Climate Change: Science and Policy

18 May 2011 - 20 May 2011

Workshop Report

In May 2011 the Institute of Advanced Studies at the University of Surrey hosted a workshop on "Climate Change : Science and Policy" as one of a series of events organised in collaboration with colleagues from North Carolina State University (NCSU) and designed to promote new research projects and academic programmes across the Universities Global Partnership Network (UGPN). The workshop focused on the broad themes 'Carbon', 'Water', 'Development', 'Animal Health' and 'Education and Training'. Participants included members of: Marine, Earth and Atmospheric Sciences, Communication, and the College of Veterinary Medicine at NCSU; Civil Engineering, Law, Mathematics, Microbial Science, and the Centre for Environmental Strategy at Surrey; the Animal Health and Veterinary Laboratories Agency (AHVLA) at Weybridge; the Institute of Animal Health (IAH) at Pirbright; and the National Centre for Earth Observation (NCEO). The workshop was funded by the British Council through a grant from the UK-US New Partnership Fund, and by the Institute of Advanced Studies.

Contributions to the Workshop

Carbon

This session focused on the role of carbon in climate warming, with an emphasis on understanding, modelling and quantifying the carbon cycle. Dave DeMaster (NCSU) reviewed data showing a strong correlation between global CO_2 and temperature levels and gave an overview of the carbon cycle, identifying the main natural and anthropogenic sources and sinks of CO_2. Ian Roulstone (Surrey) gave an overview of NCEO's programme emphasising the roles of Earth observation and high resolution modelling. Data assimilation is used to combine models, integrate multiscale data from diverse sources, and quantify uncertainty. This was followed by a series of presentations on aspects of NCEO's carbon work. Tim Hill (Edinburgh) concentrated on the terrestrial carbon cycle, reviewing data collection methods, the roles of models and data assimilation, and the problems faced in implementing these. Anna Chuter (Surrey) described the dynamics and a bifurcation in the DALEC terrestrial carbon cycle model developed at Edinburgh, while Sylvain Delahaies (Surrey) described the development of a 4DVar data assimilation scheme for DALEC.

Water

Lian Xie (NCSU) opened the session by discussing couplings between atmospheric, oceanic and terrestrial models, the role of data assimilation in merging models at different scales, and the use of these models to predict hurricanes and cyclones, precipitation, flooding and wind. Fred Semazzi (NCSU) focused on the prediction and effects of climate change on water resources in two particular regions. In the Lake Victoria basin precipitation is expected to increase, potentially contributing to a reverse in the decline of the lake's water level. However this will be offset by a huge increase in the demand for more hydroelectric power in the region. There is a need for reliable modelling to predict seasonal and year-to-year variations in the lake water level, and for these to be incorporated into hydroelectric resource planning, regulation and politics. The Eastern Mediterranean and Caucasus region is also predicted to face significant changes in its precipitation patterns and research is needed to understand the effects this will have on, for example, biodiversity and water resources. Jonathan Chenoweth (Surrey) focused specifically on the water resources of this region, presenting results showing a very significant decline by the middle of the century. Finally Peter Clark (Surrey) discussed modelling in urban meteorology, with a particular emphasis on temperature variations, urban heat islands and the coupling between these and the urban water budget.

Animal Health

Roberto La Ragione (Surrey) reviewed the effects of climate change on zoonotic pathogen evolution and adaptation, noting that climate change is one of several factors driving the emergence and spread of pathogens from animal to humans. He also discussed the role of genomics in identifying new and emerging pathogens and distinguishing between epidemic and non-epidemic strains. Andrew Breed (AHVLA) presented an overview of the potential effects that changes in temperature, precipitation and wind might have on the prevalence of pathogens and associated risk to animal health, and highlighted the need for more research, surveillance and better predictive models. Marion Foley-Fisher (AHVLA) followed this by describing her research on the Hyalomma tick borne zoonotic disease Crimea-Congo haemorrhagic fever highlighting, in particular, the danger that climate change could lead to the Hyalomma tick establishing itself in the UK or an already established UK tick becoming a vector for the disease. Maria Correa (NCSU) stressed the need to develop a conceptual framework for the study of climate change and animal health, to implement dynamic studies that embraced all branches of epidemiology and links to other physical and social sciences, and to make multi-disciplinary monitoring and data collection a priority. She also suggested that research should focus on the most fragile ecosystem.

Development

Steve Morse (Surrey) explored the hypothesis that increasing wealth (as measured by, for example, GDP) leads to a decrease in environmental degradation (eg CO_2 emissions), but concluded that the evidence is not convincing. Stephen Gourley (Surrey) described a model for 'late-life-acting' insecticides proposed for combating malaria, concluding that they could more than double the lifespan of insecticides before evolving resistance rendered them ineffective. James Kiwanuka-Tondo (NCSU) described his analysis of the highly successful Ugandan HIV/AIDS reduction campaign and then a proposal to study the complex links between HIV/AIDS, malaria, malnutrition and climate change in the Singida region of Tanzania. Fred Semazzi (NCSU) described a Google.org funded UCAR (University Corporation for Atmospheric Research) programme to develop a decision-support system integrating meteorological and epidemiological data to help combat meningitis in Ghana. A particular emphasis was placed on the regional meteorological modelling component and the need for improved data collection and assimilation. Rosalind Malcolm (Surrey) and & Mulugeta Ayalew (Surrey) reviewed a multi-disciplinary project investigating small-scale independent water providers (SIPs) in Kenya and Ethiopia. The role of SIPs goes largely unrecognized and they are often negatively described

– the need for regulation, the issues faced when designing regulation, and regulatory mechanisms were all discussed.

