of Life Counts*. London: DETR

DETR (Department for the Environment, Transport and the Regions) (2000a) *Good Practice Guide on Sustainability Appraisal of Regional Planning Guidance*. London: DETR

DETR (Department for the Environment, Transport and the Regions) (2000b) *Indices of Deprivation 2000*. London: DETR, available on www.regeneration.detr.gov.uk/rs/ 03100/pdf/rrs03100.pdf

Devuyst, D. (2000) 'Linking impact assessment and sustainable development at the local level: the introduction of sustainability assessment systems', *Sustainable Development*, Vol. 3, pp. 62–78

Devuyst, D. (2001) 'Sustainability assessment at the local level', in D. Devuyst *et al*. (eds) *How Green is the City? Sustainability Assessment and the Management of Urban Environments*. New York: Colombia University Press

Dick, B. (1997) Participative Processes, http://www.scu.edu.au/schools/gcm/ar/arp/partproc.html

Dockery, D.W. *et al.* (1992) 'Air pollution and daily mortality: associations with particulates and acid aerosols', *Environmental Research*, Vol. 59, pp. 362–73

DOH (1998) *Quantification of the Effects of Air Pollution on Health in the United Kingdom*. London: The Stationery Office

DOH (2001) *Tackling Health Inequalities: Consultation on a Plan for Delivery* (http://www.doh.gov.uk/healthinequalities/tacklinghealthinequalities.htm). London: Department of Health

Doll, R. and Hill, A.B. (1950) 'Smoking and carcinoma of the lung', *British Medical Journal*, Issue No. 4862, pp. 739–48

Douglas, M., Gasper, D., Ney, S. and Thompson, M. (1998) 'Human needs and wants', in S. Rayner and E.L. Malone (eds) Human Choice and Climate Change, Vol. 1, *The Societal Framework*. Columbus, Ohio: Battelle Press, pp. 195–263

Doyal, L. and Gough, I. (1991) *A Theory of Human Needs*. London: Macmillan

Eames, M. (2001) *Towards a New Agenda for UK Sustainable Development Research: Consultation Draft*. London: Policy Studies Institute

Eames, M (2002) *A New Agenda for UK Sustainable Development Research*. London: Policy Studies Institute

Ekins, P. (2000) *Economic Growth and Environmental Sustainability: The Prospects for Green Growth*. London/New York: Routledge

Environmental Appraisal Taskforce (2001) *Towards More Sustainable Decisions*, Foresight Programme. London: Department of Trade and Industry

ESRC (2001) 'Environmental justice – rights and means to a healthy environment for all', ESRC Global Change Programme, Special Briefing No. 7

FOE (Friends of the Earth) (1999) 'Pollution hits the poor hardest'. http://www.foe.co.uk/pubsinfo/infoteam/pressrel/1999/19990426104607.html

FOE (Friends of the Earth) (2001) *Pollution Injustice*, Research Report. London: Friends of the Earth

Gehrmann, F. (1978) '"Valid" empirical measurement of quality of life', *Social Indicators Research*, Vol. 5, pp. 73–109

Grayson, L. and Young, K. (1994) *Quality of Life in Cities: An Overview and Guide to the Literature*. London: The British Library

HM Government (1969) The Report of the Committee of Inquiry on *Foot and Mouth Disease, Parts 1 and 2* (the 'Northumberland Report'). London: HMSO

Hulme, D. and Taylor, R. (2000) 'Integrating environmental, economic and social appraisal in the real world: from impact assessment to adaptive management', in N. Lee and C. Kirkpatrick (eds) *Sustainable Development and Integrated Appraisal in a Developing World*. Cheltenham: Edward Elgar

Kirkpatrick, C. and Lee, N. (eds) (1997) *Sustainable Development in a Developing World: Integrating Socio-economic Appraisal and Environmental Assessment*. Cheltenham: Edward Elgar

Kunst, A. (1997) 'General overview of the significance of socio-economic factors on health in Europe', in *Socio-economic and cultural factors in air pollution epidemiology*, European Commission. Brussels: Air Pollution Epidemiology Report Series, No. 8

