

# **Module M594: Climate Change: Science, Society, Policy**

**Semester 2, 2010**

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Climate change – the anthropogenic shaping of the global climate system, or ‘global warming’ – has become a defining phenomenon of the new century. It is one of the most salient public policy issues in UK society and, increasingly, worldwide. Assessing and managing the risks posed by climate change, now and in the future, is a major driver of national policy and international diplomacy, is an issue of lively public debate, and provides a backdrop against which new social movements, business strategies and public policies are emerging.

By way of framing the problem, this course starts with an examination of the changing relationships between climate and societies through history, before providing a brief introduction to how science has been able to offer predictions of changes in climate risk (drawing upon Module M535), especially focusing on uncertainties and the quantification and perception of risks. The major part of the course then examines the consequences of climate change for society – both direct and indirect consequences, both now and potentially in the future - and with consideration given to development issues. These consequences – physical effects, social responses, perceptions, discourses and policy debates - will be examined from a number of different disciplinary perspectives.

The course provides explicit transferable skills training in group interaction, oral presentation, time management and project planning.

The 20-credit course takes place during weeks 1 to 12 of Semester 2. The course is lecture-based with seminars, debates and discussion sessions.

There are no formal prerequisites for this course, but the Autumn Semester Module ENV-M535 ‘The Science of Climate Change’ will form valuable background. There is some overlap with Module DEV-M088 ‘Climate Change Policy for Development’.

## All lectures by Professor Mike Hulme unless indicated

**Tuesday teaching 12-1pm in Thomas Paine Study Centre, Lecture Theatre**

**Tuesday teaching 2-5pm in ARTS 0.100**

**Thursday teaching 6-7pm in ARTS 2.03**

**Friday teaching 9-10am in SCI 3.05**

### Week 1: Introduction to the Module. Climate and Society

12/01/10, 12-1pm	Introduction: timetable, reading, coursework and questionnaire <b>Set optional coursework: a 1,500 word critique of a journal article</b> <b>Discuss and decide on Thursday evening seminar sessions</b> <b>Set Coursework #1: individual essay (4,000 words max)</b> [see separate instruction sheets]
12/01/10, 2-5pm	Lecture 1: <i>Climate, history and society</i>
15/01/10, 9-10am	Lecture 2: <i>Why we disagree about climate change</i>

Lecture 1: In this opening week we will consider the various ways in which climate has been conceptualised by societies in the past and by different intellectual traditions. This context is essential if we are to make sense of contemporary discourses of climate change. We will also consider more briefly the historiography of climate change and human civilisation during the last 10,000 years, in particular the different ways in which climate change has been invoked as an agent either of social innovation or of collapse.

Classical Greek and early Islamic thought associated climate directly with latitude, and saw these categories as fixed, from frigid, through temperate to torrid. These climates were endowed with moral and cultural values, with Mediterranean climates by their nature allowing the greatest human development. The Greeks viewed torrid (tropical) climates as uninhabitable, presaging later ideas about 'dangerous climates'. A discourse emerging in Medieval Europe attributed weather extremes and changes in climate to personal or collective (im)morality, bound up with ideas of divine judgement and witchcraft. The Classical Greek idea of climate was transformed in Enlightenment Europe, where the centre of the supposed climatic optimum shifted north and west from the Mediterranean to France and England. The 'domestication' of climate occurred in the 17C and 18C with the rise of formal meteorological measurement and developments in the 19C included the global 'mapping' and classification of climate, an exploration of its predictability, an appreciation of natural changes over long cycles (ice ages), and a discourse around acclimatisation. Climatic determinism flourished for a while, sometimes associated with ideologies of racial superiority and eugenics, traces of which can still be found in contemporary writings about future climate impacts. The social meanings of climate during the 20C have included the ideas of 'difficult' climates, climate engineering, climate and personal memory, phenology, Gaia, climate and economic value, aesthetics, and climate as catalyst for change and innovation.

Although our grasp of the physical changes occurring to climate may be new, this lecture shows that there is a much longer history of change associated with the idea of climate.

Lecture 2: This lecture lays out the central thinking of my book *Why We Disagree About Climate Change*, by introducing the idea of frames and the many different ways in which climate change is today framed by different actors and interest groups.

### Additional reading

- Boia,L. (2005) **The weather in the imagination** Reaktion Books, London, 200pp.
- Fleming,J.R. (1998) Especially chapters 1-4 in, **Historical perspectives on climate change** Oxford University Press, New York, USA, 194pp.
- Glantz,M.H. (2003) Especially Chapters 1 and 2 in, **Climate affairs: a primer** Island Press, Washington, 290pp.
- Hulme,M. (2008) The conquering of climate: discourses of fear and their dissolution **The Geographical Journal** 174(1), 5-16
- Hulme,M. (2009) The social meanings of climate Chapter 1 in, **Why we disagree about climate change** Cambridge University Press, Cambridge, 393pp.
- Hulme,M. (2009) Beyond climate change Chapter 10 in, **Why we disagree about climate change** Cambridge University Press, Cambridge, 393pp.
- Lamb,H.H. (1982) **Climate, history and the modern world** Methuen, London, 387pp.
- Orlove,B., Wiegandt,E. and Luckman,B. (2008) The place of glaciers in natural and cultural landscapes Chapter 1 in, **The darkening peaks: glacial retreat in scientific and social context** (eds.) Orlove,B., Wiegandt,E. and Luckman,B. , University of California Press, Berkeley CA, 282pp.
- Strauss,S. and Orlove,B. (eds) (2003) Especially chapter 1 in, **Weather, climate, culture** Berg/Oxford International, 416pp.

