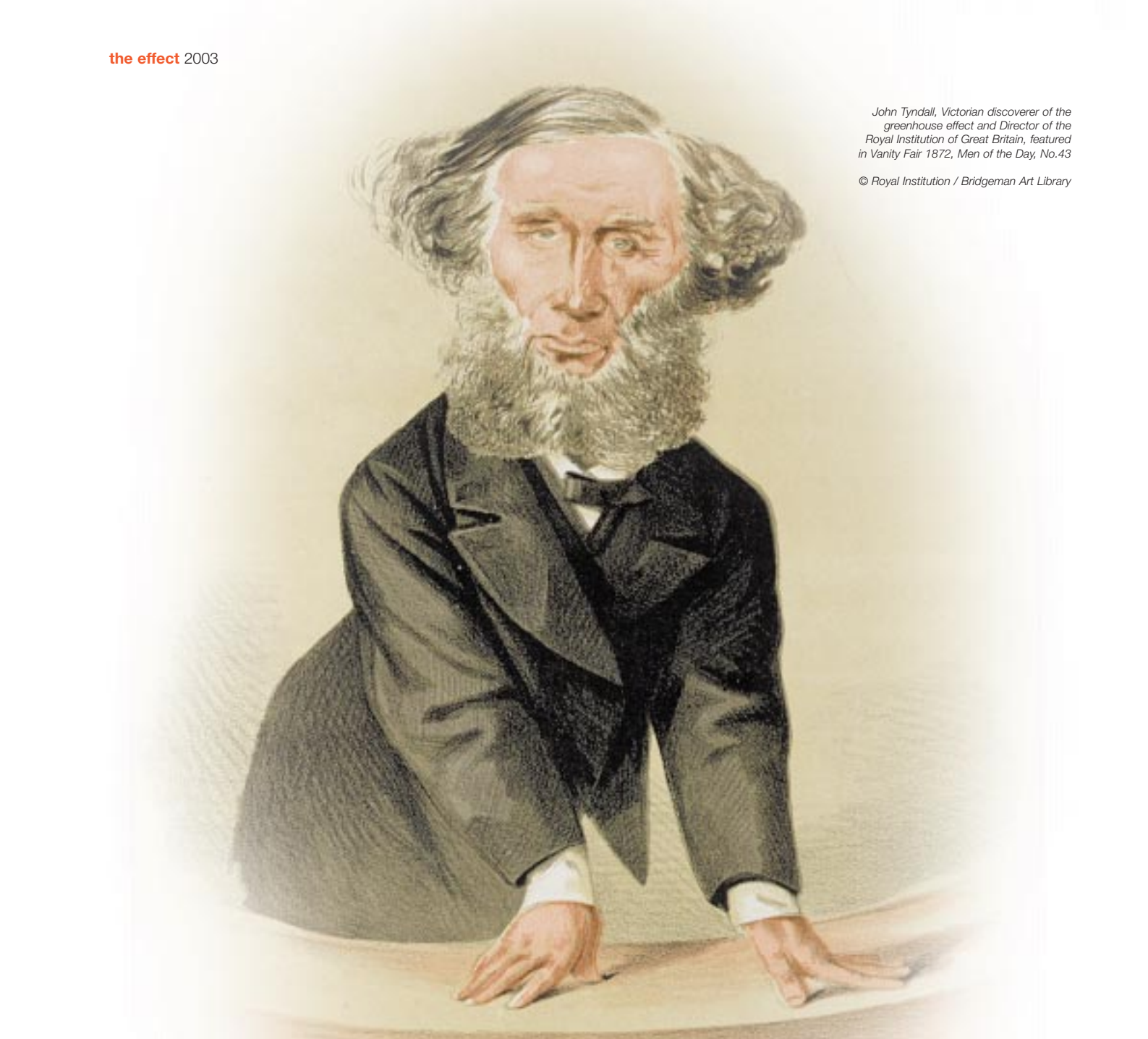
Tyndall Centre
for Climate Change Research

the effect 2003

Highlighting research and communication at the UK's Tyndall Centre

www.tyndall.ac.uk



John Tyndall, Victorian discoverer of the greenhouse effect and Director of the Royal Institution of Great Britain, featured in Vanity Fair 1872, Men of the Day, No.43

Climate change research for the 21st Century

The Tyndall Centre for Climate Change Research is a novel organisation founded in September 2000 by the UK's Research Councils. The Tyndall Centre integrates the UK's expertise from traditionally separate disciplines into a single unified body that represents the UK's mass of academic expertise in climate change research.

The Tyndall Centre's philosophy of integration is represented throughout its research, which brings together climatologists, social scientists, economists, biologists, policy analysts, engineers, businesses and industry from across the nation, and increasingly the continent and the world. With nine leading Universities at the core of the Tyndall Centre in 2000, it has now grown to 25 research centres and 150 researchers.

Named after John Tyndall, the discoverer of the greenhouse effect and successor of Michael Faraday as Director of the Royal Institution of Great Britain, the Tyndall Centre aims to be academically strong, socially relevant, and an outstanding science communicator.

We are always pleased to respond to suggestions for initiatives the Tyndall Centre should take; please contact Asher Minns (the Communication Manager) with your ideas a.minns@uea.ac.uk

The year in review

What effect has the Tyndall Centre had over the last year on what we know about climate change and on what science, policymakers and the public are doing about it? What has the Tyndall Centre discovered and what difference have we made? This second issue of the effect, covering the year 2002-03, is designed to help you answer these questions by introducing a selection of our work, our people and our successes.

In addition to progressing world class climate change research, the Tyndall Centre is committed to widening and deepening public debate about how society should respond to climate change. We are working with a view to inform policy development at international, national and local levels, and we have engaged with decision-makers and the climate policy process. For example, we have been considering 'Is international climate policy fair?' We have proposed a framework for analysing justice issues in climate change, which was presented and debated during the UN's climate change conference in Delhi in October 2002. A second workshop took place as part of the Third International Sustainability Days in September 2003.

