Syllabus
GLOBAL CLIMATE CHANGE SCIENCE AND POLICY
NR 5984, 3 Credits, CRN 17141
Spring Semester 2007
Virginia Polytechnic Institute and State University
College of Natural Resources

INSTRUCTOR:

Patrick J. Michaels, Ph.D.
Visiting Professor
Natural Resources Program
National Capital Region

CLASS LOCATION:

Virginia Tech Northern Virginia Center, Room TBD
7054 Haycock Road
Falls Church, VA

MEETING TIME:

Tuesdays, 7:00 – 9:45 PM

OFFICE HOURS:

By appointment.

COURSE DESCRIPTION:

The issue of global environmental change, largely caused by human activities, provides remarkable insights into science, the nature of science, and the culture in which it is enmeshed. This background material is essential for wise management. Students need to understand not only the scientific information, but the political and social background in which it arises. Evidence can be conflicting and policies may be expensive.

How does one make policy in such an environment? This class is run as both in standard lecture format and as an experiment in policymaking. The majority of time is spent detailing background material in basic and applied science, and policy analyses. Selected "case studies in conflicting science" are studied and discussed. Depending upon enrollment, students choose a small number of leaders to whom they serve as staff. Leaders and staff hold hearings to make findings. Staff and leaders propose legislation (which may consist of "do nothing"), which, if accepted by a majority, implies a basic understanding of policymaking in a remarkably complex, conflicting world.

In the Natural Resources Program format, class consists of 15 3.0 hour meetings. The timeline given below will be in rough correspondence to that format.

GOAL AND EDUCATIONAL OBJECTIVES:

Goal: To explore the complexities of global warming policymaking in a world of conflicting scientific and economic findings, and to understand that science itself is in part determined by this process.

Course Objectives: Upon completion of the course, students will be able to:

- Understand the basic science concerning global climate change, and how that science interacts bidirectionally with policy
- Understand the policy options that are available and the legal constraints and committments
- Critically read the primary scientific literature on climate change
- Understand the legislative process with regard to climate change, and appreciate the difficulty of policymaking in an uncertain scientific and political climate

COURSE REQUIREMENTS AND GRADING:

The course will be sequenced around issues and problems that will promote a critical inquiry into the knowledge, skills, and abilities relevant to key elements of Global Climate Change. Each session will address a series of problems or issues that will be used to guide class discussion and promote critical inquiry. Problems will be assigned at least 1 week in advance along with reading assignments. The course will require extensive readings in texts and references along with Internet searches. Students are expected to have written notes and outlines to lead class discussions and support their analysis.

Class attendance and participation in class discussions will account for 20% of the final grade. Arrangements can be worked out for a limited number of absences due to conflicts in work or other schedules. Two written examinations will account for 50% of the grade. A comprehensive final project, a critical analysis of proposed legislation, will account for 30% of the final grade.

REQUIRED TEXT

•Henderson-Sellers, A., and P.J. Robinson, 1999. Contemporary Climatology (second edition). Prentice-Hall. 344pp. (Excerpts; no purchase necessary)

•Houghton, J.T., 2001, (ed). Climate Change 2001, The Scientific Basis. 881pp. (excerpts; assignments available online)

•Kuhn, T.S., 1962 and updates. The Structure of Scientific Revolutions (excerpts; no purchase necessary)

ADDITIONAL MATERIALS

There will be a substantial number of readings from the scientific and more popular literature, as well as legal documents including the Framework Convention on Climate Change, the Kyoto Protocol to that Convention, and active global warming bills in Congress.

Much of the reading from the scientific literature pertains to the case studies. Papers will be made available online.

Antarctica Case

Davis, C. H., et al., 2005. Snowfall-driven growth in East Antarctic ice sheet mitigates recent sea-level rise. *Science*, **308**, 1898-1901.

Rignot, E., and P. Kanagaratnam, 2006. Changes in the velocity structure of the Greenland ice sheet. *Science*, **31**, 986-990.

Velicogna, I., and J. Wahr, 2006. Measurements of time-variable gravity show mass loss in Antarctica. *Sciencexpress*, March 2, 2006.

Vaughn, D.G., 2005. How does the Antarctic ice sheet affect sea level rise? *Science*, **308**, 1877-1878.

Hockey Stick Case

Esper J., D.C. Frank, and J.S. Wilson, 2004. Climate reconstructions: Low-frequency ambition and high-frequency ratification. *Eos*, **85**, 133,120.

Esper, J., E.R. Cook, and F.H. Schweingruber, 2002. Low frequency signals in long tree-ring chronologies for reconstructing past temperature variability, *Science*, **295**, 2250-2253.

Intergovernmental Panel on Climate Change, 2001. *Climate Change 2001: The Scientific Basis*. Houghton, J.T., et al., (eds.), Cambridge University Press, Cambridge, U.K, pp 881, http://www.grida.no/climate/ipcc_tar/wg1/index.htm.

Mann, M.E. R.S. Bradley, and M.K. Hughes, 1998. Global-scale temperature patterns and climate forcing over the past six centuries. *Nature*, **392**, 779-787.

Mann, M.E., R.S. Bradley, and M.K. Hughes, 1999. Northern Hemisphere temperatures during the past millennium: inferences, uncertainties, and limitations. *Geophysical Research Letters*, **26**, 759–762.

McIntyre, S., and R. McKitrick, 2003. Corrections to the Mann et. al. (1998) Proxy database and Northern Hemispheric average temperature series. *Energy & Environment*,**14**, 751-771.