Logan, W.P.D. (1953) 'Mortality in the London fog incident, 1952', *Lancet*, Vol. 1, pp. 336–8

Lucas, K. (2000*) 'Two for One and One for All?' Exploring the Potential for Integrating Sustainable Development and Social Exclusion Policy Agendas in the UK.* London: University of Westminster

MAFF/DETR (2001) *Guidance for Local Authorities in England on Public Access to the Countryside on the Rights of Way Network*, 28 May 2001

Maslow, A.H. (1954) *Motivation and Personality*, 3rd edn 1987, revised by R. Frager, J. Fadiman, C. McReynolds and R. Cox. New York: Longman

Max-Neef, M. (1992) 'Development and human needs', in P. Ekins and M. Max-Neef (eds) *Real-Life Economics: Understanding Wealth Creation*. London: Routledge, pp. 197–214

Moffatt, S., Phillimore, P., Hudson, E. and Downey, D. (2000) '"Impact? What impact?" Epidemiological research findings in the public domain: a case study from north-east England', *Social Science and Medicine*, Vol. 51, pp. 1755–69

Mulgan, G. (1998) 'Timeless values', in I. Christie and L. Nash (eds) *The Good Life*, Demos Collection Issue 14. London: Demos, pp. 99–104

OECD (Organisation for Economic Co-operation and Development) (2001) *Sustainable Development: Critical Issues*. Paris: OECD

OST (2002) Chief Scientific Adviser's Energy Research Review Group: report of the group, http://www.ost.gov.uk/policy/issues/csa_errg/main_rep.pdf

Pacione, M. (1982) 'The use of objective and subjective measures of life quality in human geography', *Progress in Human Geography*, Vol. 6, No. 4, December, pp. 495–514

Park, A. (2000) 'The generation game', in R. Jowell, J. Curtice, A. Park, K. Thomson, L. Jarvis, C. Bromley and N. Stratford (eds) *British Social Attitudes, 2000–2001: Focusing on Diversity*, The 17th Report, National Centre for Social Research. London/Thousand Oaks, Calif. Sage Publications, pp. 1–22

Parsons, E.A. (1995) 'Integrated assessment and environmental policy making: in pursuit of usefulness', *Energy Policy*, Vol. 23, pp. 463–75

Phillimore, P. (1997) 'Uncertainty, reassurance and pollution: the politics of epidemiology in Teesside', *Health and Place*, Vol. 4, pp. 201–12

Phillimore, P. and Morris, D. (1991) 'Discrepant legacies: premature mortality in two industrial towns', *Social Science Medicine*, Vol. 33, pp. 139–52

Phillimore, P. *et al.* (2000) 'Pollution, politics and uncertainty, environmental epidemiology in North-East England', in S. Kroll-Smith *et al.* (eds) *Illness and the Environment.* New York: New York University Press, pp. 217–34

Pless-Mulloli, T., Dunn, C., Sharp, L., Edwards, J., Bhopal, R. and Tate, J. (2000) 'Is it feasible to construct a community profile of industrial air pollution', *Occupational and Environmental Medicine*, Vol. 57, pp. 542–49

Pless-Mulloli, T., Phillimore, P. *et al.* (1998) 'Lung cancer, proximity to industry, and poverty in Northeast England', *Environmental Health Perspective*, Vol. 106, pp. 189–96

Pope, C. (1991) 'Respiratory hospital admissions associated with PM10 pollution in Utah, Salt Lake, and Cache Valleys', *Archives of Environmental Health*, Vol. 46, pp. 90–7

Pope, C.A. and Dockery, D.W. (1999) 'Epidemiology of particle effects', in S. Holgate *et al.* (eds) *Air Pollution and Health*. London: Academic Press, pp. 674–705

Power, A. and Harris, S. (1973) 'A cost–benefit evaluation of alternative control policies for foot and mouth disease in Great Britain', *Journal of Agricultural Economics*, Vol. 24, pp. 573–96

Ravetz, J. (2000a) 'Integrated assessment for sustainability appraisal in cities and regions', *Environmental Impact Assessment Review*, Vol. 20, pp. 31–64