"In addition to progressing world class climate change research, we are widening and deepening public debate"

Nationally, we have explored public reactions to carbon capture and storage and how these perceptions are influenced by the provision of information from different expert groups. This research has drawn considerable interest from industry and Government who recognise that the public response to introducing this technology is crucial, yet realise that little is known.

At a local level, we have developed a programme of dialogues called 'Re-designing the coast', bringing together scientists, policy-makers, coastal planners and the general public in a discourse about managing sea level rise on the East Anglian coast.

This is only a small selection of our 'global to local' activities over the past 12 months. The effect introduces you to some more and our web site and working papers - www.tyndall.ac.uk - provide a comprehensive account of our work.

Professor Mike Hulme
Executive Director
August 2003

A series of public meetings and workshops have introduced estimates of future sea level rise and their uncertainty, a range of coastal defence options, and evaluated the benefits of managed realignment for coastal defence and biodiversity.
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The Tyndall Centre has convened a series of workshops in Mexico, Brazil, Bolivia, Belize and the UK to discuss criteria for forest carbon management projects

Losing Caribbean Corals

Research funded by the Tyndall Centre and published in the international research journal, Science, shows that coral reefs across the Caribbean have suffered a phenomenal 80% decline in their coral cover

© Karen Cheney

Coral reefs across the Caribbean have suffered a phenomenal 80% decline in their coral cover during the past three decades, revealed new research funded by the Tyndall Centre and published in August in the international research journal, Science.

The amount of reef covered by hard corals, the main builders of reef framework, has decreased on average from 50% to just 10% in the last 25 years. Although the majority of the loss occurred in the 1980s, there is no evidence that the rate of coral loss is slowing.

"This rate of decline exceeds by far the well-publicised rates of loss for tropical forests. The feeling among scientists and tourists has long been that Caribbean corals are declining, since many people have seen reefs degrade over the years. We are the first to put a hard figure on coral decline across the region," said Toby Gardner, who did the research for his MSc dissertation at UEA.

The causes of coral decline are thought to include natural factors, such as hurricanes and disease, and man-made factors, like over-fishing, pollution, and sedimentation that smothers the coral.

The consequences of disappearing coral range from the collapse of fisheries, to dwindling tourism and increased coastal damage sustained during hurricanes.

"The good news is that there are some areas in the Caribbean that appear to be recovering, although the new communities are different to the old ones. We don't know how well they will cope with the challenges of rising sea levels and temperatures that result from global warming," said Jenny Gill, of Tyndall's coastal research team.

Further information: Dr Jenny Gill
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Cyclones shift seasons

Windstorms are likely to become more common in autumn and less common in winter, and southeast England should see an increase in cyclones, according to a Tyndall Centre analysis of storm activity that examined the impacts of climate change and windstorm damage on the UK's insurance and forestry industries.

Autumn storms are thought to cause more damage because leafed trees present more surface area to high winds than bare winter trees.

"We have detected these seasonal shifts but we do not expect a shift towards more extreme cyclones or a shift in the cyclone tracks for the UK," say Clair Hanson and Jean Palutikof at the Climatic Research Unit at the University of East Anglia. However, most climate models predict an increase and intensification of storm activity over continental Europe.

Clair and Jean have carried out extensive analysis of cyclone conditions over the North Atlantic and the UK, and have tested their models by comparing predictions against the seasonality, intensity, size and path of historical cyclones.

Industry partners in the project include the Forestry Commission, Royal-Sun Alliance, and CGNU insurers. The UK storm in 1987 destroyed the equivalent of two years of deciduous timber production, and the storms at the end of 1999 destroyed 10% of French forests.

Further information: Dr Clair Hanson c.hanson@uea

"southeast England could see an increase in cyclones, according to a Tyndall Centre analysis"

Windstorms are likely to become more common in autumn and less common in winter, and southeast England should see an increase in cyclones, says a Tyndall Centre analysis

© Still Pictures / Nigel Dickinson

Research that's useful to users

Climate change research clearly needs to better match the information needs of its users, say Alex Haxeltine and John Turnpenny at Tyndall HQ. They asked leading people from public, private and NGO organisations what it is that they want to know about climate change to enhance the usability and direction of Tyndall's research.

"Our results demonstrate the mainstreaming of climate change by an extremely diverse range of organisations. Each organisation has a unique research need to aid their decision-making," said John. "Some organisations need more treatment of social and economic aspects; others need a clearer expression of the statistical uncertainty of research results. Information always has to be transparent and well communicated."

Their answer to the diversity of information needs is the concept of 'strategic guidance' which aims to use different research tools specifically assembled for each question and organisation. Research tools include computer models, scenarios, expert judgement, and visual images of scenarios and futures.

These initial results have informed the design of two new case studies that will test and apply strategic guidance to an innovative methodology called Integrated Assessment. Integrated Assessment aims to connect the many different types of data - social, economic, engineering, climatic - that are needed to inform climate change decisions. The Tyndall Centre is at the forefront of integrated assessment research.

One case study will work with UK government for guidance on the dialogue around international climate policy; the second will develop user guidance for an integrated assessment for Eastern England.

Further information: Dr Alex Haxeltine a.haxetine@uea.ac.uk and Tyndall Working Paper 31

Internationally fair adaptation policies

At its starkest, those facing the greatest impact of climate change are least responsible. Who is likely to benefit and who will lose from decisions on adapting to climate change? And, crucially, who makes the decisions? Adaptation to climate change presents formidable dilemmas to the international community, but the potential injustice and inequity is not well understood.

Justice in adaptation to climate change was explored at a Tyndall Centre conference as part of the Third International Sustainability Days in September 2003. The workshop was organised jointly by the Tyndall Centre, the Centre for Social and Economic Research on the Global Environment (CSERGE), the Foundation for International Law and Development (FIELD) and the International Institute for Environment and Development (IIED).