Education and Training

This session began with a presentation from Fred Semazzi describing NCSU's Professional Masters programme on Climate Change and Society> (CCS). This is taught by experts on climate science, geographic information systems, engineering, communications, economics, statistics, hydrology and health. He noted that there is a strong resonance between the content of the CCS programme and the MSc programmes taught by CES at Surrey. The CCS programme is currently being upscaled from NCSU to the whole state university network, and could provide a model for a global programme under the auspices of the UGPN.

This presentation was followed by a more general discussion of the mechanisms and methods of delivery that might be adopted for joint NCSU-Surrey and UGPN education and training programmes, including:

- Semester-long student exchanges for taught components and/or projects and internships: the similarities between the content and structures of the CCS programme and CES's MSc programmes might make these feasible for a programme based on these.
- 'Realtime' and/or 'asynchronous' online delivery of modules: relevant experience with distance education exists at both NCSU (Maria Correa) and Surrey (Rosalind Malcolm).
- Summer Schools: these are perhaps particularly appropriate for shorter graduate level courses - delivery of full undergraduate courses/modules face the difficulties that (a) there is no tradition of summer semesters in the UK university systems, and (b) many staff in both the USA and UK regard the summer as their main research period.
- 'Blended' programmes combining different methods of delivery: for example short intensive face-to-face teaching (eg at Summer Schools) combined with online delivery and support. This might also be particularly appropriate for part-time and continuing professional development (CPD) type programmes.

Recommendations for Future Collaborative Activities

The overarching recommendation that emerged from the workshop was that North Carolina State University and the University of Surrey should initiate the development of a Universities Global Partnership Network programme, Climate

Change, Science and Society (CCSS), focused on Translational Climate Research and Education.

Climate change and its consequences is one of the major global challenges of our time requiring research and education across a wide range of disciplines. It is also high among the priorities of national and international political and funding bodies: "The Heads of State, Ministers and Heads of Delegations present at the World Climate Conference-3 (WCC-3), held from 31 August to 4 September 2009 in Geneva, agreed on the need to develop and implement a Global Framework for Climate Services (GFCS) to improve the availability and application of robust climate science to decision-making for national development and particularly for climate change adaptation." (2009)

" . . . the leaders [Cameron and Obama] announced a package of significant ongoing and future activities intended to deepen their partnership and commitment to meeting global challenges in the following areas: Space Science and Exploration, Clean Energy and Climate Science, Food Security, Health and Wellbeing, Innovation and Growth."(2011)

The CCSS programme should seek to be closely aligned with the Global Framework for Climate Service launched by WCC-3 in September 2009 and respond to the call by Cameron and Obama in May 2011 to deepen partnerships dedicated to meeting global challenges. Initially CCSS will focus on the wide and complementary ranges of relevant research and expertise at NCSU and Surrey. However the programme should evolve rapidly to incorporate the strengths and interests of the University of Sao Paolo (USP) and Seoul National University (SNU) as contacts with these institutions are developed. The programme will also be keen to maintain and develop close collaborations with other institutions that work closely with the UGPN partners, including the Animal Health and Veterinary Laboratories Agency (AHVLA), the Institute for Animal Health (IAH), and the National Centre for Earth Observation (NCEO), members of which participated in the Surrey workshop.

The focus on translational research and education will require the engagement and interaction of a wide range of disciplines from the physical, biological and social sciences, engineering and the arts. Broadly speaking the themes of the programme can be organised into the three areas:

Monitoring and Forecasting

How is the climate changing? What will the effects of these changes be on meteorological variables such as temperature, precipitation and wind? What tools need to be developed to monitor and forecast climate and meteorological changes over space and time scales that are useful for the design and implementation of adaptation and mitigation strategies?

Environment and Infrastructure

How is climate change effecting the natural and man-made environment? In particular what are its effects on energy and water resources, food security, animal and human health, biodiversity, How can accurate data on these changes be gathered and incorporated into effective monitoring and prediction frameworks. How might rural and urban infrastructures be changed to adapt to and mitigate the effects of these changes?

Policy and Society

How can, will and should society respond to climate change and its effects on environment and infrastructure? What political, regulatory and behavioural changes are needed to implement adaptation and mitigation strategies? What tools would facilitate effective design of policy and regulation? How can top-down policy and regulation be aligned with bottom-up changes in attitude and behaviour?

These questions are currently the focus of a considerable global research effort within a wide range of disciplines. However studies are often descriptive, static, difficult to compare, and conducted within the framework of a single discipline. The UGPN CCSS programme will aim to evolve a conceptual framework for translational climate studies which focuses particularly on:

- Multidisciplinary data collection, monitoring, prediction and validation over a range of time and space scales;
- The development of data-driven tools for researchers, policy makers and regulators;
- Communication, education and training aimed all levels from the general public to researchers, regulators and politicians.

Acknowledgements

organisers would like to thank the grant holder, Malcolm von Schantz, for his enthusiastic support and encouragement.

Prof. Mark Roberts
Email: m.roberts@surrey.ac.uk

Prof. Fred Semazzi (North Carolina State University)
24 October, 2011