## **Week 2: What Do We Know About Changing Climate Risks And How Do We Know It?**

19/01/10, 12-1pm	Lecture 3: <i>The discovery of climate change</i>
19/01/10, 2-5pm	Lecture 4: <i>Scenarios of climate risks and dangerous climate change</i>
22/01/10, 9-10am	Lecture 5: <i>The use of (climate) science in policy</i>

Lecture 3: To demonstrate the scientific pedigree of the twin ideas that climates change over time and that humans have had an increasing impact on global climate, this lecture tells the story of how climate change was ‘discovered’. This account contrasts the earlier reading of climate change as natural and occurring over geological cycles, with the emergent reading of climate change as human-induced and occurring on human generational time-scales. The possibility that humans might alter *local* climates had been existent since the 17C, but the prospect of human-induced change of *global* climate – via altering the greenhouse effect - awaited the ideas of Fourier (1820s), the experiments of Tyndall (1860s), the calculations of Arrhenius (1896) and the observations of Callendar (1938) and Keeling (1957 onwards). The idea of global warming first emerged in popular discourse in the early 1950s, but it took further empirical work combined with new abilities to perform computational modelling in the 1960s and early 1970s for the scientific understanding of the climate system to mature. The last 25 years of research has seen an expansion of disciplines examining past evidence and future prospects – hydrology, engineering, economics, etc. – and an increasing penetration into society of the *idea* of global warming.

Lecture 4: Natural science – for example, Earth system sciences, agricultural, ecological and health sciences – has been very productive over the last 25 years in understanding the changing climate risks associated with rising concentrations of greenhouse gases. This lecture will summarise the state of knowledge as reported in the Fourth Assessment Report of the IPCC, drawing upon a range of scenarios and a variety of risks: spatial changes in climates, changes in extreme weather, changes in functioning of the Earth system. We will also consider how far these predicted risks can contribute to our understanding of what constitutes dangerous climate change, the avoidance of which is at the heart of the UN Framework Convention on Climate Change. We will show that what is, or is not, dangerous climate change is not self-evident.

Lecture 5: Science thrives on disagreement, indeed can only progress through disagreement and challenge. But disagreements presented as disputes about scientific evidence, theory or prediction, may often be rooted in more fundamental differences between the protagonists about epistemology, values or the role of science in policy-making. This lecture examines the changing nature of science and what significance this has for disagreements within scientific discourse about the existence, causes and consequences of human-induced climate change. Science always speaks with a conditional voice, or at least good science always does. We must recognize that skepticism, uncertainty and doubt are essential features of any science-led public policy debate. We must also recognise the limits to scientific knowledge, and that such knowledge can be (is) transformed in the process of leaving the laboratory and entering the social world.

#### Additional reading

- Dessai,S., Adger,N.W., Hulme,M., Köhler,J., Turnpenny,J. and Warren,R. (2004) Defining and experiencing dangerous climate change **Climatic Change** 64, 11-25.
- Fleming,J.R. (1998) Chapters 5-10 in, **Historical perspectives on climate change** Oxford University Press, New York, USA, 194pp.
- Hulme,M. (2009) The ‘discovery’ of climate change Chapter 2 in, **Why we disagree about climate change** Cambridge University Press, Cambridge, 393pp.
- Hulme,M. (2009) The performance of science Chapter 3 in, **Why we disagree about climate change** Cambridge University Press, Cambridge, 393pp.
- IPCC (2007) **Climate change 2007: the physical science basis** WGI Technical Summary, Cambridge University Press, Cambridge, UK, 70pp.
- Pielke,R. jr (2007) Especially chapters 1-6 in, **The honest broker: making sense of science in policy and politics** Cambridge University Press, Cambridge, 198pp.
- Schellnhuber,H.J., Cramer,W., Nakicenovic,N., Wigley,T.M.L. and Yohe,G. (eds) (2006) **Avoiding dangerous climate change** Cambridge University Press, Cambridge, 392pp.
- Von Storch,H. and Stehr,N. (2006) Anthropogenic climate change: a reason for concern since the 18th century and earlier **Geografiska Annaler** 88A(2), 107-113.
- Weart,S. (2010) The idea of anthropogenic climate change in the 20th century **WIREs Climate Change** 1(1), 67-81

