



MAKING THE CASE

FOR THE SOCIAL SCIENCES

**No. 3 SUSTAINABILITY,
THE ENVIRONMENT AND CLIMATE CHANGE**

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Foreword

For several decades scientists have argued that the increasing demands being placed on the planet's resources are in the long run unsustainable. The problem can only get worse as governments everywhere seek to meet the demands of the world's expected nine billion inhabitants by 2100. The precise consequences remain uncertain in their timing and geographical distribution but we already observe declines in biodiversity, the widespread destruction of forests, the exhaustion of fisheries, soil erosion and environmental pollution. And to this mix we can now add the threat of climate change linked to rising sea levels, water shortages and more extreme weather events.

Global trends, when expressed as averages, can appear to be relatively slow-moving, permitting a comfortable rate of adaptation in wealthy and technologically advanced countries, and this may help to explain why governments have been reluctant to act. On occasion, effective collective action has been taken, as in the case of CFCs and the hole in the ozone layer; but more generally the positive intent behind many sustainability strategies, climate change conferences and the Millennium Development Goals has been strongly compromised by national interest. Debate over the reliability of scientific evidence and the kinds of technological solutions required to reduce our dependence upon carbon, for example, have fed back unhelpfully into even more complex debates about how best to change the behaviour of individuals, corporations and governments. How should we structure market incentives? What kinds of regulation can work? And what should be the roles of local communities and voluntary action?

The work of social scientists is central to finding solutions since their causes and consequences are broadly societal. We need, for example, a better understanding of international geo-politics, environmental risks and vulnerability, consumer behaviour, energy security and the delivery of policy. The case studies included here demonstrate the extensive and continuing contribution of, indeed leadership in, research to the development of solutions through policy initiative and best practice at all scales of governance; and, in particular, how to deal with the potential consequences of climate change.

The Academy of Social Sciences, in its role as the voice of the social sciences in the UK for the public benefit, is delighted to present you with some examples to demonstrate how social scientists are helping the country and the world understand these important issues and find solutions. The booklet has been compiled with the assistance of several Academicians who are authoritative in the areas covered and with the substantial production support of the British Psychological Society, without which neither the booklet nor its content would have been possible.



A handwritten signature in black ink, appearing to read 'C Cooper'.

Professor Cary Cooper
CBE AcSS
Chair of Council,
Academy of Social
Sciences



A handwritten signature in black ink, appearing to read 'G Mulhern'.

Dr Gerry Mulhern
CPsychol
President, The British
Psychological Society



A handwritten signature in black ink, appearing to read 'Ann Colley'.

Professor Ann Colley
CPsychol AcSS
CEO, The British
Psychological Society



Prosperity without growth

When the Sustainable Development Commission (SDC) announced it was to undertake a project on economic growth and the environment, there were a few raised eyebrows in the corridors of Whitehall at what appeared to be a contradictory task. To an economist the idea of an economy that doesn't grow is an anathema yet, to an ecologist, the continual expansion of the material economy simply doesn't make sense. **Professor Tim Jackson AcSS**, at the University of Surrey, led the *Redefining Prosperity* project in his role as Economics Commissioner.

This profound dilemma has haunted the environmental debate for decades, so Professor Jackson commissioned a series of think-pieces from intellectual leaders around the world to address critical elements in the puzzle. Over a period of six months between November 2007 and May 2008 psychologists, anthropologists, economists, philosophers, policy-makers, journalists, sociologists and environmental scientists met around a table in Whitehall to listen to the arguments and debate the issues.

Drawing both on the SDC process and on the insights from his own 15-year social research programme at the University of Surrey, Professor Jackson drafted what turned out to be a controversial and ground-breaking document. *Prosperity without Growth* swiftly became the fastest downloaded report in the Commission's 10-year history. A revised and expanded version, published in November 2009 by Earthscan, was reprinted three times in its first year and is already being translated into 11 different languages.

Although it provides no silver bullets or 'off-the-shelf' solutions, the book is bringing out the debate around the dilemmas inherent in growth, unravelling the economic and social forces that trap us in it, and offering concise policy-relevant suggestions for ways forward. *Prosperity without Growth* has helped to inspire a renewed search for a lasting prosperity and a variety of Government and civil society led initiatives to build a more ecologically sustainable economy.