McIntyre, S., and R. McKitrick, 2005. Hockey sticks, principal components, and spurious significance. *Geophysical Research Letters*, **32**, doi:10.1029/2004GL021750.

Moberg, A., et al., 2005. Highly variable Northern Hemisphere temperatures reconstructed from low- and high-resolution proxy data. *Nature*, **433**, 613-617.

Soon, W., and S. Baliunas, 2003. Proxy climatic and environmental changes of the past 1,000 years. *Climate Research*, **23**, 89–110.

Von Storch, H., et al., 2004. Reconstructing past climate from noisy data. *Science*, **306**, 679-682.

Hurricanes and Global Warming

Hoyos, C.D., et al., 2006. Deconvolution of the factors contributing to the increase in global hurricane intensity. *SciencExpress*, March 16, 2006.

Knight, J.R., et al., 2005. A signature of persistent natural thermohaline circulation cycles in observed climate. *Geophysical Research Letters*, doi:10.1029/2005GL024233.

Knutson, T., Tuleya, R., 2004. Impact of carbon dioxide-induced warming *Journal of Climate*, **17**, 3477-3495.

Michaels, P.J., Knappenberger, P.C., and C Landsea, 2005. Extended Comments on "Impacts of CO2-Induced Warming on simulated hurricane intensity and precipitation: Sensitivity of the choice of climate model and convective parameterization.". *Journal of Climate* **18**, 5179-5182.

Virmani, J.I., and R. H. Weisberg, 2006. The 2005 hurricane season: An echo of the past or a harbinger of the future? *Geophysical Research Letters*, doi:10.1029/2005GL025517.

Webster, P.J., et al., 2005. Changes in tropical cyclone number, duration, and intensity on a warming environment. *Science*, **309**, 1844-1846.

Lecture 1	The Energy Balance Basic Concepts: Radiation, Albedo, Emissivity The Nature of Climate History of the Perception of Climate Change Causation: From Environmental Disturbance to Social Cost
Lecture 2	The Climate Machine: Atmospheric General Circulation

	Early Analog Simulations Global Circulations: ITCZ, Hadley, Westerlies, Polar Modern General Circulation Models Changes in Greenhouse Gases and Influence on Models
Lecture 3	Science and Society The Nature of Scientific Paradigms Interactions of Paradigms with Politics The Nature of Public Choice and its influence on science How Scientific Knowledge Evolves and is Recorded The Peer-Review Process: Surprisingly Complicated
Lecture 4	Paleo-indicators of climate Analyses of multiproxy datasets Case Study: The Hockey Stick Controversy
Lecture 5	The Nature of Storms—cyclones and hurricanes Expected changes with warming Dynamics of storm generation and effects on ecosystems
Lecture 6	Return to Secondary Circulations El Nino, Atlantic Multidecadal Oscillation Pacific-North American Pattern, Pacific Decadal Oscillation Quantitative Analysis of Climate Change
Lecture 7	Case Study: Antarctica, Greenland and the North Pole Conflicting Science, week-by-week.
Lecture 8	Mid-semester Examination Emissions Trading, Taxes, Command-and-Control Class Discussion: Are Emissions Limitations “Desirable”? Economic Analyses of Costs of Limitations
Lecture 9	History of Concern about Climate Change 1970s (IIASA, DOE) 1980s Startup of the U.N IPCC Mission of the IPCC The Framework Convention on Climate Change The Kyoto Protocol to the Framework Convention
Lecture 10	Policy Analyses Active Federal Legislation on Climate Change Internationally Adopted Emissions Restrictions State and Local Ordinances

Lecture 11	More Observed Changes in Climate Hurricanes around the world Importance of Data Selection Different Results—Different Reseachers Class Legislative Proposals and Discussion
Lecture 12	Case Study: Hurricanes and Global Warming
Lecture 13	Hearings on subject matter chosen by leaders Testimony by Staff
Lecture 14	Continue Hearings and Testimony Submission of Legislation
Lecture 15	Second-half examination Attempts to pass proposed legislations

BLACKBOARD

Course announcements, information, assignments, and documents will be posted on Blackboard, accessible with your PID and Password at www.learn.vt.edu or the Virginia Tech Home Page.

GRADUATE HONOR CODE

The tenets of the Virginia Tech Graduate Honor Code will be strictly enforced in this course, and all assignments shall be shall subject to the stipulations of the Graduate Honor Code as outlined in the Graduate Catalog at http://www.ncr.vt.edu. For more information on the Graduate Honor Code, please refer to the GHS Constitution, located online at http://fbox.vt.edu/studentinfo/gradhonor/ Please contact the instructor immediately if you have questions.

SPECIAL ACCOMMODATIONS

If you need adaptations or accommodations because of a disability (learning disability, attention deficit disorder, psychological; physical, etc.), if you have emergency medical information to share with me, or if you need special arrangements in case the building must be evacuated, please make an appointment with me as soon as possible. My office location and hours are shown above at the beginning of the syllabus.

COURSE EVALUATIONS

In the spirit of continuous improvement, the instructor seeks ways to improve this course and values your input. To that end, you will be asked to complete an informal evaluation mid-term and at the end of the semester as well as a formal

evaluation on December 13. At any point during the course, your suggestions and comments are most welcome.

NOTE: The course syllabus is a work in progress. Changes and updates will be made to accommodate the needs and interests of the students. Modifications may also be made if natural resource communications issues surface during the semester that may provide a unique learning experience for students.

WEATHER LINE

For weather cancellations, please check www.ncr.vt.edu and the Weather Alert Line 703-538-8325.