**Syllabus as of March 20, 2015. Will be updated as course progresses.**

| **Climate Change Economics and Policy** | **Spring 2015** | **ENV 640 & PPS 585** |
|---|---|---|
| Sanford School of Public Policy | 3 credits | Duke University |

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**Time**
Tuesdays, Thursdays 8:30-9:45

**Class Location**
Sanford 03

**Instructor**

Billy Pizer
billy.pizer@duke.edu
Phone: 919-613-9286

Office Hours:

*Preferred times*
Monday & Friday 9:30-11:30 (190 RH)
Check calendar at http://goo.gl/QeClHN
and/or request appointment for any open time
using Gmail/Outlook

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**Course Description**

Global climate change is thought by many to be the most significant environmental challenge of the 21st century. Unchecked, the continued accumulation of greenhouse gases (GHGs, such as carbon dioxide and methane) over this century is projected to eventually warm the planet by about 3 to 8 °C (6 to 14 °F), with associated impacts on the environment, economy, and society. Because the emissions of greenhouse gases result from virtually every kind of economic activity -- driving a car, heating a home, operating a steel mill, raising pigs -- any policy aimed at reducing emissions will have significant and broad-based impacts on the economy.

Several economic facets of the climate change problem illustrate in part why it has been so difficult to mount a successful effort to address it:

- The climate is a global public good. GHGs mix globally and have both global and local consequences. This international nature of the problem raises international governance difficulties related to national sovereignty, international coordination, free-riding tendencies, and equity concerns.
- Energy is an essential economic input. GHGs are ubiquitous in the global economy. There are thousands of sectors and millions of sources to confront. Energy is a pervasive, essential input, of which over 80% is currently derived from fossil fuel. Energy consumption is central to economic growth, development, and poverty alleviation.
- The relevant timeframe is very long. Most GHGs have a very long residence time in the atmosphere. Thermal lags may require decisions well before impacts. Issues related to international equity and long-term discounting arise. Energy producing and consuming

technologies often involve large, long-lived capital investment. Technological change also becomes important over these long timeframes.

- Key uncertainties are large and varied. There are large uncertainties in environmental, technical, market, and regulatory risks. Uncertainties in the probability and magnitude of climate damage, in regulation, in technological development, in competing fuel prices, as well as risk of irreversible impacts, both respect to the climate and mitigation investments.
- Distributional impacts could be large. There could be substantial distributional implications at household, industry, and regional levels from climate change policies, as well as intergenerational distributional implications.
- Limited experience with policy instruments to control greenhouse gas emissions. This is an area of very active policy development at the national, state, and international levels. Econoimc analysis of various policy proposals is also active, both at the level of theory and empirical application.

This course will explore the economic characteristics of the climate change problem, assess national and international policy design and current implementation issues, and survey the economic tools necessary to evaluate climate change policies. The course will be discussion-oriented and will require a high degree of participation by students in the classroom.

The objectives of the course are (1) to understand the economic drivers of emissions and mitigation opportunities, and how they are portrayed in economic models; (2) to understand economic issues associated with valuing mitigation benefits; (3) to understand key policy mechanisms, design features, and how economic analysis informs policy discussions; and (4) the current landscape of domestic and international policy implementation and discussion.

Prerequisites: One semester of microeconomics (PPS 810 or equivalent) and statistics (PPS 812 or equivalent).

## Readings

Readings will include journal articles and book chapters drawn from the academic literature, policy-oriented publications, and government reports. Readings will be available on the internet or via Sakai. ***Assigned readings may be revised up until one week before class, so please check the syllabus regularly.***

## Sakai

Readings, class announcements, schedule changes and grades will all be posted to the course Sakai site.

## Course Assignments

Written assignments should be presented in a format appropriate to the assignment. All assignments must be submitted electronically through Sakai in MS Word format (to facilitate

commenting). Submissions should be done via the "Assignments" function. You can upload multiple documents at any time and use the "save draft" function to save your work on Sakai. However, you can only submit assignments once, so do not do so until you have completed and uploaded the final versions of all of your files – but also don't forget to "submit". Unless otherwise specified, a paper copy is not necessary.

There will be five assignments. The first three are individual assignments and the work must reflect your own individual thinking. However, you are free to discuss the problems and help one another, particularly on the Stata and Excel coding. The idea is that you can help one another learn, but you should not rely entirely on another student to produce the assignment output.

The last two assignments will be small group projects exploring the domestic policies and international negotiating position of key jurisdictions. Additional information will be provided when the assignment is made.

**Class Participation**

The course will be discussion-oriented and will require a high-degree of participation by students in the classroom. Class participation is not optional. Students are expected to prepare for class by completing the assigned reading prior to the class for which they are listed, and to participate in class sessions. Please read the newspaper (e.g., New York Times, Washington Post, Wall Street Journal), and track EENews services such as ClimateWire, EnergyWire, and E&E Daily (while at Duke, you can sign up for a free subscription at www.eenews.net).