"How vulnerable communities can best adapt to changing climate is both a practical and a moral issue for the international community," said Neil Adger, leading the Tyndall team on adaptation. "Creating fair processes and fair institutions is a vital part of seeking sustainable adaptation solutions," he said.

The research team have documented planning, insurance and everyday farming decisions in Asia, Africa, and Europe to assess common rules for fairness in adaptation. "The government of Samoa in the Pacific use traditional village councils to plan for climate change. This is adaptation in action," says MJ Mace from FIELD.

The conference brought together forty leading researchers from across the world to learn lessons for adaptation. With over fifty countries worldwide now developing national plans for adaptation, the conference made a timely input into seeking to make plans acceptable and sustainable.

Further information: Dr. Neil Adger n.adger@uea.ac.uk or m.j.mace@field.org.uk www.field.org.uk

"Creating fair processes and fair institutions is a vital part of seeking sustainable adaptation solutions,"

The Tyndall Centre and the Foundation for International Environmental Law and Development (FIELD) have been holding a series of international workshops to explore fairness in policies for climate change adaptation

The Tyndall Centre has successfully prototyped the first computer network that performs complex integrated assessments of traditionally disparate climate change research data. © M. Robinson

Computer capability prototyped

The Tyndall Centre has successfully prototyped their first computer network that performs complex integrated assessments of traditionally disparate data modules. The prototype system is unique in connecting global economic, emissions, climate and impact data across a distributed network.
The data modules are written by different authors at different research institutions and have been linked together by the Centre for Novel Computing (CNC) at the University of Manchester. It is based upon new software that harnesses the power of a network of computers to run distributed simulations of integrated climate change scenarios.

"We have demonstrated for the first time that we can link data from different disciplines to deliver rigorous results using pioneering information technology. We have tested our system against case studies and shown the model output to be valid," said Rachel Warren who leads the project.

The prototype has linked a pilot economics model from Tyndall's ETECH+ project, an emission module, a climate module from the University of East Anglia, and a climate impacts tool from the Potsdam Institute in Germany. The system is also connected to a downscaler to make the climate output regionally applicable.

"As other modules become compatible, this system will become a lot more sophisticated," says Rachel.

The next step is to demonstrate that the integrated assessment can be run on different computers in multiple locations, to allow different modules to be run at separate institutions. The system will ultimately support an emerging European virtual organisation that collaborates on complex integrated assessments.

Further information: Dr Rachel Warren r.warren@uea.ac.uk

Beliefs about climate change

Tyndall North and GKSS in Germany are developing a computer simulation of perception and responses to climate change by public, business, government and the media

© Courtesy of IISD / Leila Mead

The response of business to climate change will primarily be influenced by the perceived losses and gain in competitiveness, says Mercedes Bleda at the Institute of Innovation Research at UMIST and the University of Manchester. As innovative and adaptive capabilities increase, so does a firm's long-term competitiveness, driven by an increase in profit and its market share. These ideas are being tested in a survey with members of the business community.

Mercedes, in partnership with colleagues from Tyndall North and GKSS in Germany, is developing a computer simulation of perception and responses to climate change. Their model integrates the perceptions of climate change by the public, business, government and the media to represent 'belief clusters' that share influential ideas, knowledge claims and beliefs.

Dennis Bray at GKSS leads the project's public perception work, which is relating a belief in climate change to weather events and anomalies. "Personal experience has greater influence to the individual than reports made in the media," says Dennis. "And it is important to distinguish between the concepts of global warming and climate change when scientists frame the issue. It is also interesting to see how people's beliefs in climate change collapse more rapidly than they increase."

"Weather events and anomalies need to be defined quite precisely in their magnitude, frequency and distribution if the public is to interpret climate change as intended by the expert," he comments.

A government simulation is also underway. This project will ultimately be linked with a climate model that will integrate physical-world and sociological understanding.

Further information: Dr Mercedes Bleda mercedes.bleda@umist.ac.uk; Dr Dennis Bray bray@gkss.de; Dr Simon Shackley simon.shackley@umist.ac.uk.

Managing biodiversity for global climate change

Ecologists and conservationists from around the world discussed wildlife and climate change at the Tyndall Centre in partnership with the RSPB, English Nature, World Wildlife Fund and the World Conservation Monitoring Centre

Ecologists and conservationists from around the world discussed their observations and predictions about wildlife and climate change at a key international conference held in April at Tyndall Centre HQ. Global climate change and biodiversity was organised by the Tyndall Centre in partnership with the RSPB, English Nature, World Wildlife Fund and the World Conservation Monitoring Centre. The aim was to evaluate current research and define the next steps for wildlife scientists and conservation policy makers.

Including researchers from China, Australia, South Africa and Iceland, delegates' interests and expertise spanned from the Antarctic Ocean to tropical forests and from microscopic phytoplankton to large mammals.

The emerging importance of managing landscapes to allow species and ecosystems to adapt to a changing climate was a central theme. It was agreed that there will be wildlife winners and losers in the future as average temperatures increase. Losers are already at the edge of their climate range and have nowhere to move as temperatures warm. Other species, such as some butterflies and Mediterranean birds, are adapted to higher average temperatures and are increasing their range. It emerged that a much under researched area is the impact of climate change on marine ecosystems.

In discussing dangerous thresholds of climate change for biodiversity, some delegates felt that many ecosystems could cope with a global warming of up to two degrees centigrade but that significant and catastrophic losses could be expected at higher global temperatures. There was also discussion about the conservation sector becoming politically active in pressuring governments to reduce carbon dioxide emissions.