Energy consumption and the problem of 'behaviour change'

Effective responses to climate change need substantial reductions in energy consumption. New, more efficient, technologies and less polluting forms of supply are part of the story, but the bottom line is: ways of life will also have to change. So, governments spend substantial sums persuading individuals to do their bit, to kick the CO₂ habit and act responsibly. An estimate from the National Audit Office says such initiatives cost £284 million a year for the UK and yet energy demand has fallen hardly at all. **Professor Elizabeth Shove** of Lancaster University decided to investigate why.

Interviews with more than 100 households, policy-actors and manufacturers, plus historical studies of bathing, laundering, heating and cooling indicate that practices like those of taking a daily shower or of maintaining 22°C indoors whatever the weather cannot be explained in terms of personal preference or individual choice. Rather, successful energy-consumption reduction is a matter of understanding how

patterns of daily life evolve along with ordinary technologies and infrastructures like bathrooms, kitchens, and washing machines. Put simply, people do not use energy; they use the services it makes possible. The researchers found that the issue is one of convention and infrastructure, not of individual choice.

Research in this tradition has been influential in showing that individual persuasion as a policy strategy has significant limits and in showing the many other ways in which governments and businesses shape what people take to be normal ways of life.

These insights have been taken up both within the UK – by the Royal Commission on Environmental Pollution, by the WWF and by the National Audit Office – and internationally by the UN Environment Programme and the World Business Council for Sustainable Development.

www.lancs.ac.uk/staff/shove/transitionsinpractice/tip.htm



Navigating pathways to sustainability

More than a billion people in the world today go hungry. Global environmental changes are increasing stress on food, health, water and energy supplies. The challenge is to make human development and global innovation take more account of environmental sustainability and social justice. Over the last four years, researchers at the ESRC Social, Technological, and Environmental Pathways to Sustainability

(STEPS) Centre at Sussex University – led by **Professors Melissa Leach, Ian Scoones** and **Andy Stirling** – have looked at new kinds of methods, concepts and practices which aim to help put human development and global innovation on more sustainable paths.

Projects in the urban slums of Delhi, the highlands of Kenya and rural China have



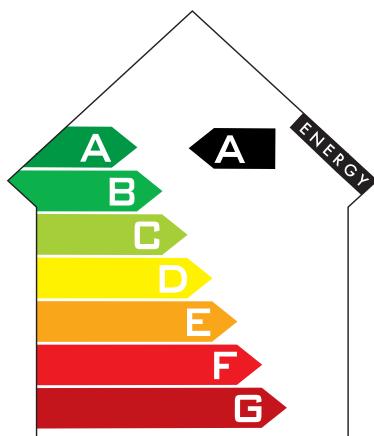


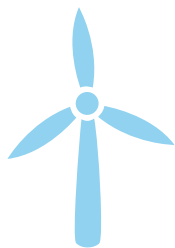
refined a new method for enabling excluded, but highly knowledgeable, communities to engage in key sustainability-related decisions on more equal terms with experts, big business and policy makers. This has highlighted new 'pathways' to more sustainable farming strategies, water infrastructures and health systems. The resulting STEPS pathways approach has been picked up by the *Salzburg Global Seminar* chaired by Kofi Annan, the World Health Organisation, the Gates and Rockefeller Foundations, the UK Foresight Programme on *Global Food and Farming Futures*, DfID and the Wellcome Trust.

A new STEPS tool for measuring diversity in innovation strategies and stakeholder engagement has been published by the Royal Society and referred to in their recent study on international research, *The Scientific Century*. A concept of 'transformative innovation' has been built into the *Defra Innovation Strategy* and new STEPS thinking on resilience has been adopted by natural

science colleagues in several international projects. A high profile 'New Manifesto' project has united efforts of many like-minded organisations and institutes, helping to catalyse a series of similar manifestos in China, India and Latin America, and prompting discussion of linked initiatives by UNESCO and the *Third World Academy of Sciences*.

More can be read on these activities at www.steps-centre.org and www.anewmanifesto.org





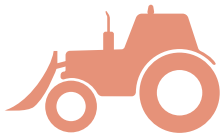
Designing out environmental damage: understanding the institutional challenges

In the past, policy makers have tried to deal with environmental problems only once they have emerged and become troublesome. In the 1990s, many countries tried a more preventative approach whereby the sectors that were causing pollution, such as transport and agriculture, would take environmental factors into account at the design stage. In principle, this could go a long way towards promoting sustainability, but in practice there are many obstacles standing in its way.

