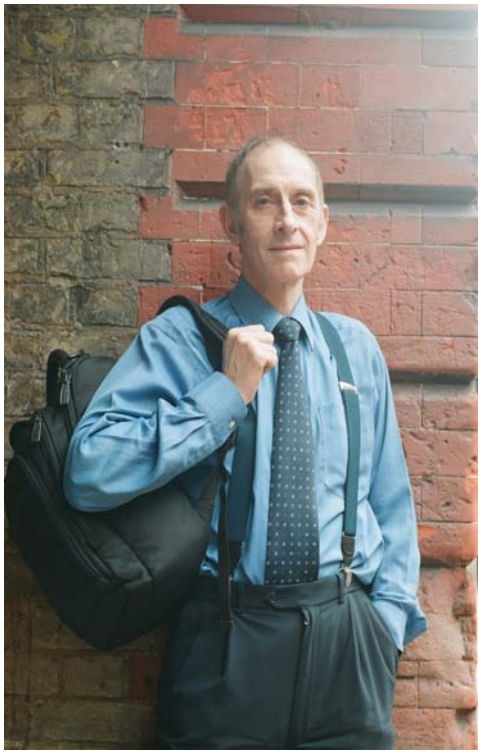
Cambridge Centre for Climate Change Mitigation Research (4CMR)

Review of 2007 from the Director, Terry Barker

Photographs by Robin Grierson, University of Cambridge



In April, 2007, 4CMR Centre moved to refurbished offices in houses 17-19 Silver Street in the Department opposite Reception, after the temporary homes in the basement of house 21, then in a small office beside the Judge Business School in Trumpingdon Street. The new offices are bright, comfortable and convenient, but most important they encourage group work and interaction, being mostly interconnected on one floor, with a few steps!

Academically we also made progress, with Rachel Warren in the lead in the publication of a description of the Community Integrated Assessment System, with our global energy-environment-economy model as one of its components. Katie Jenkins was awarded one of the prestigious UK Research Councils' Interdisciplinary Research Studentships, and continues to be an active member of the Centre working on extreme climate events. The year was also notable for the efforts of several members of the Centre for the IPCC coming to fruition with the international meeting in Bangkok in May adopting the Mitigation Report and with the award of the Nobel Peace Prize to the IPCC, jointly with Al Gore.

We were sorry to lose Tim Foxon, who was appointed one of the UK Research Council Academic Fellows in the Sustainability Research Institute at the University of Leeds, and Jonathan Köhler, who has moved to the Fraunhofer Institute for Systems and Innovation Research (ISI) in the University of Karlsruhe, Germany. We have appointed Athanasios Dagoumas and Stephen Stretton to work on energy-related themes focused on transport, use of energy in the home, and the electricity system.

About the Centre

4CMR's overarching objective is to foresee strategies, policies and processes to mitigate human-induced climate change, which are effective, efficient and equitable, including understanding and modelling transitions to low-carbon energy-environment-economy systems. To address this objective, expert knowledge from many disciplines is essential in addressing the complex issues of GHG mitigation, including expertise in communicating between disciplines and in filling poorly researched gaps in knowledge. Members of the Centre study climate change mitigation with a focus on computable modelling, using observations and theory.

The Centre is directed by Dr Terry Barker, who has an international reputation in the field of climate change economics and policy, and has a current staff of 10 researchers and 2 PhD students. The researchers have expertise in many areas including economics, energy, environment, engineering, politics, systems analysis, applied mathematics and computing.

Research within the Centre

The research effort at 4CMR is intended to be at the leading edge of UK and international research in the area. The Centre houses global, European and UK modelling teams adopting a common set of conventions and protocols and networked with multidisciplinary teams working in different countries. The Centre's research is focused on climate-change mitigation through technological change induced by use of economic instruments, such as the EU's emission trading scheme. We apply a multi-disciplinary approach and aim to inform national and international policy-making.