### Week 3: Climate Risks, Culture and the Public

26/01/10, 12-1pm	Lecture 6: <i>Climate risks, culture and society</i>
26/01/10, 2-5pm	Lecture 7: <i>Perceptions of climate risks and their communication</i>
28/01/10, 6-7pm	Seminar 1A: Framing climate change (to be confirmed)
29/01/10, 9-10am	Lecture 8: <i>Climate change icons and the public</i>

Lecture 6: There is a long history of humans relating to climate in pathological terms and climate-related risks continue to surprise us and to shock us. A prospective, and not fully predictable, change in climate therefore offers fertile territory for the heightening of these fears. This lecture examines the construction of risk around climate change, drawing upon ideas from social and behavioural psychology, risk perception and cultural theory. The discourse around ‘dangerous climate change’ is a classic example of how disagreements about climate change have emerged. The role of language, metaphors and visual imagery in the construction of climate change risks is important to understand, as is the way semiotics (signs and symbols) have been used by different interest groups engaged with climate change – governments, campaigning organisations, commercial organisations. Climate change has been identified as an ‘unsituated’ risk which differs fundamentally from more ‘situated’ risks such as waste incinerators. What does this imply for questions of urgency, agency and priority about the design and public acceptability of climate change policies?

Lecture 7: The public and policy discourses of climate change are heavily influenced by the way the science is framed and communicated. In particular, we need to understand the processes by which science and policy meet through media-shaped narratives. This lecture examines the ways in which climate change has been represented in the media, by campaigning organisations and by advertisers. It discusses the relationship between these social representations of climate change and the construction and identification of climate change by the knowledge community. The ‘deficit model’ of science communication is no longer tenable. It is not sufficient to argue that more or clearer information about climate change from scientists will lead to greater public engagement with climate change. Neither can it be argued that more scientific certainty about future climate change, or better representations of scientific uncertainty, will lead to greater public engagement. Different climate change discourses use different linguistic repertoires, often related to the specific goals of the discourse coalition involved. Specific climate change communication initiatives - such as the Cape Farewell project (art), *The Day After Tomorrow* (film) – are examined.

Lecture 8: Climate change communication campaigns use a variety of strategies to deliver their message. This lecture presents one case study of research designed to encourage climate change understanding in non-climate experts through the use of icons. An icon is defined as a tangible global representation considered worthy of admiration or respect, which one can relate to and feel empathy for. There is some evidence of the usage of such icons already e.g. the melting of the West Antarctic Ice Sheet or potential thermohaline shutdown. Yet, these icons used by climate experts are likely to discourage efficacy in the non-expert as they are too remote from everyday life. Instead, an iconic approach aims to harness the emotive and visual power of icons already in the public eye with a rigorous scientific analysis of possible changes under a different climate future. What makes an ‘icon’, and how are icons chosen? What are the effects of modelling a potential climate future upon the chosen icons, and when does the climate become dangerous with reference to the icons? Does this method of communicating climate change provide saliency to the layperson?

### Additional reading

- Ereaut,G. and Segnit,N. (2006) **Warm words: how are we telling the climate story and can we tell it better?** Institute for Public Policy Research, London, 32pp. & Segnit,N. and Ereaut,G. (2007) **Warm words II: how the climate story is evolving** Institute for Public Policy Research/Energy Savings Trust, London, UK, 51pp.
- Furedi,F. (2007) The changing meaning of disaster **Area** 39(4), 482-489.
- Hulme,M. (2009) The things we fear Chapter 6 in, **Why we disagree about climate change** Cambridge University Press, Cambridge, 393pp.
- Hulme,M. (2009) The communication of risk Chapter 7 in, **Why we disagree about climate change** Cambridge University Press, Cambridge, 393pp.
- Lowe,T., Brown,K., Dessai,S., de Franca Doria,M., Haynes,K. and Vincent,K. (2006) Does tomorrow ever come? Disaster narrative and public perceptions of climate change **Public Understanding of Science** 15(4), 435-457.
- Malone,E.L. (2009) **Debating climate change: pathways through argument to agreement** Earthscan, London, 176pp.
- Moser,S. (2010) Communicating climate change: history, challenges, processes and future directions **WIREs Climate Change** 1(1), 31-53.
- Nisbet,M.C. (2009) Communicating climate change: why frames matter for public engagement **Environment** Mar/Apr 15pp.  
<http://www.environmentmagazine.org/Archives/Back%20Issues/March-April%202009/Nisbet-full.html>
- O'Neill,S.O. and Hulme,M. (2009) An iconic approach for representing climate change **Global Environmental Change** 19(4), 402-410
- Pidgeon,N.F. and Butler,C. (2009) Risk analysis and climate change **Environmental Politics** 18(5), 670-688.