Over the last ten years **Professor Andrew Jordan AcSS** has drawn on an extensive body of work conducted with **Professor Adriaan Schout** of the Clingendael Institute in the Netherlands and **Professor Andrea Lenschow** of the University of Osnabrück to inform policy makers about what facilitates and/or hinders such environmental policy integration. They looked at the ways in which OECD countries normally go about developing new policies and how easy it is to include,

or at least avoid overlooking, environmental issues at an early stage. They found that while many OECD states were politically committed to the broad principle of 'integration', very few had systematically re-designed their policy-making processes to implement it in practice. Their findings were published in two books: *The Coordination of the EU* (which was awarded the European Studies Association's 'best book' prize in 2007) and *Innovation in Environmental Policy?*

In 1999 their evidence encouraged the House of Commons Environmental Audit Committee to look again at this challenge – as one requiring deeper collaboration between different levels of governance, specifically the EU and its member states, as well as sectors of policy. In 2004-5, this work informed the design and main findings of a European Environment Agency review of best practices in different EU states. Following a workshop which the team organised for high-level policy coordinators in the EU, the Dutch environment ministry



decided to change its internal procedures to take account of this finding. Subsequently, Professor Schout served as an expert advisor to the Commission's Directorate-General for Research and the EU's Economic and Social Committee. Professor Jordan was subsequently asked by UK Foresight to advise them on how the

findings could be extended to a closely related policy challenge – international migration triggered by systemic environmental pressures such as climate change.

www.uea.ac.uk/env/people/facstaff/jordana



Promoting more sustainable communities

Global sustainability problems cannot be addressed without a myriad of pro-environmental changes at a local community level. Community-led initiatives can have a major influence on the sustainability of local food provision, transport, energy, waste, housing and household management – all ‘heavy hitters’ in terms of environmental impact. The processes involved in establishing and running successful local sustainability schemes are, however, poorly understood.

A research team led by **Dr Alex Franklin** and **Dr Julie Newton** from Cardiff’s ESRC-funded Centre for Business Relationships, Accountability, Sustainability and Society (BRASS), tried to uncover the secrets of successful community initiatives through a long-term research partnership with the community in Stroud, Gloucestershire who have a reputation as sustainability pioneers.

The research exposed the weaknesses in traditional approaches to promoting

sustainable communities as these tend to rely on developing a standardised ‘toolkit’ of skills and knowledge to use in teaching communities about sustainable living.

It revealed the importance of people learning from *doing* rather than by being told, and of finding ways to connect people to sustainability which matched the nature of their everyday lives and the unique characteristics of where they lived.

Ultimately the key was to build strong links between people’s sense of ‘place’ and sustainability, taking into account the fact that different people living in the same place may relate to their hometown, and the issue of sustainability, very differently.

The findings from the project have been presented to key policy makers in Westminster and at international

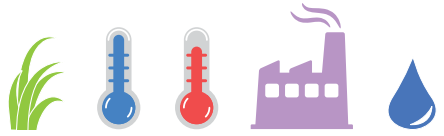
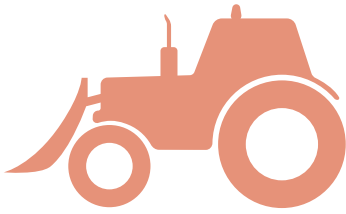


conferences in the USA and Canada, generating considerable interest. They have also been combined with international best practice examples in an interactive, web-based sustainable community model which people can explore to learn more about establishing sustainable communities. This online resource is complemented by practical guidelines to help communities seeking to develop sustainability projects to better understand the roles that skills, knowledge and learning play in their success. BRASS and Stroud are now building on their research partnership to learn about the development of sustainable local food businesses through the experience of a new scheme called StroudCo.

www.brass.cf.ac.uk/community/

[www.brass.cf.ac.uk/uploads/
Sus_Community/Guidance_Note_Final.pdf](http://www.brass.cf.ac.uk/uploads/Sus_Community/Guidance_Note_Final.pdf)





Getting biopesticides to market

Political scientist **Professor Wyn Grant** of the University of Warwick led a project within the Rural Economy and Land Use programme (RELU) looking at the political and economic obstacles that have impeded the wider use of promising biopesticides. Natural resistance and the withdrawal of some products for regulatory or commercial reasons has meant that fewer chemical pesticides are available so agriculture needed more mass-produced biologically-based agents to control plant pests, but few were coming onto the market.