Some illustrative principal areas of the research at the Centre are as follows:

- options for GHG mitigation at a global level, with implications for 20 world regions to 2100
- effective, efficient and equitable policies and measures for achieving the UK's CO_2 and GHG reduction targets and the effects on UK sectoral and international competitiveness
- top-down uncertainty modelling of energy demand and new technologies for electricity generation, households and transportation
- the modelling of the EU emission allowance trading scheme and its implications for the UK energy economy

Three long-term research contracts from the UK Research Councils and the European Commission have been secured to contribute to these aims. The Centre is an integral part of the Tyndall Centre for Climate Change Research and the UK Energy Research Centre (UKERC). It has close links in Cambridge with the Centre for Public and Economic Policy (Dept. Land Economy), The Electricity Policy Research Group (Judge Business School and Faculty of Economics) and Cambridge Econometrics, which is a research partner for the UK ERC.

Externally Funded Research Projects

United Kingdom Energy Research Centre (UKERC)
Duration: 2006-2009
4CMR Team: Programme Leader: Dr Terry Barker
Core Researcher: Dr Athanasios Dagoumas
Research Assistant: Mrs Cathy Goss
Website: http://ukerc.ac.uk/ and http://ukerc.ac.uk/content/view/295/592

The starting-point for the UKERC top-down modelling carried out at 4CMR is the MDM-E3 Model designed to analyse and forecast changes in economic structure, energy systems and associated environmental impacts for use in policy making. To do this, it disaggregates industries, products, and household and government expenditures, as well as foreign trade and investment. The model is a combination of time-series econometric relationships and cross-section input-output relationships. The projection of fuel use by user and type of fuel is used to calculate emissions of carbon dioxide and other gases and particulates to the atmosphere, allowing for different qualities of fuel and different processes of combustion. The econometric 'top-down' treatment is supplemented by an engineering 'bottom-up' approach in four important areas: the electricity supply industry (ESI), household energy consumption, the transport sector, and waste.

ADAM: ADaptation And Mitigation strategies. Supporting European Climate Policy.
Co-ordinated by the Tyndall Centre for Climate Change Research
Duration: 2006-2009
Funding: European Commission
4CMR Team: Project Leader: Dr Terry Barker
Co-ordinator: Ms Katie Jenkins
Research Associate: Dr Serban Scrieciu
Research Assistant: Ms Svetlana Tashchilova (40%)
Website: http://www.adamproject.eu/

ADAM is an integrated project that will lead to a better understanding of the trade-offs and conflicts that exist between adaptation and mitigation policies. ADAM will support EU policy development in the next stage of the development of the Kyoto Protocol and will inform the emergence of new adaptation strategies for Europe. The ADAM work programme is structured around four overarching domains: Scenarios, Policy Appraisal, Mitigation and Adaptation. The Mitigation Domain will evaluate the costs and effectiveness of different mitigation options at the EU level and estimate their corresponding contribution at the global level. These evaluations will address the main interactions between the EU and other world regions: international trade, development aid, technology transfer, and trade of used products and investment goods.

4CMR are involved in the Analysis of mitigation policy options at the European level (M1) and globally (M2). 4CMR's contribution to M1 will be macro economic modelling including adaptation, ancillary benefits, impact on employment, competitiveness and foreign trade. 4CMR's contribution to M2 will be macro economic modelling including adaptation, impact on employment, competitiveness and foreign trade.

Integrated Modelling: Innovating Integrated Assessment Systems

Duration: 2006-2009
4CMR Team: Programme Leader: Dr Terry Barker
Deputy Programme Leader: Dr Rachel Warren
Core Researcher: Dr Yongfu Huang
Core Researcher: Dr Jonathan Köhler (25%)
Co-ordinator: Ms Katie Jenkins
Website: http://www.tyndall.ac.uk/