Further information: Professor Andrew Watkinson a.watkinson@uea.ac.uk or www.tyndall.ac.uk/biodiversityconf for the full conference report

Short-term forecasts inform long-term change

How society responds now to seasonal climate forecasts can tell us about its future capacity for coping with climate impacts, say Richard Washington from Oxford University and Tom Downing from the Stockholm Environment Institute. They are investigating the statistical connection between short and long-term climate predictions and how seasonal forecasts influence the behaviour of farmers in southern Africa.

Seasonal forecasts have operated in southern Africa for several years and are relatively accurate. "If a farmer in southern Africa uses a seasonal drought forecast to select resistant crops, reduce fertiliser applications, or increase irrigation, then he is adapting to seasonal climate. Alternately, the forecast might not influence his behaviour at all," says Richard. Farmers' adaptation to these seasonal forecasts may be linked to their ability to deal with climate change impacts on longer timescales.

"If you consider the timescales of carbon dioxide driven climate change in the 2030s, 2050, and 2080s, then the probable social responses over those timescales is enormous." The science to predict seasonal climate several months in advance is well established, as is the infrastructure to deliver the forecasts to farmers. "We are testing the statistical relationship between seasonal variation and long-term climate change, as well as the social response," says Richard. Though talked about at the World Bank, the World Meteorological Organisation and the UK Government's Department for International Development, this Tyndall Centre project is the first specific test using seasonal forecasts as a strategy for adaptation to long-term climate change.

Further information: richard.washington@geog.ox.ac.uk or tom.downing@sei.se

Tyndall research at Oxford University and the Stockholm Environment Institute is testing the statistical relationship between seasonal climate and long-term climate change, and the social response of southern African farmers to seasonal forecasts. © Emma Archer

Storing hydrogen for power and transport

Hydrogen storage presents a scientific challenge for demonstrating the feasibility of a hydrogen powered economy. Dimos Tsakiris, a chemist at Tyndall North, is investigating long-term hydrogen storage that has minimum transportation costs.

"Efficient storage solutions are a prerequisite for the optimum use of renewable energy such as hydro, solar, wind or even nuclear power," says Dimos.

One possible solution is the so-called MTH cycle, named after the liquid organic chemicals methylcyclohexane, toluene, and hydrogen. During the MTH cycle, surplus electricity generated in summer is used to produce hydrogen by the electrolysis of water. Hydrogen and toluene are then converted into methylcyclohexane in what is called the hydrogenation step. The methylcyclohexane is stored in tanks that can easily be transported to where the hydrogen fuel is needed.

In winter when domestic power demands are high, the hydrogen is recovered from the methylcyclohexane by dehydrogenation and transformed into heat or power. It can be combined with oxygen in a fuel cell, or burnt it in an engine or gas turbine. The leftover toluene is then recycled for further use in the next summer's MTH cycle.

"To demonstrate the feasibility of a future hydrogen economy, seasonal storage of electrical energy requires a satisfactory solution. This might be one of them," says Dimos.

Further information: Dimos Tsakiris d.tsakiris@postgrad@umist.ac.uk

Tyndall North is investigating technical challenges and policy implications for a hydrogen-fuelled economy

Warm to cool buildings

"Buildings being designed and built now need to be adapted to the climate in 100 years" says Professor Geoff Levermore at Tyndall North. He is generating future weather data that will be used by building designers

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Air conditioning will be the easiest option in new and existing buildings to provide future summer comfort while the requirement for winter heating will reduce slightly, show preliminary findings from Professor Geoff Levermore's and David Chow's research at Tyndall North and UMIST's Centre for Civil and Construction Engineering. These initial results suggest that any decrease in winter heating will not offset the electricity for summer air conditioning.

Geoff is researching how new buildings need to be designed in a changing climate. "Buildings being designed and built now need to be adapted to the future climate as some buildings will last for 100 years. They need to be designed for higher summer temperatures, more sunny days and increased humidity."

The next part of their research will test the effect of solar shading, changing the size of window glazing, and increasing thermal mass to reduce the effects of higher summer temperatures. These results, together with publication of the future weather data that underpins this research, will help building engineers have useful climate data for their designs. The climate data is being published in collaboration with the Chartered Institute of Building Services Engineers (CIBSE).

Further information: Professor Geoff Levermore geoff.levermore@umist.ac.uk

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Creating 40% Houses

"At the current rate of renewal (20,000 houses a year) it will take 1000 years or more to replace Britain's housing stock, so we need to revolutionise the energy efficiency of our existing houses," comments Graham Sinden of Oxford University's Environmental Change Institute. A controversial solution, according to colleague Dr Brenda Boardman, would be to increase the rate of demolition by 500% to 100,000 houses each year, every year. This could be achieved by Government policy but is unlikely to be popular.

The Tyndall Centre's 40% House project is examining immediate actions to decrease household carbon dioxide pollution by 60% by 2050, a target recommended by the UK Government's Royal Commission on Environmental Pollution.

40% House is building the United Kingdom Domestic Carbon Model (UKDCM), an integrated model of the energy profiles of the UK housing stock, to identify and transform the patterns of energy use. This will tackle thermal performance, heating systems, lights and individual appliances as well as potential climate change impacts on energy demand. "A full suite of policy and consumer changes are needed for a 40% House; it cannot be delivered with piecemeal strategies," says Brenda Boardman.

Further information: Graham Sinden graham.sinden@eci.ox.ac.uk

Defining dangerous climate change

Contributors from around the world asked in a Tyndall online forum: What is a dangerous level of climate change? A previous forum discussed the pros and cons of geological sequestering of carbon

The ultimate objective of the UN's Framework Convention on Climate Change is to prevent dangerous human interference with the climate system. But what is a dangerous level of climate change? Over 160 contributions discussed this central question in an online forum convened by Tyndall doctoral researcher Suraje Dessai. "Dangerous climate change has become a topical issue in scientific and policy circles but clearly also concerns wider publics," said Suraje. "With the online forum I wanted to broaden the debate about dangerous climate change to interested lay people."