Whilst it was clear that regulation of these products is necessary – just because something is ‘natural’ doesn’t mean it is safe – there were barriers preventing them from being licensed and so becoming available to growers.





Many of the difficulties seem to arise because the processes were designed for chemical pesticides: questions asked about chemical products were not necessarily relevant to biological products, so that the system had an inadequate or incomplete regulatory design. This compounded other problems faced by smaller companies in meeting regulatory requirements.

The research team interviewed a wide range of relevant parties, ranging from supermarkets to regulators; they observed meetings between the Pesticides Safety Directorate (PSD) and companies applying for product registration; and they arranged training for PSD staff. The PSD was very receptive to improving the regulatory system and worked constructively with the research team. Some supermarkets were more interested than others in encouraging the use of biocontrol products, but there was a lack of interaction between the supermarkets and the other people involved in the licensing process.

The research helped to overcome risk averseness in a very conservative organisation. As a result, the UK now has a permanent Biopesticides Scheme, offering reduced fees for registration, and has led the field in Europe for biopesticides regulation: because companies can choose in which country to apply for licensing, they often choose the UK, and The Netherlands is following closely behind. The research also emphasised Integrated Pest Management as a generic approach to pest control. The team participated in the European Commission policy action REBECA biocontrol and integrated pest management is a central element of the new package of legislation passed by the EU in 2009.

www2.warwick.ac.uk/fac/soc/pais/biopesticides/

www.relu.ac.uk/news/policy%20and%20practice%20notes/Grant/1%20November%202007%20Wyn%20Grant.pdf



What should we be doing about the risk of flooding?

Flood risk appears to be increasing in the UK as a result of likely climate change, but the possible magnitude of future risk was unknown. As part of the Foresight Future Flooding project **Professors Edward Evans** (University of Glasgow), **Jim Hall** (Newcastle University) and **Edmund Penning-Rowsell** (Middlesex University) led a large team of 42 UK specialists from all disciplines, including a group of economists, sociologists, and geographers.

A model based of flood risk today based on Geographical Information Systems (GIS) was applied to four socio-economic scenarios, coupled to Intergovernmental Panel on Climate Change (IPCC) and UK Climate Impacts Programme (UKCIP) forecasts of future climates, to look at frequency, extent and consequences of future floods if the existing flood defence policy remained unchanged.

The results were startling. From an annual cost to the country of flood damage of possibly £1bn today, the research indicated

an increase to the equivalent of over £20bn a year by 2080 under the most extreme climate change scenario, and at least a doubling of risk in the most benign situation. Coastal areas were hardest hit, driven by sea level rise. Even substantial increases in possible flood defence budgets failed to restrain the forecast increase in flood damages, showing that 'engineering our way out' of this increase in risk was not a viable strategy.

Sir David King, Chief Government Scientist at the time, has since written: *'The project had an immediate impact in the UK. There was a significant rise in funding for flood defence in the UK after publication of the Foresight Future Flooding report, and this was sustained until about 2008... There are very few projects of this magnitude in my opinion that have had such a big impact both nationally and internationally.'*

Following the project the UK's annual flood defence budget was increased from £600m to £800m and Defra's 2005 flood risk



management policy on *Making Space for Water* was a direct response to the projected future increase in flood threat. The successful TE2100 project on the future protection of London from flooding also built on the *Foresight* approach and was accepted by the Environment Agency and government as the basis for decisions about the future of the Thames Barrier.

Internationally, a comparable Sino-British project has been undertaken successfully in China, and the US Corps of Engineers is actively following in the same direction.

www.bis.gov.uk/foresight/our-work/projects/published-projects/flood-and-coastal-defence



Flood risk management – redistributing expertise

Devastating environmental events such as flooding can move those affected by them to question and, sometimes, dispute the expert knowledge claims associated with the science and management of environmental risk. 'Why do they keep saying it's a one-in-a-hundred-year-event when we've been flooded three times in five years?' 'Wouldn't proper maintenance of the river channels be more effective than building flood walls?' 'We're the ones with experience of flooding, why aren't the "experts" interested in what we know?' Such questions are posed in specific local contexts, and can only be adequately addressed at the same scale. Such 'knowledge controversies' have typically been seen in environmental science and policy communities as troublesome problems to be avoided. **Professor Sarah Whatmore AcSS** of the University of Oxford and a research team funded by the Rural Economy and Land Use (RELU) programme investigated whether, and how, knowledge controversies could actually help

democratic societies handle environmental uncertainty more effectively.

