

IDCE 30205/ EN 207 Climate Change, Energy and Development

Professor: Jennie C. Stephens, Environmental Science and Policy (ES&P) Program

Department of International Development, Community, & Environment (IDCE)

jstephens@clarku.edu x 8846, IDCE House Office 303

Spring 2009, Friday: 9:00-11:50 Room: JC 206

Course Overview: This course explores the evolving science of climate change, the uneven distribution of climate change impacts throughout the world, the challenges of integrating science into effective policy, technologies and policies for climate change mitigation and climate change adaptation, and the associated conflicts between and diversity among challenges of developed and developing countries. In addition to a global focus, national, regional, local, and community aspects of climate change, energy, and development are explored. This is a graduate level course, required for all ES&P graduate students; undergraduate registration is limited and by permission only.

Learning goals:

- (1) apply scientific understanding of climate change with its inherent uncertainty into policy analysis and into integrated analysis of the complexity of climate-related societal challenges
- (2) understand the process of energy technology innovation (R&D, demonstration, and deployment) and the challenges associated with changing energy technology systems
- (3) integrate different stakeholder perspectives, disciplines, scales and geographic contexts in evaluating climate change mitigation and climate change adaptation efforts
- (4) develop both oral and written communication skills to facilitate systematic analysis and effective consideration of these complex issues.

Required Readings

Book: Dessler, A. E. and E. A. Parson (2006). The Science and Politics of Global Climate Change. Cambridge, Cambridge University Press.

Course Reader: Most of the required readings have been compiled into a course reader (available at Curry Printing in UC basement). A few additional readings may be added throughout the semester and these readings will either be available as PDF documents on Cicada or else a hard copy will be distributed in class.

Course Requirements and Grading Distribution

Participation and weekly online reading response	20%
Papers	45%
Climate Science Paper – Individual (15%)	
Energy Technology Innovation Paper - Group (15%)	
Climate Policy Paper - Group (15%)	
Presentations	15%
Group Presentation (5%), Final Project Presentation (10%)	
Final Research Paper	20%

Preparedness and Participation: Coming prepared to engage in each class session is a critical part of this course. Preparing for class each week includes thorough reading of the assigned readings, posting a weekly reading response, reading and commenting on other students posted reading responses before class, and actively engaging in the class discussion. Being able to listen to what other students have said and respond and integrate one's own thoughts into the broader discussion is critical to effective class discussions.

Climate Change, Energy and Development Spring 2009 Syllabus

Weekly Online Reading Response: Each week students are required to post a written reading response online before midnight on the Wednesday before class. These reading responses are designed to stimulate class discussion. They should be 2-3 paragraphs critically discussing specific themes, concepts or proposals presented in the readings. Each reading response should include at least two questions that could be raised during the class discussion to help the group explore the key ideas and points raised within the readings. These reading responses are to be submitted electronically through CICADA by midnight on the Wednesday before the class session. Before the beginning of class on Friday, students are required to read and comment on at least two of their peers' reading responses. Students are allowed to miss one reading response and one peer comment on the reading response over the course of the semester without penalty. No late reading responses will be accepted.

Group Presentations: Every week a group of three students will be responsible for presenting an integration of that week's assigned reading and initiating the class discussion. These presentations should not be a simple summary of the readings, but should synthesize the readings and raise interesting questions that will lead to engaging class discussion. These three students should coordinate their presentation and their plans for engaging the class. These presentations should also incorporate at least one additional paper or resource related to the topic of the assigned readings (may also include supplemental figures or a short audio/video piece).

Climate Science Assignment (INDIVIDUAL PAPER): Due 2/2/09. Find and read a recent scientific paper published within the past three years in a high profile science journal (i.e. Science, Nature, Climatic Change, etc) that presents results of recent climate change science research. Then write a concise, well-organized 600 word paper explaining the significance of the scientific development presented in the paper. The paper should explain the context and relevance of the science, and should explain how the research contributes to the scientific understanding of anthropogenic influence on the climate system. Each paper should acknowledge whether or not this research was included in the IPCC 2007 Working Group I Full Report (<http://www.ipcc.ch/ipccreports/ar4-wg1.htm>), and each paper should also mention remaining uncertainties and potential future research that would build off this research. The paper should also address whether and how this science is relevant to or may influence climate policy. All references mentioned in this paper should be properly referenced using (author, year) convention - a list of full references should be included at the end of the paper.