"With the online forum I wanted to broaden the debate about dangerous climate change to interested lay people"

Several participants to the debate argued that issues of danger are not relevant to climate change, and that because of the large uncertainties in climate change, a definition would not be useful. Others suggested that without an agreed hazardous level of climate change, scientists cannot talk about risk. A suggested alternative might be to start looking at collective human responses to dangerous thresholds.

"The online debate at least highlighted the complexities in understanding and defining dangerous climate change," said Suraje. "I argue that to make progress in understanding dangerous climate change, and therefore develop sustainable responses, science needs to recognise the central role played by people's experiences and perceptions of danger."

Some contributors thought that an ultimate concentration target of greenhouse gases is essential for moving forward the international climate negotiations, while others did not - believing it is the impacts of droughts, floods and hurricanes, drowning and disaster that matter. One contributor argued that climate change only matters when people do not have the option to adapt their responses, or when the price of adaptation is high.

Dangerous climate change could be defined in terms of a physical measure where climate variability differs from what would normally be expected. Another contributor suggested an assessment that presents the facts to decision-makers with the use of real-world impacts, agreed by consensus, starting at local risk and working towards global definitions of dangerous climate change.

Further information: Suraje Dessai s.dessai@uea.ac.uk. The full discussion is at www.tyndall.ac.uk/forum/messages/archive/dangerous.html Also see Tyndall Centre Working Paper 28

Implications of EU emissions trading

The European Union's new Emissions Trading Directive will come into force in 2005, but what does it mean for existing UK policies? Tyndall researcher Steve Sorrell from the Science and Technology Policy Research Unit at the University of Sussex has been exploring the far-reaching implications of the EU scheme.

"The Directive is one of the most radical environmental policies for many years, but it is incompatible with many aspects of UK policy and the speed of implementation could create difficulties," says Steve. The Directive will initially cover electricity generators, oil refineries and energy intensive industries representing 45% of EU carbon dioxide emissions.

Steve Sorrell of the Social Policy Research Unit and the Tyndall Centre has been exploring the far-reaching implications of the EU's soon-to-be implemented Emissions Trading Directive

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The UK was an early starter on climate policy, having already established a complex set of policy instruments, including the controversial Climate Change Levy in April 2001 and the UK emissions trading scheme. The Levy led many companies to adopt complex negotiated agreements, while others volunteered to participate in the UK scheme. Now these companies are facing something completely different.

Steve says the EU scheme has turned the UK's early start into a false start. "Many of the existing agreements could be abandoned in the next 18 months."

Steve is now working with the UK Government's Department of Environment, Food and Rural Affairs (DEFRA) to develop rules for allocating tradable carbon allowances. The process is highly controversial as the allowances will ultimately be worth billions of pounds.

"Despite the clashes, I think the EU scheme is in many respects well designed. It is a pragmatic compromise between economics and political reality," says Steve. "Many people are only now waking up to the implications."

Further information: Dr Steve Sorrel s.r.sorrell@sussex.ac.uk

In welcoming the principal message of the UK Government's new Energy White Paper, researchers also called for integrated policy making. By 2030, 40% of the UK's greenhouse gas emissions will be due to expansion plans for aviation

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First reactions to the Energy White Paper

Some of the first experts to comment on the UK Government's new Energy White Paper were Tyndall researchers Kevin Anderson, Simon Shackley and Jim Watson. They welcomed the principal message that a long term energy strategy is essential if the UK is to remain on a path to 60% cuts in carbon dioxide emissions by 2050, and the strong emphasis on energy efficiency as a central tenet of reduction policies. They also endorsed the enthusiastic support of renewable energy technologies.

The lack of detail in the White Paper was, however, of some concern. The absence of a clear target for energy efficiency and the softening of a 'hard target' to an 'aspiration' for renewable energy's 20% contribution to electricity supply by 2020 were clearly disappointing.

The Tyndall researchers called for a more complete picture of the nation's carbon emissions in setting reduction targets. Now that the UK is no longer a manufacturing nation, many of its major commodities are produced abroad, which exports the UK's carbon pollution, which is then missed from the nation's emissions accounting.

They paid particular attention to the need for joined-up thinking in Government, citing the planned-expansion in UK aviation. By 2030 following the current path, 40% of UK greenhouse gas emissions will be due to aviation alone.

The Tyndall researchers also call for regulatory standards in manufacturing for maximum emissions and energy use. Industry would then be free to adopt or develop new technologies that meet the standards, encouraging innovation.

Further information: simon.shackley@umist.ac.uk or see Tyndall Briefing Note 6 at www.tyndall.ac.uk

Winning arguments with evidence

The Tyndall Centre took part in several Social Science Week events in June, including Winning Arguments, organised by the Economic and Social Research Council's (ESRC) Sustainable Technologies Programme. Senior researchers presented and discussed their successes and failures at informing government policy makers.

"The key insight to come from the event is that influencing policymakers is possible, however it is never quick or painless," says Frans Berkhout from the Science and Technology Policy Research Unit (SPRU) at the University of Sussex. "Researchers need to put more effort into how they tell the story that their research has uncovered. They need to engage in dialogue, not simply tell policymakers the results of their work. And they need to build trust over the long term. Like most people, senior managers in companies or government are most likely to be influenced by the people that they already know."

Frans has also been leading the Tyndall project: How can business adapt to climate change? The results of the research were discussed with a business and policy audience in June. A full record of the workshop will soon be available on the Tyndall Centre's website.

Further information: Dr Frans Berkhout f.berkhout@sussex.ac.uk or the Tyndall Centre's Business Liaison Manager Elaine Jones e.l.jones@uea.ac.uk

Exploring Science and Art

The Tyndall Centre is combining the cultures of science and art to create a major new original artwork that describes the aesthetic relationship between climate and the built environment. Canadian artist Janice Kerbel is creating the work in collaboration with Tyndall researchers and the Norwich School of Art.