The team looked at flood risk modelling as the main scientific practice relied upon by the agencies responsible for flood risk management in the UK. They found that the provisos attached by flood scientists to their claims tend to be blunted in the service of evidence-based public policy, so that carefully worded scientific propositions become hardened into technical statements that appear to be 'known facts'. The lack of transparency about how such expert knowledge claims were produced is what leads to controversy when people affected by flooding look at them.

Working in two localities affected by flooding (Ryedale in Yorkshire and Uckfield in Sussex), the team also developed a new research methodology – Competency Groups – designed to help with knowledge controversies. This involved the social and natural scientists in the project team collaborating with volunteer residents to



look at what informed local flood risk management and to try out alternatives. These collaborations produced new ways of modelling flood risk, incorporating local knowledge into the production of bespoke models of flood dynamics and the effects of various kinds of intervention. In the case of Ryedale, the group's alternative suggestion for reducing flood risk by means of a series of bunds (mini-dams) has since been independently tested as part of a new flood management strategy funded by a Defra

demonstration project, and is now being constructed with funding from the District Council.

This approach to knowledge controversies, and the Competency Group methodology for intervening in them, is being turned into a web-resource so that people involved in other fields of environmental science and policy – such as ecosystem or climate change management – can try them for themselves.

<http://knowledge-controversies.ouce.ox.ac.uk/>



Visualising alternative coastal futures

Coastal erosion and flooding are directly linked issues in a number of parts of the UK including North Norfolk. Here, cliff erosion provides the sediment that protects the low-lying Norfolk Broads to the south from flooding. These cliffs have also been heavily protected in the 20th century to safeguard cliff-top settlements. However, doing this has increased the flood risk in the south as less sediment has been supplied to nourish local beaches. A *coastal simulator* was designed by researchers working in the Tyndall Centre to quantitatively simulate future changes and hence inform future management choices.

Professor Andrew Watkinson of the University of East Anglia and **Professor Robert Nicholls** of the University of Southampton led a large interdisciplinary team across nine UK institutions. This study brought together future climate projections from the IPCC, socio-economic scenarios developed by UK agencies such as UKCIP, and various shoreline management policies. Algorithm-based socio-economic scenarios

of the built environment were developed, and a range of different possible management approaches were produced and analysed.

The results represent a world first in earth systems simulation, together with quantitative estimates of the impacts and changing risks associated with coastal flooding and cliff erosion stretching out into the 21st century. The work showed that there is an important trade-off between erosion risk and flood risk, which must be considered in future coastal management.

The products of the simulator, together with more simple diagrammatic visualisations of what the coast might look like in the future, were used as a basis for engaging local communities in a more structured debate over how the coast and local communities might evolve in the future. The research findings empowered different stakeholders to develop a shared vision for the future.

www.tyndall.ac.uk/content/tyndall-centre-coastal-simulator



Dampening demand for gas-guzzlers: economic research informing public policy

In 2007, the Department for Transport (DfT) were keen to build a strong evidence base to help develop policy that would encourage people to purchase fuel-efficient cars and so reduce the UK's emissions of CO₂. The plan was to understand how cost and price differentials affect consumer decisions to purchase low carbon cars.

From the outset **Dr Brett Day**, from the School of Environmental Sciences at the University of East Anglia, advised the DfT on academic developments in the field of demand modelling and how those might be used to build an evidence base that would provide a way of understanding the impact of changes in car purchase and running cost on the relative proportions of cars purchased with different levels of fuel efficiency. That advice evolved into a major empirical research project.

The DfT provided access to information held by the DVLA on the purchases of cars in the UK. Combining that with commercial data on car specifications and prices, and with

household data held by the UK Data Archive, Dr Day was able to construct a rich data set recording patterns of demand for cars in the UK over the period 2001 to 2006.

Extending state-of-the-art techniques of econometric analysis, Dr Day used the data to build a model of household demand for the purchase of cars in the UK. That model could predict how demand for different types of cars would react to changes in tax or cost structure. The DfT now had a tool that they could use to explore what effect changes in policy and changes in price and running costs might have on the fuel efficiency profile of the UK's car fleet.