## **Week 4: Economics and Climate Change**

02/02/10, 12-1pm	Lecture 9: <i>Economics and climate change</i>
02/02/10, 2-5pm	Lecture 10: <i>The Stern Review: ethics, risks and values</i>
04/02/10, 6-7pm	Seminar 1B: Framing climate change (to be confirmed)
05/02/10, 9-10am	Lecture 11: <i>A short history of climate engineering</i>

Lecture 9: There are many different ways individuals and societies ascribe value to activities, assets, constructs and resources. This lecture explores some of these different frameworks and explains why the choice of valuation framework is so important when deciding what to do about climate change. Professional economists recognise a number of different ways of ascribing and analysing values. The dominant frame in the West has been neo-classical welfare economics which is strongly linked to the view that the market is the dominant means by which values are revealed. Other frameworks include Marxist economics, the new institutional economics framework and ecological economics. This latter framework, for example, would try to expose the environmental goods and services - including innate cultural associations of a given climate - which are serviced by climate, and find multiple ways of attaching value to them. This lecture will illustrate the importance of GDP-

based indicators, discounting, the social cost of carbon and risk representation in economic debates about climate change.

Lecture 10: The most widely cited economic assessment of climate change in recent years – the Stern Review – uses many of these concepts in articulating powerfully an economic case for strong global climate policies. We examine the framework, assumptions and value judgements used in the Review and then present two sets of arguments which have claimed that the framework used by the Stern Review was, respectively, too radical (e.g. Lomborg, Nordhaus) or too conservative (e.g. the ecological economists). This comparative critique reveals that many of the economic reasons for disagreement about what to do about climate change are rooted in different choices of analytical frameworks, different ethical positions about our responsibility for the future world and different attitudes to risk. These various dimensions of how and why we attach value to things are elaborated. Radically different prognoses for addressing climate change emerge depending on what value system is adopted.

Lecture 11: In recent years the idea of deliberately seeking to re-engineer the Earth's climate has been gaining visibility. This lecture considers some of the historical, environmental, economic, ethical and governance issues surrounding some of the ideas which are grouped together under the heading of 'geo-engineering'. This thinking is not new and can be traced back to the 19<sup>th</sup> century. It is also important to distinguish between schemes for large-scale carbon management and schemes for solar radiation modification. Most of the social, ethical and political aspects of climate engineering have been very little studied or thought through.

#### Additional reading

- Agrawala,S. and Fank hauser,S. (eds.) (2008) **Economic aspects of adaptation to climate change: costs, benefits and policy instruments** OECD Publishing, Paris, 134pp.
- Anthoff,D., Hepburn,C. and Tol,R.S.J. (2009) Equity weighting and the marginal damage costs of climate change **Ecological Economics** 68(3), 836-849.
- Dietz,S., Hope,C. and Patmore,N. (2007) Some economics of 'dangerous' climate change: Reflections on the Stern Review **Global Environmental Change** 17(3/4), 311-325
- Fleming,J.R. (2007) The climate engineers: playing God to save the planet **Wilson Quarterly** Spring 46-60 <http://www.colby.edu/sts/climateengineers.pdf>
- Gardiner,S. (2010) Ethics and climate change: an introduction **WIREs Climate Change** 1(1), 54-66.
- Hulme,M. (2009) The endowment of value Chapter 4 in, **Why we disagree about climate change** Cambridge University Press, Cambridge, 393pp.
- Lomborg,B. (ed.) (2004) Especially Chapter 1 (exchange between Cline, Mendelsohn and Manne) in, **Global crises, global solutions** Cambridge University Press, Cambridge, 648pp.
- Neumayer,E. (2007) A missed opportunity: the Stern Review on climate change fails to tackle the issue of non-substitutable loss of natural capital **Global Environmental Change** 17(3/4), 297-301
- Royal Society (2009) **Geoengineering the climate: science, governance and uncertainty** Royal Society Report, London, 82pp.

Stern,N. (ed.) (2006) Especially chapter 6 in, **The economics of climate change: the Stern review** Cambridge University Press, Cambridge, UK, 692pp.

## **Week 5: Climate (Change) and (Sustainable) Development**

09/02/10, 12-1pm	Lecture 12: <i>Climate and development</i>
09/02/10, 2-4pm	Lecture 13: <i>Millennium Development Goals and climate change</i>
11/02/10, 6-7pm	Seminar 2A (Marisa Goulden): National Adaptation Plans (to be confirmed)
12/02/10, 9-10am	Lecture 14 (Marisa Goulden): <i>Climate change and sustainable development</i>

### **Optional coursework due, 1500hrs Thursday 11 February Register extended essay titles, Friday 12 February**

Lecture 12: Our views of development and how we think of progress are powerful shapers of attitudes to climate change. Our definition of poverty and how we understand the inequalities in our world are also important. This lecture outlines some of these different views and approaches, and explains why an understanding of climate change cannot be separated from an understanding of development. Proposed 'solutions' to climate change emanating from developed economies look very different if one is a citizen or policy-maker in Uganda, Honduras or Bangladesh. And the 'new' development agenda - adaptation to climate change which is now beginning to be resourced from growing climate change funds – might be a distraction from the more fundamental development rights of poverty alleviation, basic health care and education. Within this context what significance does climate change have? Is climate change the primary threat to securing sustainable development for the three billion people denied it today, and the two to three billion due to arrive in the next 50 years? Or do the climate risks to which such people are already exposed constitute the greater danger?