Each student will also sign up for two classes where they will be responsible for providing brief (2-3 minute) opening remarks in (1) a discussion of the required readings, and (2) recent news reports. Your class participation grade will be based both on your remarks and the degree to which you generally participate in class discussions.

**Econometric Report**

As a consultant to a U.S. government agency, you will prepare an econometric report for agency staff. You will use energy, environmental, and economic data to develop a statistical model relevant to a contemporary energy and environmental policy issue (to be announced in class). You will undertake a regression analysis (or other appropriate statistical approach) and, based on this econometric work, you will write a brief report describing your research question, conceptual model, empirical approach, data, results, and implications. Use of Stata is strongly encouraged. Report length: 5 pages of text, plus tables, figures, and appendices. See assignment description for more detail.

**Simulation Analysis**

As a policy analyst at the U.S. E.P.A., you will conduct a quantitative economic analysis to evaluate the sensitivity of climate policy benefits and/or costs to several important assumptions. You will employ a simplified version of an Integrated Assessment Model (IAM) to conduct your analysis and

will report your methods and results in a brief report. Report length: 5 pages of text, plus tables, figures, and appendices. See assignment description for more detail.

**Domestic Policy Analysis / International Negotiation Assignments**

As a research team for a prominent NGO, you will research (a) the domestic policy landscape, and (b) the international negotiation position, of key jurisdictions. Each group of 3-4 students will turn in a 5-6 page paper as well as make a 20 minute oral presentation for each of the two assignments. Students will turn in self- and peer-assessments as part of the exercise that will factor into the assignment grading. See assignment description for more detail.

**Schedule of Assignments and Grading**

| Assignment | Date Assigned | Date Due | Percentage |
|---|---|---|---|
| Econometric Report | January 8 | January 21 (I)<br>January 26 (II)<br>February 2 (III) | 20 |
| Simulation Analysis 1 | January 27 | February 9 | 15 |
| Simulation Analysis 2 | February 10 | February 23 | 15 |
| Domestic Policy Analysis | February 24 | As chosen | 15 |
| International Negotiation | February 24 | As chosen | 15 |
| Class Participation | | | 20 |
| Total | | | 100 |

Your number grade will be translated into a letter grade of A, A-, B+, B, B-, or C+.

All assignments are due at 9am on the day indicated. Late assignments will be marked down one-third of a letter grade for each day (or part thereof) late for the first three days. Assignments that are still incomplete after five days will receive no credit unless prior arrangements are made. If you are ill or have a family emergency that prevents you from being able to complete the assignment on time, please contact the instructor by email prior to the class in which the assignment is due.

**Useful Websites**

Resources for the Future (RFF): http://www.rff.org/Focus_Areas/Pages/Energy_and_Climate.aspx

Energy Information Administration (EIA): http://www.eia.doe.gov/environment

Center for Climate and Energy Solutions (formerly Pew Center on Global Climate Change): http://www.pewclimate.org

U.S. Environmental Protection Agency: http://www.epa.gov/climatechange/
Proposed Rule for Existing Power Plants:
http://www2.epa.gov/carbon-pollution-standards/clean-power-plan-proposed-rule

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Intergovernmental Panel on Climate Change: http://www.ipcc.ch/

UNFCCC portal for submissions related to the Durbin process
http://unfccc.int/bodies/awg/items/7398.php (on or before ADP 2.5, June 2014)
http://goo.gl/vzLJIm (post ADP 2.5)

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**Course Topics, Readings, and Assignments**

| No | Date | Topics and Readings |
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| | | **Costs and Benefits of Climate Change Mitigation** |
| 0 | | **Background Reading on Climate Change Science**<br><br>Tol, Richard (2014) *Climate Economics*. Chapter 1.<br><br>Klein, Grady and Yoram Bauman (2014). *Cartoon Introduction to Climate Change*. Chapters 1-7.<br><br>IPCC (2014). *Climate Change 2014: Synthesis Report. Summary for Policymakers.* Pages 1-16.<br><br>Allegre (2012). No Need to Panic About Global Warming. *The Wall Street Journal*. January 27.<br><br>Nordhaus (2012). Why the Global Warming Skeptics Are Wrong. *The New York Review of Books*. March 22. |
| 1 | Th 1/8 | **Course Introduction and Overview**<br><br>*Goulder, Lawrence and William A. Pizer (2008). The economics of climate change. In *The New Palgrave Dictionary of Economics 2nd edition*. Hampshire, UK: Palgrave Macmillan.<br><br>*Nordhaus (2013). *DICE 2013R: Introduction and User's Manual*. Sections I and II (pages 3-6).<br><br>*Congressional Budget Office (CBO) (2003). The economics of climate change. Chapter 3 in *The Economics of Climate Change: A Primer*. Washington, DC: CBO. pp 1-4 required.<br><br>Lazarus, Richard (2009). Super Wicked Problems and Climate Change: Restraining the Present to Liberate the Future. *Cornell Law Review* 94(5). Especially pp 1153-1187.<br><br>IPCC (2004). *16 Years of Scientific Assessment in Support of the Climate Convention*. Geneva: IPCC Secretariat.<br><br>Questions for discussion:<br>(1) What is climate change economics? What topics does it include?<br>(2) What are some current issues in climate change policy?<br>(3) How can economics help inform policies?<br><br>**Assignment #1: Empirical analysis of carbon dioxide data** |