Laura Fellowes, Head of the DfT's Environment Analysis and Economics Division, said that '[the project] provides an excellent example of research that advances both the evidence base for public policy and the body of knowledge on economic valuation'.

<http://www.dft.gov.uk/pgr/economics/rdg/cardemand/cardemandreport2.pdf>



Improving recycling rates in local communities

In response to challenging targets to reduce household waste, Guildford Borough Council commissioned **Professor David Uzzell**, an environmental psychologist at the University of Surrey, to undertake research to develop innovative methods to increase participation in Guildford's Kerbside Collection Scheme.

The psychological dimension of an environmentally friendly behaviour such as recycling usually means 'what are people's attitudes?', yet it is known from other research that attitudes are not always a reliable predictor of behaviour: people are happy to say that they believe it is important to act in an environmentally friendly way but are often less happy actually to do so. There is also an assumption that, if recycling is made convenient enough, then the public will simply participate. This research focused on the extent to which an individual's waste management habits are determined by often disregarded factors: neighbourhood

influence and their own sense of who they are – their identity.

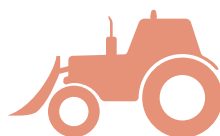
Neighbourhoods in the borough were identified to receive feedback about how well their street was doing in terms of recycling participation. Over a 10-week period, households received different forms of feedback on levels of participation (in comparison to other areas, their previous performance and local authority targets). Recycling rates increased by up to 90 per cent in some streets and remained high (80 per cent) even after the feedback had been discontinued. The approach was rolled out across the borough, which also recruited a team of volunteer 'recycling champions' in their local communities. These 'champions' helped by putting out their kerbside collection boxes on the correct day and time, to remind their neighbours to do the same or by getting involved in activities to highlight recycling activity. This was very successful and helped the increase in recycling rates.



A spokesperson for the council said, 'The results of this ground-breaking research have been enormously helpful in assisting Guildford Borough Council to develop its waste awareness strategy for the future. It provided incontrovertible proof that campaigning at a grassroots level in recognisable local communities is extremely

effective. The work being carried out by our community recyclers combined with service improvements to our recycling schemes is beginning to pay real dividends with our latest figures showing a recycling rate of 33 per cent.' By 2009 the rate had increased further to 40 per cent.





Greening the CAP

Research conducted at the Centre for Rural Economy (CRE) at Newcastle University by **Professors Philip Lowe OBE AcSS, Neil Ward AcSS** and **Dr Katherine Falconer** has had a major impact on the greening of the European Union's Common Agricultural Policy (CAP) in the UK and beyond.

In the 1990s, the CAP was widely criticised in the UK for its cost and its limited provision of public goods. UK farming unions opposed reductions in direct payments to farmers, claiming UK agriculture's competitive position would be damaged.

Through expert interviews and economic analysis, the research examined the scope to 'modulate' farm payments, switching some of the money subsidising farm production to support countryside management and rural development schemes.

The research showed that modulation would not only be environmentally beneficial but would assist in diversifying

rural economies. The reform would helpfully widen the range of beneficiaries of CAP payments beyond farmers and could improve the competitiveness of UK agriculture within the EU.

The UK's Minister of Agriculture arranged for a joint briefing on the implications for CAP reform with the European Agriculture Commissioner at the University. EU member states were subsequently given an option to switch payments in this way. Further advice on how modulation should be pursued in the UK was given when Neil Ward, then a CRE researcher, was seconded to the Cabinet Office to review rural and agricultural policy and briefed the Prime Minister and other key ministers.

The UK Government was convinced to take a lead in switching hundreds of millions of pounds from production subsidies to environmental payments – the only member state to pursue this option up to 2006. This initial voluntary adoption of modulation by the UK then paved the way



for the EU to introduce a system of compulsory modulation for all member states.

The UK's bold decision effectively doubled the annual spend in England on agri-environmental schemes from approximately £80m per year in the mid-1990s to over £160m per year a decade later. The UK's early adoption of modulation set a new and more radical course for Europe in redirecting the financing of the €50 billion CAP during subsequent reforms, opening much wider opportunities for the CAP to support environmental and rural development objectives. As we approach another CAP reform in 2013, further modulation of payments is being pressed for to improve the ecological capacity of European agriculture and to protect vital ecosystem services.

www.ncl.ac.uk/cre/publish/pdfs/rr99.3a.pdf

www.ncl.ac.uk/cre/publish/pdfs/wp36.pdf





Climate change and food security

Climate variability, especially drought, has always posed serious risks to food security. The impacts depend on both the climate and on the vulnerability of the people and places affected.