Lecture 13: The world remains deeply unequal, with increasingly divergent life chances between North and South, and multiple barriers remaining for those who aspire to basic standards of well-being and personal security. The 2002 Johannesburg Summit articulated many of these contours of inequality and also agreed a set of development goals, and institutional innovations to secure them. Half-way to 2015, the Millennium Development Goals remain an unforgiving pull on the conscience of the world. For some, climate change trumps all of these dilemmas; for others, these dilemmas remain serious obstacles in negotiating an action agenda on climate change. In what ways are development goals and climate goals synergistic? In what ways are they antagonistic? Are we really measuring the right things? If the Millennium Development Goals are not met, what does this justify for our determination and ability to tackle climate change?

Lecture 14 (Goulden): This lecture explains how climate change is placed within the wider field of sustainable development through examination of theory, policy and a number of case studies of governmental and non-governmental organisations. Most climate change policy is currently in the reformist, less radical approach to sustainable development, with a focus on energy agreements and politics. Some climate change discourse and policy, however, is related to more radical interpretations of sustainable development, primarily concerning equity and limits.

#### Additional reading

Adger,W.N., Huq,S., Brown,K., Conway,D. and Hulme,M. (2003) Adaptation to climate change in the developing world **Progress in Development Studies**, 3, 179-195.

- Boyd,E., Grist,N., Juhola,S. and Nelson,V. (2009) Exploring development futures in a changing climate: frontiers for development policy and practice **Development Policy Review** 27, 659-674.
- Dyson,T. (2005) On development, demography and climate change: the end of the world as we know it? **Population and Environment**, 27(2), 117-149.
- Grist,N. (2008) Positioning climate change in sustainable development discourse **Journal of International Development** 20, 783-803.
- Gupta,J., Persson,A. and Olsson,L. (2010) Mainstreaming climate change in development co-operation policy: conditions for success pp.319-339 in, **Making climate change work for us: European perspectives on adaptation and mitigation strategies** (eds.) Hulme,M. and Neufeldt,H., Cambridge University Press Cambridge, 413pp.
- Hulme,M. (2009) The challenges of development Chapter 8 in, **Why we disagree about climate change** Cambridge University Press, Cambridge, 393pp.
- Munasinghe,M. and Swart,R. (2005) **Primer on climate change and sustainable development** Cambridge University Press, Cambridge, 458pp.
- O’Neill,B.C., MacKellar,F.L. and Lutz,W. (2001) Especially Chapter 6 in, **Population and climate change** Cambridge University Press, Cambridge, 266pp.
- Sanwal,M. (2009) Reflection on the climate negotiations: a southern perspective **Climate Policy** 9(3), 330-333

## Week 6: Adapting to Climate Change

16/02/10, 12-1pm	Lecture 15 (Marisa Goulden): <i>Adaptation, vulnerability and resilience</i>
16/02/10, 2-3pm	Lecture 16: <i>Adapting to climate change: limits and barriers</i>
<b>16/02/10, 3-4pm</b>	<b>Set Coursework #2: Debates</b>
16/02/10, 4-5pm	Lecture 17 (Marisa Goulden): <i>Adapting to coastal change in Norfolk</i>
<b>17/02/10, 1-5.30pm</b>	<b>Half-day fieldtrip to Norfolk coast; leave ZICER building at 1pm</b>
18/02/10, 6-7pm	Seminar 2B (Marisa Goulden): National Adaptation Plans (to be confirmed)
19/02/10, 9-10am	Lecture 18 (Marisa Goulden): <i>Adaptation in the Nile Valley</i>

Lecture 15: (Goulden) Adaptation to climate change denotes actions undertaken to reduce the risks, and capitalize on the opportunities, associated with global climate change. This lecture summarizes current thinking about adaptation. It starts with an explanation of key adaptation concepts – autonomous versus planned adaptation, vulnerability, adaptive capacity and resilience – before introducing the diversity of contexts in which adaptation occurs. Some discussion of the key prerequisites for effective adaptation will be covered, and major approaches to climate impact and adaptation assessment and their evolution are reviewed. Examples will be drawn from historical learning and from contemporary debates and future speculation about needed adaptations.

Lecture 16: Present understanding of processes of adaptation to climate change suggests that actions occur when risks are known and when resources are available to minimise these risks or reduce vulnerabilities. Using the concepts of thresholds and barriers, this lecture examines whether there are limits to adapting to climate change. Thresholds of change in physical and ecological systems can be defined as those beyond which irreversible change occurs and a barrier is defined as a political, social, or behavioural obstacle to change. A number of arguments are examined. First, any claimed limits to adaptation depend on the precise goals of adaptation. Second, adaptation may

be limited by the uncertainty that surrounds future foresight of risk. Third, social and behavioural characteristics act as deep-seated barriers to action. Fourth, adaptation is limited due to irreversible loss of places and identities that people hold dear.