Called Home Climate Garden, the exhibition consists of a series of sculptural plantings and drawings that are based on a number of everyday indoor habitats with different climates - for example, an air conditioned office, a library, a council flat, and a hair salon. Inspiring Janice's work is the connection between atmospheric quality, climate and plants.

The exhibition builds upon Janice's experience as artist-in-residence at the Tyndall Centre. Her previous work includes Bird Island and How to Rob a Bank, where she rethinks concepts and practices within the framework of the everyday to interrogate the relationship between the real, the imagined ideal, and the illusory.

Following its winter exhibition at Norwich Art Gallery, Home Climate Garden will tour selected UK art galleries in the New Year.

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Home Climate Garden is exploring science and art with gallery-goers and school pupils in partnership with Janice Kerbel, the Tyndall Centre's artist-in-residence

The Tyndall Centre is investigating how agriculture can adapt to summers with less water, when demand for irrigation is predicted to rise 20% by 2025

Involving the public in coastal decisions

Together with the Centre for Social and Economic Research on the Global Environment (CSERGE), the Tyndall Centre has organised a programme of regional discussions called 'Re-designing the coast'. The discussions have brought together scientists, policy-makers, coastal planners and the general public in a dialogue about managing sea level rise.

The series of meetings and workshops have introduced estimates of future sea-level rise and their uncertainty, a range of coastal defence options, and information on how decisions affecting the coast are made. The discussions have led to a new Tyndall project, led by Professor Tim O'Riordan that will research new forms of governance for more effective coastal management.

Tyndall's novel research into coastal 'futurescapes' is supporting the decision-making.

"To visualise coastal futures we create highly realistic visualisations using the same technology that you see on flight simulators, enabling the user to navigate around a digital coastal landscape and explore the future landscapes for themselves," said Andy Jones at Tyndall Centre HQ.

Andy Jones uses a custom-made portable equipment station to take the visualisations to public meetings, but the major innovation is a sophisticated virtual reality theatre within UEA's new Zuckerman Institute for Connective Environmental Research. The theatre will present visualisations on a large wrap-around screen, and by wearing special viewing glasses, users will get a feeling of 3-D immersion as they navigate the virtual reality landscapes.

Research into sea level rise and local decision making has been valued by Norfolk's coastal councils and regional organisations, and is now reaching national bodies such as the UK Government's Department for Environment, Food and Rural Affairs

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Further information: Professor Tim O'Riordan t.oriordan@uea.ac.uk; Dr Andy Jones a.p.jones@uea.ac.uk; and Dr Kate Brown k.brown@uea.ac.uk

In a case study at Christchurch Harbour and Barton-on-Sea in Dorset, Kate Brown and colleagues interviewed local people, business-owners and decision-makers about their attitudes and perceptions towards sea level rise and coastal defence. Early analysis suggests an interesting tension between participatory and centralised approaches to decision making, and that overall perceptions are clouded by the distant time horizons of the impacts of sea level rise. Other studies are now underway in Scotland and East Anglia.

The Tyndall Centre and the Royal Institution organized a public debate to discuss 'Nuclear Power: Global warming escape or unnecessary risk?' in the famous lecture theatre where John Tyndall delivered his 19th Century discourses

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Debating nuclear power with the public

The Tyndall Centre and the Royal Institution (Ri) organized an evening debate in May to discuss 'Nuclear Power: Global warming escape or unnecessary risk?' The debate was at the Ri's famous London headquarters, held in the same lecture theatre where John Tyndall delivered his 19th Century public discourses.

Professor Ian Fells of Newcastle University opened the debate. He argued that the loss of carbon-free power from the progressive closure of old reactors will outweigh the growth of renewable energy, unless the UK commissions new reactors.

The second speaker was Bruno Lescoeur, head of electricity generation at Électricité de France. France generates 80% of its electricity from nuclear, and exports 15% of its electricity to the rest of Europe. Bruno discussed the need for France's new generation of pressurised water reactors to replace its decommissioned reactors from 2017.

Vladimir Berkovski, Deputy Director of Radiation Safety in the Ukraine, summarized the scale and impacts of the accident at the Chernobyl reactor in 1986. Despite the severity of the accident, he explained that the Ukraine had no economic alternative but to proceed with its nuclear power programme that currently delivers up to 50% of its electricity.

The final speaker, Mark Johnston, argued that nuclear power is dirty, dangerous and expensive, citing a succession of nuclear accidents and continual small-scale leaks. He noted that without massive state subsidy neither British (nuclear) Energy nor British Nuclear Fuels could survive.

The proceedings are being published as a Tyndall Centre-Royal Institution report.

Further information: Professor Brian Launder brian.launder@umist.ac.uk

New Headquarters for Tyndall HQ

"Do something absolutely fresh and new in science," said Solly Zuckerman in 1960, the first Chief Scientific Advisor to the UK Government when he proposed bringing together scientists from different disciplines to study the environment. Zuckerman's vision has been continued by the Research Council's founding the Tyndall Centre; and at UEA through the building of the new Zuckerman Institute for Connective Environmental Science (ZICER).

The Tyndall Centre's HQ at UEA is now located within ZICER. A glass bridge connects the ZICER building to the Climatic Research Unit and the main School of Environmental Sciences.

The building is part-powered by a wall of solar panels, and is monitored as part of a Europe-wide project studying the design and integration of solar panels. A roof canopy system and reservoirs in the hollow concrete floors contribute to a high thermal inertia that should ensure temperatures vary by less than one degree centigrade throughout the year.

Tyndall North at UMIST in Manchester is also moving to newly prepared premises. They are relocating to the Pariser Building at the centre of the UMIST campus.