Professor Diana Liverman AcSS of the Universities of Oxford and Arizona has looked at how food systems respond to climate risks. She analysed how climate affects crop yields and farm livelihoods in countries such as Mexico, and conducted fieldwork and interviews to understand the ways in which farmers adapt by using irrigation, changing crops, seeking alternative work or buying insurance. Together with colleagues around the world, she completed integrated assessments and comparative case studies of climate change and food systems.

The research showed that food systems become vulnerable to climate change in highly complex ways. For example, as climate changes, irrigation may not be an option in drying regions and current crop

varieties may not easily adapt to new climate conditions. Because food is traded internationally the impacts of climate change, including prices paid by consumers and paid to farmers, are mediated through networks of producers, transporters, traders and retailers, and influenced by government policies at many different levels. Other changes in society – such as the privatisation of water and credit systems or government cutbacks in agricultural advice and food subsidies – are making it difficult for poorer farmers to make a living and for poorer people to access nutritious food. Uncertainties in projections of regional climate change make it difficult to plan for the future.

This type of research on climate change and food systems has prompted governments (including the UK and many developing countries), non-governmental organisations (such as Oxfam) and the private sector (such as major food processors and retailers) to consider how agriculture and



food systems can better adapt to climate change. Funding for food and agricultural adaptation is now a component of the climate change negotiations and has become a focus of the international development community. The international agricultural research community has initiated a major effort to help adapt food systems in the developing world to climate change. At local levels, climate information and

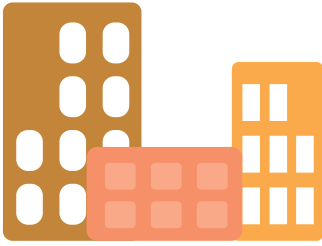
forecasts are being combined with insurance to help farmers cope with climate extremes.

For further information:

Global Environmental Change and Food Systems programme: www.gecafs.org/

Climate Change, Agriculture and Food Security: www.ccafs.cgiar.org/





Urban responses to climate change and resource constraint

The challenge for large metropolitan areas in the 21st century is to ensure their continued economic and social development while dealing with the uncertainties raised by global ecological change. As a result national and local governments are increasingly thinking about strategies for protecting large cities from climate change, for reducing reliance on external energy, water, food and waste flows, and developing the knowledge, expertise and governance capacity for effectively managing the changes required.

Using a range of methods, including analysing documents and interviews with policymakers, politicians, corporates, utilities and environmental groups, **Dr Mike Hodson** and **Professor Simon Marvin** of the University of Salford explored urban responses to climate change and wider resource constraint. They compared the knowledge and capacity being developed in large world cities, as well as their own context of Greater Manchester:

They showed how selected large world cities were able to strategically understand the implications of climate change for flooding, weather and other critical resource issues such as energy supply against the context of their own aspirations for economic growth. Local governments of such cities were also trying to increase their autonomy by decreasing their reliance on external infrastructure networks. Working through new urban networks, often with environmental groups and corporates, world cities were aiming to establish themselves as developing 'exemplary' urban responses that, it was claimed, could be transferred and adopted in other contexts. However, the research showed that cities varied in their ability to respond to developing challenges; therefore, a wider range of options for solutions are required and we should not rely on world cities to produce these.

This work has informed a number of governmental and commercial reviews as

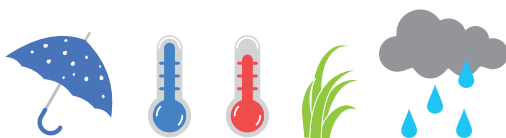


well as future international research and policy priorities. For example, the Centre for Sustainable Urban Futures (SURF) produced a framework for urban infrastructural transitions with Arup that has informed responses in Greater Manchester and a major new initiative in Cape Town. Also the Swedish research foundation, Mistra, launched a major comparative policy and

research programme to understand and develop context-sensitive learning from different urban responses. Urban governments are now better able to understand the different options involved in constituting responses.

www.surf.salford.ac.uk/page/Critical_Infrastructureell





Building resilience to climate change

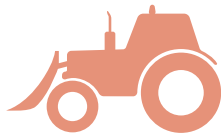
The impacts of a changing climate will affect the economy and geography of the UK. Changing frequency of floods and heat waves and increasing coastal management problems are all expected and to which adaptation will be required.