Energy Technology Innovation Assignment (GROUP PROJECT AND PAPER): Due 2/23/09 Groups of 4-5 students will chose a specific emerging energy technology with potential to contribute to a low-carbon energy system to research, and then collectively write a concise, well-organized 1000 word paper briefly reviewing all three stages of the innovation process (R&D, demonstration, and deployment) related to that technology. The paper should critically assess the greatest current challenges associated with advancing the technology's potential for climate change mitigation, and identify whether the dominant obstacles are within the R&D, demonstration, or deployment stage. All references mentioned in this paper should be properly referenced using (author, year) convention and a list of full references should be included at the end of the paper.

Climate Policy Assignment (GROUP PROJECT AND PAPER): Due 3/30/09. Groups of 4-5 students will research and write a concise, well-organized 1,000 word paper answering one of the following questions. What will a post-2012 international climate agreement look like? Clark has committed to becoming climate neutral – how can that commitment be met? How is a city like Worcester responding to climate change? How is President Obama integrating climate change into his economic stimulus plan? (modifications OK)

Final Research Paper (INDIVIDUAL OR IN PAIRS): Due 4/30/09. The final research paper provides an opportunity for each student (or a pair of students) to explore in more depth one aspect of the challenges associated with climate change, energy, and development. This final paper addresses and explores a research question that expands on one of the three previous papers focused on a specific area of climate science, a specific energy technology, or a specific climate policy. For this paper each student will define a specific research question and then review the literature and information available to answer the research question. NOTE: Please refer to the ES&P Research Paper Guidelines for more details suggestions on how to write an effective research paper. Each student (or pair of students) will present their research at the end of the semester.

Course Schedule and Reading Assignments

1. January 16 – Introduction to Climate Change, Energy, and Development

Introductory lecture, individual introductions, review of course goals and structure, review of assigned readings, and discussion on expectations of the course.

Key questions: How can society effectively confront this daunting 21st century challenge of climate change? How can we balance near-term needs with long-term risks? How is energy, including electricity, fuel for cooking, and transportation, linked to development and linked to climate change? What is the IPCC and how has it influenced international climate action?

2. January 23 – Climate Change Science: Understanding the Anthropogenic Influence on the Climate System

- (1) Dessler, A. E. and E. A. Parson (2006). The Science and Politics of Global Climate Change. Cambridge, Cambridge University Press. Chapters 1-3.2 Read through the top of page 76
- (2) IPCC 2007 Summary for Policymakers, Working Group I. In: Climate Change 2007: The Physical Science Basis. Contribution of Working Group I to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change. Cambridge University Press.

Key questions: What is understood scientifically about the human influence on the climate system? What pollutants and associated human activity are contributing to climate change? How does the scientific process work and how has climate science evolved within this process? What are the major uncertainties in climate science? How are uncertainties presented in the IPCC summary for policymakers?

January 26 – 5-6pm. Attend lecture at Worcester Polytechnic Institute (WPI). “Energy, CO₂, and Climate Change: Technology for a Greenhouse World” by Dr. Franklin M. Orr, Jr. Keleen and Carlton Beal Professor, Department of Energy Resources Engineering and Director of the Global Climate and Energy Project at Stanford University. Alden Memorial <http://www.wpi.edu/News/Events/Lecture/>

3. January 30 – The Science of Climate Change Impacts

- (1) Dessler, A. E. and E. A. Parson (2006). The Science and Politics of Global Climate Change. Cambridge, Cambridge University Press. Page 76-102 (section 3.3 through 4.2.2)
- (2) IPCC (2007). Summary for Policymakers, Working Group II. In Climate Change 2007: Impacts, Adaptation and Vulnerability. Contribution of Working Group II to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change. Cambridge University Press
- (3) Alam, M. and Rabbani, M.G., 2007. Vulnerabilities and responses to climate change for Dhaka. *Environment and Urbanization*, 19(1): 81-97
- (4) Hansen, J. E. (2007). "Scientific reticence and sea level rise." Environmental Research Letters **2**: 1-6.