The Tyndall Centre is committed to delivering high impact research, based on quality cutting-edge science, supported by a sustainable inter-disciplinary research culture. The 2nd Phase of the Tyndall Research Strategy (2006-09) was launched on the 4th May 2006, and comprises 7 research programmes designed to carry forward the work from phase 1. 4CMR is the lead partner in research programme 7 - Integrated Assessment Modelling. Dr Terry Barker will be leading the research programme, which will be developing and using the Community Integrated Assessment System (CIAS). The system links a climate and closed carbon-cycle model, a global energy-environment-economy model, an impacts tool and a down-scaling module. It will be applied to analyse specific scientific and policy issues, including costs of stabilisation of atmospheric greenhouse gas concentrations, and post-2012 international climate policy options, including analysis of instruments designed to induce and diffuse technological change, allowing for the non-linear dynamic responses of the coupled climate socio-economic system.

OMEGA: Opportunities for Meeting the Environmental Challenge of Growth in Aviation

4CMR Team: Programme Leader: Peter Allen
Core Researcher: Dr Jonathan Köhler
Research Assistant: Annela Anger-Kraavi
Website: http://www.omega.mmu.ac.uk/

Increasingly, stakeholders in UK aviation are recognising that severe challenges lie ahead. They are accepting that timely action is necessary and that radical changes may be needed to address them. The project 'Opportunities for Meeting the Environmental Challenge of Growth in Aviation (OMEGA)' will combine academic capability with knowledge exchange between academia, industry and policymakers to assist in developing future strategies for a sustainable UK aviation industry. 4CMR are a partner in the OMEGA project and will study the possible impacts on the aviation industry and general economic activity of including the aviation sector in the European Union Emissions Trading Scheme (EU ETS). The Cambridge Econometrics' European model E3ME will be developed to incorporate the aviation sector in the EU ETS. Scenarios of emissions permit allocations and business responses to changes in costs from the permit prices will be explored, to investigate conditions under which aviation might significantly affect permit prices in the EU ETS and under which aviation sector investment decisions will be influenced by the permit price.

Green Fiscal Commission (GFC)

Duration: 2007-2009
4CMR Team: Programme Leader: Dr Terry Barker
Core Researcher: Dr Athanasios Dagoumas
Website: http://www.greenfiscalcommission.org.uk/

The over-arching objective of the UK Green Fiscal Commission is to establish an evidence base to support the large-scale introduction of green taxes in order to respond effectively to global environmental challenges (especially climate change) and bring about cost-effective environmental improvements that also promote innovation in business and assist the creation of new industries. Green taxes are defined broadly as any revenue-raising market-based environmental economic instrument, including for example, auctioned emissions allowances. The role of 4CMR will be the development of the transport and household submodels, to allow feedback into MDM-E3 and the review of effects of green taxes on transport and household policies using Cambridge Econometrics' Energy-Environment-economy model of the UK MDM-E3, provided to the Centre for academic research.

Engineering Cities (GFC)

Duration: 2006-2009
4CMR Team: Programme Leader: Dr Terry Barker
Core Researcher: Dr Jonathan Köhler
Core Researcher: Dr Athanasios Dagoumas
Website: http://www.tyndall.ac.uk/research/programme6/scoping_study.html

The aim of the Tyndall Centre Cities Programme is to develop a city-scale assessment capacity that simulates the evolution of climate impacts and emissions over the 21st century. This city-scale assessment tool will be applied for urban policy-makers, planners, engineers and other stakeholders to compare alternative adaptation and mitigation strategies and to consider how cities grow whilst reducing emissions and vulnerability to climate change.
4CMR overall objective is to provide scenarios of economic activity at a city scale. This will be modelled by adapting the existing E3MG and MDM global and UK models of economic activity that were developed in part during the first phase of the Tyndall Centre. In keeping with the overall integrated assessment framework, the economics model will be driven by global scenarios of climate and socio-economic change. These will be disaggregated to obtain measures of economic activity at a city scale but will remain in the context of global scenarios of climate and socio-economic change.
Of particular interest to urban planners and policy makers are the potential gains or losses from cities or nations using their own powers to explore city-scale mitigation strategies. The different scenarios of economic activity will be used to drive the land use model and provide inputs to the emissions accounting models.