Professor Neil Adger led research at the Tyndall Centre for Climate Change Research into what adaptation is already underway in the UK, developing a database of what actions have already been undertaken, ranging from planning for storm surges on the Thames estuary to new agricultural practices, and assessing whether they could be regarded as examples of best practice that should be employed across the country. The resulting database, developed in collaboration with the UK Climate Impacts Programme (UKCIP) funded by Defra, has formed part of a web-based tool widely used by private and public organisations to determine their own adaptation needs and options.

The project led to many questions on how

well adapted the UK is to current climate events. For example, there were many hundreds of excess deaths among elderly people in the summer heat wave of 2003. In collaboration with public health scientists, Neil Adger and **Dr Irene Lorenzoni** surveyed elderly populations at risk from heat waves in Norwich and London. Some were especially vulnerable because they had few means of support and others because they ignored all assistance as part of their strong identity as living independently, the research adding to our knowledge of the difficulties in identifying hard-to-reach vulnerable groups. Subsequent research showed that the same populations are also vulnerable to cold wave events, although policy and intervention were much better aligned to deal with these risks.

Making the UK adaptable is a major policy concern and the Royal Commission on Environmental Pollution, the Environment Audit Committee of the House of Commons and the Climate Change



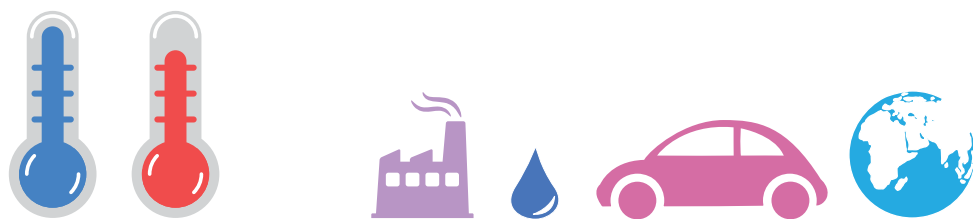
Committee have all reported on the risks and priorities in 2010 and all have drawn on the research and expertise of the Tyndall Centre. But, these risks are global and UK social scientists are contributing to the work of the Intergovernmental Panel on Climate Change (IPCC) in this area. Neil Adger, for

example, is convening a chapter on human security for the IPCC Fifth Assessment in 2013.

www.tyndall.ac.uk

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Determining climate change targets

An international treaty on climate change has to be based on good information about how far annual emissions of greenhouses gases can and should be curbed in order to limit the possible risks of global warming. In 2009 a team of researchers led by

Professor Lord Nicholas Stern,
Dr Alex Bowen and **Dr Nicola Ranger**

from the Centre for Climate Change Economics and Policy and the Grantham Research Institute on Climate Change and the Environment at London School of Economics and Political Science joined with the UK Met Office to explore this issue from the point of view of both natural and social science.

They explored how global temperatures might respond to different paths for annual emissions and which paths would be most economically desirable or feasible, in terms of the costs of deploying different technologies and of other actions required by the projected rates of emissions reductions, based on both past experience

and modelling of potential future measures to tackle climate change.

The research team found that to have a reasonable chance of avoiding global warming of more than 2°C above its pre-industrial level, annual global emissions of greenhouse gases must decrease from about 47 billion tonnes in 2010 to 44 billion tonnes in 2020, much less than 35 billion tonnes in 2030 and well below 20 billion tonnes in 2050.

Policy-makers from many countries used these findings in the run-up to the United Nations climate change conference in Copenhagen in December 2009. They were cited by then UK Prime Minister Gordon Brown and others in speeches and texts, and received wide media coverage.

On the eve of the Copenhagen conference, the centre and institute published further research showing that countries' pledges to cut emissions still mean that 49 billion tonnes would be emitted in 2020, so



further reductions would be required. New work has shown that annual global emissions are now too high to allow a reasonable chance of avoiding a temperature rise of more than 1.5°C. The researchers at the centre and institute continue to work

with the Met Office and the United Nations Environment Programme to inform the international negotiations leading up to the next conference in Cancún, Mexico, in December 2010.





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