Key Questions: How are the current and pending impacts of climate change distributed globally? What are the projections about how climate change will impact different parts of the world? How does vulnerability differ in developing and developed countries?

February 2nd – Climate Science Paper Due – submit through Cicada

February 5th - Attend panel discussion on Climate Change Solutions: Integrating National, State, and Local Initiatives. Tilton Hall, 12:30-2. Class discussion the following day will focus on this panel discussion.

4. February 6 – Applying Climate Science to Policy

- (1) Dessler, A. E. and E. A. Parson (2006). The Science and Politics of Global Climate Change. Cambridge, Cambridge University Press. Page 102 - 177 (section 4.2.3 through the end)
- (2) Holdren, J. P. (2008). Convincing the climate-change skeptics. Boston Globe. August 4, 2008 (and Holdren addendum and note in response to critique of the op-ed)
- (3) IPCC (2007). Summary for Policymakers, Working Group III. In Climate Change 2007: Mitigation. Contribution of Working Group II to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change. Cambridge University Press. Full Report <http://www.ipcc.ch/ipccreports/ar4-wg3.htm>
- (4) Stephens, J. C. and A. C. Graham (2008). "Climate Science to Citizen Action: Energizing Nonformal Climate Science Education." Eos **89**(22): 204-205.

Key Questions: What are the policy challenges associated with applying climate science? What are the major mitigation options? Given inherent uncertainty of science, how does the general public interpret those who are skeptical that humans are contributing to climate change? How have climate change skeptics influenced climate policy? How can the public become more informed?

5. February 13 – Energy Systems & Energy Technology Innovation

- (1) Gallagher, K. S., J. P. Holdren, et al. (2006). "Energy-technology innovation." Annual Review of Environment and Resources **31**: 193-237.
- (2) Pacala, S., and R. Socolow. 2004. Stabilization Wedges: Solving the Climate Problems for the Next 50 Years with Current Technologies. Science 305:968-972.
- (3) Ausubel, J. H. (2007). "Renewable and nuclear heresies." International Journal of Nuclear Governance, Economy and Ecology **1**(3): 229-243.

Key Questions: What are the major components of technology innovation? What is the appropriate role of government in contributing to each component of energy technology innovation? How can policy encourage a portfolio of approaches to mitigating climate change? How do we reconcile negative impacts of low-carbon emitting energy technologies?

6. February 20 – The Future of Coal: Potential for Carbon Dioxide Capture and Storage

- (1) Stephens, J.C., 2006. Growing interest in carbon capture and storage (CCS) for climate change mitigation. Sustainability: Science, Practice, and Policy, 2(2).
- (2) Socolow, R. H. (2005). "Can We Bury Global Warming." Scientific American **July**: 49-55.
- (3) Greenpeace International (2008). False Hope, Why Carbon Capture and Storage won't save the climate.
- (4) Spreng, D., Marland, G. and Weinberg, A.M., 2007. CO₂ Capture and Storage: Another Faustian Bargain? Energy Policy, 35: 850-854.

Key Questions: Is carbon capture and storage (CCS) technology likely to accelerate or slow-down a transition to a low-carbon emitting energy infrastructure? How can the reliance on coal be reduced? Is there such a thing as "clean coal"? What are challenges facing the development of CCS technology?

February 23 – Energy Technology Innovation Paper Due

7. February 27 – The Case of China and Corporate Shift

Informal discussion of Energy Technology Innovation Papers

- (1) Levine, M. D. and N. T. Aden (2008). "Global Carbon Emissions in the Coming Decades: The Case of China." Annual Review of Environment and Resources 33(1): 19-38.
- (2) China (2008). "China's Policies and Actions for Addressing Climate Change - White Paper. Released October 29, 2008."
- (3) Pew Fact Sheet on China and Climate Change. 2008.
- (4) Kolk, A. and D. L. Levy (2001). "Winds of Change: Corporate Strategy, Climate Change and Oil Multinationals." European Management Journal 19(5): 501-509.
- (5) Meckling, Jonas. "Corporate Policy Preferences in the EU and the US: Emissions Trading as the Climate Compromise?." *Carbon and Climate Law Review* 2/2008 (2008).

Key Questions: How and why has China's growth impacted global discussions on climate change? How has the Chinese government been responding to the challenge of climate change? How have multinational oil companies changed their perspective on climate change?