Lecture 17: (Goulden) This lecture examines the challenges of adapting to eroding coastlines and rising sea-level in Norfolk. It builds upon long-standing work conducted by the Tyndall Centre which brings together coastal modelling, stakeholder dialogues and principles of justice and equity. It shows the difficulties of bringing together science, citizens and multi-scale governance to design sustainable adaptation strategies. There will be a half-day field trip to the Norfolk Coast on Wednesday afternoon in Week 6 (17 February) to visit some of the villages most affected by rapid coastal erosion, increased flood risk and changing government policy on coastal management.

Lecture 18: (Goulden) This lecture is a case study which examines how adaptation to climate change takes places in specific contexts. Using the Nile River Basin as the geographical setting, the adaptiveness of institutional arrangements at the national and international scales that govern cross-Basin water management is discussed. The lecture explores how conflict and cooperation between institutions in the different countries sharing a river basin can either hinder or facilitate adaptations countries are making to climate variability, increasing water demand and the uncertain impacts of climate change. This case study illustrates in a real-world setting concepts and ideas introduced in previous lectures – adaptation, institutions and the limits and barriers to adaptation.

#### Additional reading

Adger,W.N., Dessai,S., Goulden,M., Hulme,M., Lorenzoni,I., Nelson,D., Otto-Naess,L., Wolf,J. and Wreford,A. (2009) Are there social limits to adaptation to climate change? **Climatic Change** 93, 335-354.

Adger,W.N., Lorenzoni,I. and O'Brien,K. (eds.) (2009) **Adapting to climate change: thresholds, values, governance** Cambridge University Press, Cambridge, UK, 514pp.

Bencala,K.R. and Dabelko,G.D. (2008) Water wars: obscuring opportunities **Journal of International Affairs** 61(2), 21-33

Dessai,M. and Hulme,M. (2007) Assessing the robustness of adaptation decisions to climate change uncertainties: a case-study on water resources management in the East of England **Global Environmental Change** 17(1), 59-72.

Füssel,H-M. (2007) Adaptation planning for climate change: concepts, assessment approaches and key lessons **Sustainability Science** 2, 265-275

Glantz,M.H. (2003) Use of climate information in decision-making Chapter 5 in, **Climate affairs: a primer** Island Press, Washington, 290pp.

Goulden,M., Conway,D. and Persechino,A. (2009) Adaptation to climate change in international river basins in Africa: a review **Hydrological Sciences Journal-Journal Des Sciences Hydrologiques** 54, 805-828.

Milligan,J., O'Riordan,T., Nicholson-Cole,S. and Watkinson,A.R. (2009) Nature conservation for future sustainable shorelines: lessons from seeking to involve the public **Land Use Policy** 26(2), 203-213

Nelson,D.R, Adger,W.N. and Brown,K. (2007) Adaptation to environmental change: contributions of a resilience framework **Annual Review of Environmental and Resources** 32, 395-419.

O'Brien,K., Eriksen,S., Sygna,L. and Otto Naess,L. (2006) Questioning complacency: climate change impacts, vulnerability and adaptation in Norway **Ambio**, 35(2), 50-56

O'Riordan,T., Nicholson-Cole,S.A. and Milligan,J. (2008) Designing sustainable coastal futures **Twenty-First Century Society** 3, 145-157.

## Week 7: Decarbonising Societies

23/02/10, 12-1pm	Lecture 19: <i>Global energy futures: the IPCC approach</i>
23/02/10, 2-5pm	Lecture 20: <i>Decarbonisation: wedges, pathways, policies</i>
25/02/10, 6-7pm	Seminar 3A: Climate change as philosophical belief? (to be confirmed)
26/02/10, 9-10am	Lecture 21 (Keith Tovey): <i>The future of UK electricity</i>

Lecture 19: Consideration of options for reducing the growth in greenhouse gas emissions requires a set of baselines which describe how we see the future developing in the absence of deliberate climate mitigation. The most comprehensive assessment of such futures – encompassing world development, demography, economic, technology and energy change, and trends in cultural qualities - was the IPCC Special Report on Emissions Scenarios published in 2000. This is a good starting point for thinking about low carbon futures and this lecture will introduce these scenarios and consider recent trends in key parameters since publication and further work about energy futures on a global scale.

Lecture 20: There are many different ways of thinking about carbon futures and relating them to near-term investment decisions, national and international policies and behavioural change. This lecture will consider three such frameworks: the idea of global 'stabilisation wedges', the idea of inverse social and technological pathways to secure the UK's 2050 carbon reduction goals, and the implementation of carbon emissions trading in Europe. This introduces the idea of different scales of agency in the efforts to decarbonise twenty-first century societies. These different frameworks also reveal deeper differences in philosophical and ideological approaches to securing a low carbon future – technology-driven, social movements or market-based mechanisms.