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"Do something absolutely fresh and new in science" said Solly Zuckerman in 1960. Tyndall Centre HQ is now located within UEA's new energy efficient building

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Science honour for the Tyndall approach

One of UK science's top honours, a Royal Society-Wolfson Research Merit Award, has been awarded to Professor John Schellnhuber, the Tyndall Centre's Research Director

One of UK science's top honours, a Royal Society-Wolfson Research Merit Award, has been awarded to Professor John Schellnhuber, the Tyndall Centre's Research Director. The award is in recognition of his research into integration science which investigates how very complex problems, such as global climate change, need input and understanding from many directions of understanding and expertise. Integration science is the backbone of the Tyndall Centre's research strategy.

"I am delighted that this Research Merit Award recognises the contribution of interdisciplinary, integrated research to advancing the environmental sciences. It is the Tyndall approach to climate change research," said Professor Schellnhuber.

Research Merit Awards attract the very best scientists to work in the UK. Professor Schellnhuber came to the Tyndall Centre from the Potsdam Institute for Climate Impact Research in Germany, where he is the founding Director. The Award, worth £1/4 million, is being used by Professor Schellnhuber to develop an integrated assessment system to better understand the complex decisions and solutions needed for climate change research.

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Feeling the effects of Arctic climate change

Arctic climate change and its implications for the UK were explored in May at a Tyndall symposium in partnership with the Polar Regions Unit of the UK Government's Foreign and Commonwealth Office (FCO). As a close neighbour of Arctic Europe, the UK can expect to experience a number of direct and indirect effects over the short to long term.

Short-term (less than 25 years)
The UK population's exposure to UV radiation will increase through a combination of Arctic ozone depletion and climate change-related effects such as changes in cloud cover, increasing average and extreme temperatures and changes in recreational behaviour. The interplay between climate change and the chemistry of the Arctic atmosphere will have a direct bearing on the risks of malignant melanomas for the UK population.

Medium-term (within 50 years)
Climate-related changes to Arctic habitats, such as reductions in tundra area and shifts in the timing of spring growth periods, are likely to have substantial impacts on the breeding success of Arctic-breeding bird species. This would have serious implications for the numbers of migratory birds coming to the UK.

A Tyndall symposium explored arctic climate change in partnership with the Polar Regions Unit of the UK Government's Foreign and Commonwealth Office
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Climate change will bring new opportunities for UK companies to exploit rich and newly accessible Arctic reserves of petroleum, mineral ores and fish. This will need to be set against new priorities - nationally and globally - for a less polluting energy economy and more sustainable industrial development.

The UK insurance industry will need to adjust to escalating claims associated with climate change related incidents (such as pipeline fractures caused by subsidence from melting permafrost), but will also be presented with new investment opportunities as Arctic activities increase.

Long-term (beyond 50 years)
An increase in Arctic meltwater flowing into the northern North Atlantic may weaken the thermohaline circulation and disrupt ocean currents in the North Atlantic. This could significantly affect northwest European climate but the likelihood, timing and impact of such a low probability but extreme event is poorly understood.

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Tyndall Assembled

Over 130 Tyndall researchers attended the third annual Tyndall Assembly, hosted by Tyndall Centre South

In July, over 130 Tyndall Centre researchers from across the country attended the third annual Tyndall Assembly, the UK's largest climate change research conference. The Assembly was hosted at Chilworth Manor by Tyndall Centre South, which is based at Southampton Oceanography Centre (SOC) and the University of Southampton.

Professor John Shepherd of the SOC is the Director of Tyndall South. He gave a key-note lecture about using new e-Science technology to model earth systems, and discussed the GEnIE project (Grid Enabled Integrated Earth System) at Southampton's regional e-science centre.

The proceedings of the three day meeting spanned the academic disciplines which are part of the Tyndall remit (natural science, engineering, and socio-economics) and contained a combination of plenary lectures, research updates, breakout sessions and socialising.

Guest speakers included Sir Eric Ash, former Rector of Imperial College, energy efficiency expert Brenda Boardman MBE from Oxford University, Paul Ekins of the Policy Studies Institute at LSE, and John Ashton, a former diplomat and now Strategic Director of LEAD International.

During the conference, £900,000 of newly funded Tyndall projects were announced, making the Tyndall Centre community now 150 researchers strong and distributed across 25 Universities and Research Centres throughout the UK.

Further information: Professor John Shepherd j.g.shepherd@soc.soton.ac.uk or www.genie.ac.uk)

Tyndall researchers at the University of Leeds' Institute for Transport Studies are simulating a range of traffic growth forecasts, technological change and behavioural change for meeting carbon dioxide emissions targets

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Working Papers

A selection of the most recent Tyndall Centre Working Papers - they are downloadable at www.tyndall.ac.uk. Tyndall Working Papers are for the early availability of mature research results.

Climate change, impacts, future scenarios and the role of transport, Alison Pridmore, Abigail Bristow, Tony May and Miles Tight, June 2003 TWP33

Integrating renewables and CHP into the UK Electricity System: Investigation of the impact of network faults on the stability of large offshore wind farms, Xueguang Wu, Lee Holdsworth, Nick Jenkins and Goran Strbac, April 2003 TWP32

A scoping study of UK user needs for managing climate futures. Part 1 of the pilot-phase interactive integrated assessment process (Aurion Project), John Turnpenny, Alex Haxeltine and Tim O'Riordan, April 2003 TWP31

Abrupt climate change: can society cope? Mike Hulme, March 2003 TWP30

A multi-criteria assessment framework for carbon-mitigation projects: Putting "development" in the centre of decision-making, Katrina Brown and Esteve Corbera, February 2003 TWP29

Defining and experiencing dangerous climate change, Suraje Dessai, W. Neil Adger, Mike Hulme, Jonathan Köhler, John Turnpenny and Rachel Warren, January 2003 TWP28

Building resilience to climate change through adaptive management of natural resources, Emma L. Tompkins and W. Neil Adger, January 2003 TWP27

Country level risk measures of climate-related natural disasters and implications for adaptation to climate change, Nick Brooks and W. Neil Adger, January 2003 TWP26