8. March 13 – Economics of Climate Change (potential guest lecture)

- (1) Stern, N. (2006). Stern Review Report on the Economics of Climate Change. Executive Summary
- (2) McKibbin, W. J. and P. J. Wilcoxon (2008). Building on Kyoto: Towards a Realistic Global Climate Agreement. Washington DC, Energy Security Initiative, Brookings Institute.
- (3) NRDC (2008). The Cost of Climate Change, What We'll Pay if Global Warming Continues Unchecked.
- (4) Helft, M. 2008. Google's Green Agenda Could Pay Off. New York Times. October 28, 2008.

Key Questions: How have economic studies helped or hindered efforts to develop climate policy? What economic arguments have the greatest salience and why? How can climate change mitigation be integrated into our economy?

9. March 20 – Health, Food, and Climate Change

- (1) Eshel, G. and P. A. Martin (2006). "Diet, Energy, and Global Warming." Earth Interactions 10(9): 1-17.
- (2) Epstein, P.R., 2005. Climate Change and Human Health. *New England Journal of Medicine*, 353(14): 1433-1436.
- (3) Cifuentes, L., V. H. Borja-Aburto, et al. (2001). "Hidden Health Benefits of Greenhouse Gas Mitigation." Science 293: 1257-1259.

Key Questions: How do food production and consumption patterns and choices impact climate change? How can food and agriculture be incorporated into climate change mitigation efforts? What are the connections and overlaps between human health and climate change?

10. March 27 - Climate Change Education, Communication and Awareness

- (1) Reiner, D.M. et al., 2006. American Exceptionalism? Similarities and Differences in National Attitudes Toward Energy Policy and Global Warming. *Environmental Science & Technology*, 40(7): 2093-2098.
- (2) Boykoff and Boykoff (2004). "Balance as bias: global warming and the US prestige press." Global Environmental Change 14: 125-136.
- (3) Leiserowitz, A., E. Maibach, et al. (2008). Global Warming's "Six Americas" An Audience Segmentation.

Key Questions: Do citizens of the USA have different perspectives on climate change and energy than citizens of other developed countries, and if so why? How has the media influenced public perceptions of the climate change problem and potential solutions? What are the characteristics of climate change that make communicating about this topic so challenging?

March 30 – Climate Policy Paper Due

11. April 3 – Ethics, Gender, and Security

Informal discussion on climate policy papers

- (1) Brown et al., 2007. Ethical Dimensions of Climate Change. 2007. Rock Ethics Institute.
- (2) Gardiner, S. N. (2004). "Ethics and Global Climate Change." Ethics **114**: 555-600.
- (3) WEDO (2008). Gender, Climate Change and Human Security, Lessons from Bangladesh, Ghana and Senegal, Women's Environment and Development Organization.

Key Questions: What are the primary moral arguments and dilemma associated with the climate change problem? What are the gender implications of climate change? And how is human security threatened by climate change in different parts of the world?

12. April 10 – Adaptation and Vulnerability

- (1) Tanner, T. and T. Mitchell (2008). "Introduction: Building the Case for Pro-Poor Adaptation." IDC Bulletin 39.4 Poverty in a Changing Climate **39**(4): 1-5.
- (2) Gallopín, G. C. (2006). "Linkages between vulnerability, resilience, and adaptive capacity." Global Environmental Change **16**(3): 293-303.

Key Questions: How can adaptive capacity be facilitated and enhanced to reduce the suffering associated with climate change? How should vulnerability, resilience and adaptation be considered in the international policy context?

13. April 17 - Student Presentations

14. April 24 - Student Presentations

DUE DATE: April 30 – Final Research Paper to be submitted by 5pm

Suggested Resources: A few of many

Kasperson library

World Energy Outlook

DSIRE: The Database of State Incentives
for Renewable Energy

ACORE: American Council on Renewable Energy

The Institute for Global Environmental Strategies
Clean Development Mechanism (CDM) database

Energy Technology Innovation Policy Program
at Harvard's Kennedy School of Government

SolveClimate.org

The Carbon Disclosure Project

Grist.org

The Union of Concerned Scientists

U.S. Department of Energy

The Pew Center on Global Climate Change

Natcarb The National Atlas of CO₂ Storage