Lecture 21 (Keith Tovey): This lecture explores the hard choices and conflicting issues of energy security, carbon dioxide emissions reductions and politics in the UK, covering the scientific basis of the electricity generation and also some of the key political/social aspects.

### Additional reading

Anderson,K., Mander,S., Bows,A., Shackley,S., Agnolucci,P. and Ekins,P. (2008) The Tyndall de-carbonisation scenarios – Part II: scenarios for a 60% CO<sub>2</sub> reduction in the UK **Energy Policy** 36, 3764-3773

Bailey,I. (2010) The EU Emissions Trading Scheme **WIREs Climate Change** 1(1), 144-153

Girod,B., Wiek,A., Mieg,H. and Hulme,M. (2009) The evolution of the IPCC's emission scenarios – changes, causes and critical aspects **Environmental Science and Policy** 12(2), 103-118

- Grubb,M., Betz,R. and Neuhoff,K. (eds.) (2006) National allocation plans in the EU emissions trading scheme: lessons and implications for Phase II **Climate Policy** (Special Issue), 6(4), 349-501
- IPCC (2000) **Emissions scenarios. A special report of Working Group III of the Intergovernmental Panel on Climate Change.** Cambridge University Press, Cambridge, UK and New York, NY, USA, 599 pp.
- Knopf,B, and Edenhofer,O. (2010) The economics of low stabilization: implications for technological change and policy pp.291-318 in, **Making climate change work for us: European perspectives on adaptation and mitigation strategies** (eds.) Hulme,M. and Neufeldt,H., Cambridge University Press Cambridge, 413pp.
- Mander,S., Bows,A., Anderson,K., Shackley,S., Agnolucci,P. and Ekins,P. (2007) Uncertainty and the Tyndall decarbonisation scenarios **Global Environmental Change** 17(1), 25-36
- Pacala,S. and Socolow,R.H. (2004) Stabilisation wedges: solving the climate problem for the next 50 years with current technologies **Science** 305, 968-972
- Verbruggen,A. (2008) Renewable and nuclear power: a common future? **Energy Policy** 36(11), 4036-4047
- Wang,T. and Watson,J. (2008) China's carbon emissions and international trade: implication for post-2012 policy **Climate Policy** 8(6), 577-587

## **Week 8: The Future of Climate Policy**

02/03/10, 12-1pm	Lecture 22: <i>The goals of climate policy</i>
02/03/10, 2-5pm	Lecture 23: <i>How should climate be governed?</i>
04/03/10, 6-7pm	Seminar 3A: Climate change as philosophical belief? (to be confirmed)
02/03/10, 4-5pm	Lecture 24 (Tim Rayner): <i>The EU: rising to the challenges of climate change mitigation and adaptation governance?</i>

Lecture 22: The way climate change is framed affects the types of policy interventions that are sought and by what agents. Within the Framework Convention, climate change mitigation and adaptation are structurally linked, requiring policies to be negotiated and designed in parallel. Internationally, the Kyoto Protocol negotiated in 1997 has been the benchmark agreement for shaping the goals of (and disputes around) mitigation policies, whilst the last few years have seen a growing attention to whether or not a new genre of adaptation policies is necessary or desirable. How we respond to climate change – through whatever type of policy enactment - is about how we frame our understanding of the relationship between the individual, society and nature, and the balance of responsibility between past, present and future generations. This lecture explores the various ways in which governments have defined the goals of climate policy international, national and local scales.

Lecture 23: The Kyoto Protocol is a classic example of nation-state multi-lateralism, with targets and timetables, but other ways of forging policy coalitions are possible – corporate actors, sub-national government, municipalities. The Bali road-map to 2009 is working towards a post-2012 successor to the Kyoto Protocol. But science alone does not drive policy and governments alone do not enact policy. Active policy actors in climate change are increasing in number and becoming more heterogeneous. The lecture examines other ways in which societies may respond to climate change – e.g. through litigation, insurance, technological innovation, geo-engineering, new social contracts.

This explains why surveys repeatedly find large discrepancies over who is perceived to be responsible for 'taking action' on climate change – the UN, the Americans, national governments, businesses, the rich, individuals.

Lecture 24 (Tim Rayner): For over 20 years the European Union (EU) has played a leading role in global efforts to address the threat of climate change. By 2009, it had established an innovative emissions trading scheme and adopted a package of measures to reduce emissions by 20% by 2020 across its 27 Member States. Highlighting the key institutional characteristics of the EU as a system of multi-level governance, and other opportunities and constraints faced by policy makers, this lecture will ask how such steps have been possible, how good the EU's emission reduction record really is, and why progress with the adaptation agenda has been comparatively slow.