Ravetz, J. (2000b) *City Region 2020: Integrated Planning for a Sustainable Environment*. London: Earthscan

Rogerson, R.J. *et al*. (1989) 'Indicators of quality of life: some methodological issues', *Environment and Planning A*, Vol. 21, No. 12, pp. 1655–66

Schwartz, J. (1991) 'Particulate air pollution and daily mortality: a synthesis', *Public Health Reviews*, Vol. 19, pp. 39–60

Scottish Executive (2002) Speech by the First Minister to the Dynamic Earth Conference in Edinburgh: http://www.scotland.gov.uk/pages/news/extras/00005700.aspx

Sen, A. (1993) 'Capability and well-being', in M.C. Nussbaum and A. Sen (eds) *Quality of Life*. Oxford: Oxford University Press, pp. 30–53

Seraaj, M. (2001) *Minority Ethnic Issues in Social Exclusion and Neighbourhood Renewal*, Policy Briefing. London: Black Regeneration Forum

Smith, S.P. and Sheate, W.R. (2001a) 'Sustainability appraisal of English regional plans: requirements of the EU Strategic Environmental Assessment Directive', *Impact Assessment and Project Appraisal*, Vol. 19, pp. 263–76

Smith S.P. and Sheate, W.R. (2001b) 'Sustainability appraisals of regional planning guidance and regional economic strategies in England: an assessment', *Journal of Environmental Planning and Management*, Vol. 44, pp. 735–55

Social Exclusion Unit (1998) *Bringing Britain Together: A National Strategy for Neighbourhood Renewal.* London: SEU, Cm 4045

Stratford, N. and Christie, I. (2000) 'Town and country life' in R. Jowell, J. Curtice, A. Park, K. Thomson, L. Jarvis, C. Bromley and N. Stratford (eds) *British Social Attitudes, 2000–2001: Focusing on Diversity*, The 17th Report, National Centre for Social Research. London/Thousand Oaks, Calif.: Sage Publications, pp. 175–208

TEES (1995) *Health, Illness, and the Environment in Teesside and Sunderland*, TEES Environmental Epidemiology Study. University of Newcastle upon Tyne

Townsend, P. and Davison, N. (1992) *Inequalities in Health*. London: Penguin

Townsend, P. *et al*. (1986) *Inequalities in Health in the Northern Region*. Newcastle: Bristol University and Northern Regional Health Authority

Townsend, P. *et al*. (1988) *Health and Deprivation: Inequality and the North*. London: Routledge

Tregear, A., Kznesof, S. and Moxey, A. (1998) 'Policy initiatives for regional foods: some insights from consumer research', *Food Policy*, Vol. 23, pp. 383–94

Walker, G., Fairburn, J. and Bickerstaff, K. (2000) *Ethnicity and risk: the characteristics of populations in census wards containing major accident hazard sites in England and Wales*, Occassional Paper 15. University of Staffordshire: Department of Geography

West, A. and de Silva, D. (1999) '*Down To Earth*': *Report of a National Conference on Environmental Action and Sustainable Development in a Multi-Cultural Society*. London: Community Development Foundation

Whitehead, M. (1992) 'The Health Divide', in Townsend, P. and Davison, N. (eds) *Inequalities in Health*. London: Penguin

WHO (1997) *Health and Environment in Sustainable Development*. Geneva: WHO

WHO (2000) *Environmental Health Indicators: Development of a Methodology for the WHO European Region*, Interim Report. Bilthoven: WHO Europe

Wood, C.M. and Djeddour, M. (1992) 'Strategic environmental assessment: EA of policies, plans and programmes', *Impact Assessment Bulletin*, Vol. 10, pp. 3–22

World Commission on Environment and Development (1987) *Our Common Future* (the Brundtland Report). Oxford: Oxford University Press

Wynder, E.L. and Graham, E.A. (1950) 'Tobacco smoking as a possible etiologic factor in bronchiogenic carcinoma', *Journal of the American Medical Association*, Vol. 143, pp. 329–37