An investigation of network splitting for fault level reduction, Xueguang Wu, Joseph Mutale, Nick Jenkins and Goran Strbac, January 2003 TWP25

Impact of integrating renewables and CHP into the UK transmission network, Xueguang Wu, Nick Jenkins and Goran Strbac, November 2002 TWP24

Justice and adaptation to climate change, Jouni Paavola and Neil Adger, October 2002 TWP23

Renewable energy and combined heat and power resources in the UK, Jim Watson, Julia Hertin, Tom Randall and Clair Gough, April 2002 TWP22

Renewables and CHP deployment in the UK to 2020, Jim Watson, January 2002 TWP21

Reviewing organisational use of scenarios: Case study - evaluating UK energy policy options, John Turnpenny, August 2002 TWP20

The role of hydrogen in powering road transport, Alison Pridmore and Abigail Bristow, April 2002 TWP19

The development of large technical systems: implications for hydrogen, Jim Watson, March 2002 TWP18

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Hydrogen energy technology, Geoff Dutton, April 2002 TWP17

Adaptation to climate change: Setting the agenda for development policy and research, Neil Adger, Saleemul Huq, Katrina Brown, Declan Conway and Mike Hulme, April 2002 TWP16

Long run technical change in an energy-environment-economy (E3) model for an IA system: A model of Kondratiev waves, Jonathan Köhler, April 2002 TWP15

The use of integrated assessment: an institutional analysis perspective, Simon Shackley and Clair Gough, April 2002 TWP14

Technological change, industry structure and the environment, Paul Dewick, Ken Green and Marcela Miozzo, January 2002 TWP13

The climate regime from The Hague to Marrakech: Saving or sinking the Kyoto Protocol?, Suraje Dessai, December 2001 TWP12

Representing the integrated assessment of climate change, adaptation and mitigation, Terry Barker, December 2001 TWP11

Burying carbon under the sea: an initial exploration of public opinions, Clair Gough, Ian Taylor and Simon Shackley, December 2001 TWP10

Climate dangers and atoll countries, Jon Barnett and Neil Adger, October 2001 TWP9

Social capital and climate change, Neil Adger, October 2001 TWP8

Security and climate change, Jon Barnett, October 2001 TWP7

The identification and evaluation of suitable scenario development methods for the estimation of future probabilities of extreme weather events, Clare Goodess, Mike Hulme and Tim Osborn, July 2001 TWP6

The issue of 'Adverse effects and the impacts of response measures' in the UNFCCC, Jon Barnett, July 2001 TWP5

How high are the costs of Kyoto for the US economy? Terry Barker and Paul Ekins, July 2001 TWP4

Socio-economic futures in climate change impact assessment: using scenarios as 'learning machines', Frans Berkhout, Julia Hertin and Andrew Jordan, July 2001 TWP3

Integrated assessment models Mike Hulme, March 2001 TWP2

A country-by-country analysis of past and future warming rates, Tim Mitchell and Mike Hulme, November 2000 TWP1

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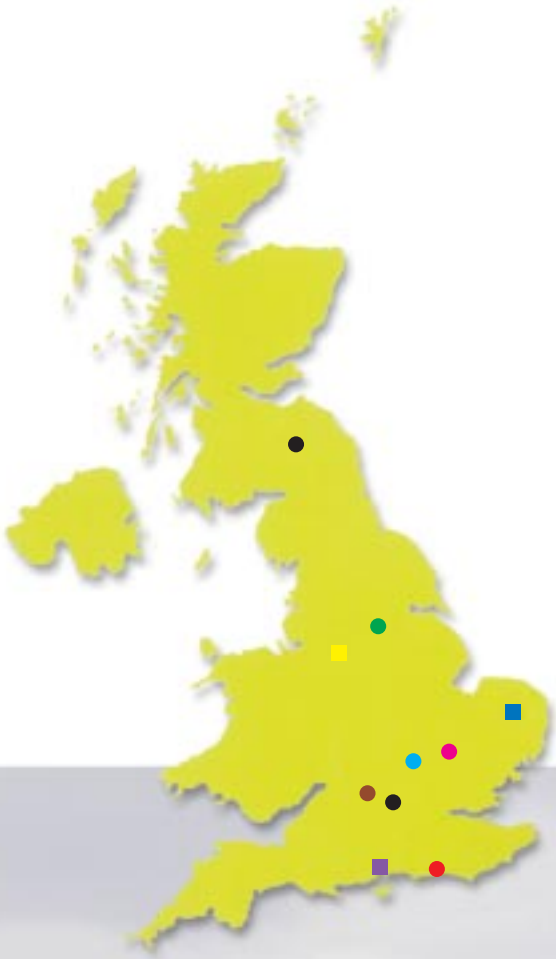
Tyndall Centre
for Climate Change Research



Tyndall Partners

- University of East Anglia *www.uea.ac.uk*
- UMIST *www.umist.ac.uk*
- University of Southampton and Southampton Oceanography Centre *www.soc.soton.ac.uk*
- University of Cambridge *www.cam.ac.uk*
- SPRU (Science and Technology Policy Research), University of Sussex *www.sussex.ac.uk/spru*
- ITS (Institute for Transport Studies), University of Leeds *www.its.leeds.ac.uk*
- NERC Centre for Ecology and Hydrology Bush & Wallingford *www.ceh.ac.uk*
- Cranfield University *www.som.cranfield.ac.uk/som/complex*
- Energy Research Unit (CLRC-RAL) *www.eru.rl.ac.uk*

www.tyndall.ac.uk

A range of further information, including contact details for project leaders and other staff, fact sheets about the Tyndall Centre's research, the Tyndall Centre's Research Strategy, and a quarterly electronic newsletter, is available at our website.

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NATURAL ENVIRONMENT RESEARCH COUNCIL

E·S·R·C ECONOMIC & SOCIAL RESEARCH COUNCIL

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Engineering and Physical Sciences Research Council

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