#### Additional reading

- Anderson,K. and Bows,A. (2008) Reframing the climate change challenge in light of post-2000 emission trends **Philosophical Transactions of the Royal Society A**, 366, 3863-3882
- Berkhout et al. (2010) How do climate policies work? Confronting governance dilemmas in the European Union pp.137-164 in, **Making climate change work for us: European perspectives on adaptation and mitigation strategies** (eds.) Hulme,M. and Neufeldt,H., Cambridge University Press Cambridge, 413pp.
- Biermann,F., Pattberg,P. and Zelli,F. (2010) Global climate governance beyond 2012\_ architecture, agency and adaptation pp.263-290 in, **Making climate change work for us: European perspectives on adaptation and mitigation strategies** (eds.) Hulme,M. and Neufeldt,H., Cambridge University Press Cambridge, 413pp.
- Friman,M. and Linner,B-O. (2008) Technology obscuring equity: historical responsibility in UNFCCC negotiations **Climate Policy** 8, 339-354
- Giddens,A. (2009) **The politics of climate change** Polity Press, London, UK, 264pp.
- Hulme,M. (2009) The way we govern Chapter 9 in, **Why we disagree about climate change** Cambridge University Press, Cambridge, 393pp.
- Mace,M.J. (2006) Adaptation under the UN Framework Convention on Climate Change: the international legal framework Chapter 3 in, **Fairness in adaptation to climate change** Adger,W.N. et al. (eds.), MIT Press, Cambridge, MA, 319pp.
- Miller,C.A. (2004) Climate science and the making of a global political order pp.46-66 in, **States of knowledge: the co-production of science and the social order** (ed.) S.Jasanoff, Routledge, London, 317pp.
- Prins,G. and Rayner,S. (2007) Time to ditch Kyoto **Nature** 449, 973-975.
- Victor,D.G. (2009) Plan B for Copenhagen **Nature** 461, 343-345.

**Week 9: Free for coursework preparation**

**For Erasmus Scholars: Coursework #1 due in, 1500hrs Thursday 11 March 2009 (Week 9)**

**Week 10: Coursework debates**

**Coursework #1 due in, 1500hrs Thursday 18 March 2009 (Week 10)**

**Coursework #2 due in, exactly six days after respective debate**

**Easter Vacation, 22 March to 16 April**

**Weeks 11-12: Coursework debates**

**Coursework #2 due in, exactly six days after respective debate**

## Recommended texts

The Intergovernmental Panel on Climate Change web site - [www.ipcc.ch/index.htm](http://www.ipcc.ch/index.htm) - contains the full text of the Fourth Assessment reports and the summaries.

See the new journal - **Wiley Interdisciplinary Reviews (WIREs): Climate Change** – launched January 2010 <http://wires.wiley.com/WileyCDA/Section/id-398161.html>

- Adger, W.N., Lorenzoni, I. and O'Brien, K. (eds.) (2009) **Adapting to climate change: thresholds, values, governance** Cambridge University Press, Cambridge, UK, 514pp.
- Aldy, J.E. and Stavins, R.N. (eds.) (2007) **Architectures for agreement: addressing global climate change in the post-Kyoto world** Cambridge University Press, Cambridge, 408pp.
- Dow, K. and Downing, T.E. (2006) **The atlas of climate change**. Earthscan, 128pp.
- Fagan, B.M. (2008) **The great warming: climate change and the rise and fall of civilisations** Bloomsbury Press, London, UK, 308pp.
- Fleming, J.R. (1998/2005) **Historical perspectives on climate change**. Oxford University Press, 194pp.
- Garvey, J. (2008) **The ethics of climate change: right and wrong in a warming world** Continuum International Publishing, London/New York, 179pp.
- Hulme, M. (2009) **Why we disagree about climate change: understanding controversy, inaction and opportunity**. Cambridge University Press, Cambridge, 393pp.
- Hulme, M. and Neufeldt, H. (eds.) (2010) **Making climate change work for us: European perspectives on adaptation and mitigation strategies** Cambridge University Press, Cambridge, 411pp.
- Malone, E.L. (2009) **Debating climate change: pathways through argument to agreement** Earthscan, London, 176pp.
- Moser, S. and Dilling, L. (eds.) (2007) **Creating a climate for change: communicating climate change and facilitating social change**. Cambridge University Press, Cambridge, 549pp.
- Munden, P. (ed.) (2008) **Feeling the pressure: poetry and science of climate change** British Council, Berne, Switzerland, 93pp.
- Munasinghe, M. and Swart, R. (2005) **Primer on climate change and sustainable development**. Cambridge University Press, Cambridge, 458pp.
- Pielke, R. jr (2007) **The honest broker: making sense of science in policy and politics**. Cambridge University Press, 198pp.
- Roberts, J.T. and Parks, B.C. (2007) **A climate of injustice: global inequality, North-South politics and climate policy** MIT Press, Cambridge MA, 404pp.
- Schipper, L. and Burton, I. (eds.) (2008) **The Earthscan reader on adaptation to climate change** Earthscan, London, 288pp.
- Schlesinger, M.E. and Khesgi, H., et al. (2007) **Human-induced climate change: an interdisciplinary assessment**. (eds.) Cambridge University Press, Cambridge, 400pp.
- Stern, N. (2006) **The economics of climate change: the Stern review**. Cambridge University Press, Cambridge, UK, 692pp.