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| 2 | T 1/13 | **What drives carbon dioxide emissions, and how do we model it?**<br><br>*Tol, Richard. *Climate Economics* (2014). Chapter 2.<br><br>*Darmstadter, J. (2003). The energy-CO2 connection: A review of trends and challenges. Chapter 1 *of Climate Change Economics and Policy: An RFF Anthology*. Washington: RFF.<br><br>*Holtz-Eakin, D. and T. Seldon (1995). Stoking the fires? CO2 emissions and economic growth. *Journal of Public Economics* 57(1):85-101. (mainly, 85-92).<br><br>*Nordhaus (2013). *DICE 2013R: Introduction and User's Manual*. Sections III.A & III.B (pages 6-15).<br><br>*Lutter, Randall (2000). Developing Countries' Greenhouse Gas Emissiosn: Uncertainty and Implications for Participation in the Kyoto Protocol. *Energy Journal* 4(21). Pp. 93-120. Read Sections 3-6.<br><br>*United States Government (2014). Fact Sheet: U.S.-China Joint Announcement on Climate Change and Clean Energy Cooperation. http://goo.gl/2JQXD0 .<br><br>IEA (2014). *World Energy Outlook 2014.*<br><br>IPCC (2000). *Emission Scenarios: Summary for Policymakers*. Geneva: IPCC.<br><br>Interagency Working Group on Social Cost of Carbon, United States Government (2010). Technical Support Document: Social Cost of Carbon for Regulatory Impact Analysis. Section III.E on socio-economic assumptions.<br><br>Parson, E. et al (2007). Global Change Scenarios: Their Development and Use. Sub-report 2.1B of Synthesis and Assessment Product 2.1 by the U.S. Climate Change Science Program and the Subcommittee on Global Change Research. Department of Energy, Office of Biological &Environmental Research, Washington. Executive Summary required.<br><br>Schmalensee, Richard, Thomas M. Stoker, and Ruth A. Judson (1998). World carbon dioxide emissions: 1950–2050. *Review of Economics and Statistics* 80(1): 15-27.<br><br>Hall, D.S. (2007). Greenhouse gas emissions and the fossil fuel supply chain in the United States. Issue Brief 1 in *Assessing U.S. Climate Policy Options.* Washington: RFF.<br><br>Stern, David (2004). The rise and fall of the environmental Kuznets curve. *World Development* 32(8). pp 1419-1439.<br><br>Clarke, L., J. et al (2007). Reference Scenarios. Chapter 3 of Scenarios of Greenhouse Gas Emissions and Atmospheric Concentrations. Sub-report 2.1A of |

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| | | Synthesis and Assessment Product 2.1 by the U.S. Climate Change Science Program and the Subcommittee on Global Change Research. Department of Energy, Office of Biological &Environmental Research, Washington.<br><br>Van Vuuren, D.P et al. (2011) The representative concentration pathways: an overview. *Climate Change* 109.<br><br>Moss, R.H. et al. (2010). The next generation of scenarios for climate change research and assessment. *Nature* 463 (pp. 747-756).<br><br>Nordhaus and Boyer (1999). *Roll the Dice Again*, Chapter 3. Section 3.<br><br>Questions for discussion:<br><br>(1) What drives emissions and how do we forecast them?<br>(2) How well can we forecast emissions?<br>(3) What is the environmental Kuznets curve?<br>(4) What is a "baseline" forecast? |
| 3 | Th 1/15 | **How do we reduce carbon dioxide emissions and how much does it cost? Modeling issues and aggregate results**<br><br>*Weyant, J.P. (2000). An introduction to the economics of climate change policy. Report prepared for the Pew Center on Global Climate Change. Arlington. Section III, pp. 8-29.<br><br>*Ross, M (2007). Documentation of the Applied Dynamic Analysis of the Global Economy (ADAGE) Model. Section 2, pp 15-28.<br><br>*IPCC (2014). Climate Change 2014: Mitigation of Climate Change. Section 6.3.6.1-6.3.6.2. Also look at Table 6.2, 6.3, Figure 6.7, 6.15.<br><br>*IPCC (2014). Technical Summary in: Climate Change 2014: Mitigation. Contribution of Working Group III to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change. Section 3.1.<br><br>Clarke. L.J. et al (2009). International climate policy architectures: Overview of the EMF 22 international scenarios. Energy Economics 31. pp S64-S81.<br><br>Clarke, L., J. et al (2007). Technical Summary. Scenarios of Greenhouse Gas Emissions and Atmospheric Concentrations. Sub-report 2.1A of Synthesis and Assessment Product 2.1 by the U.S. Climate Change Science Program and the Subcommittee on Global Change Research. Department of Energy, Office of Biological &Environmental Research, Washington. |
| 4 | T 1/20 | **How do we reduce carbon dioxide emissions and how much does it cost? More detailed modeling and results** |

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| | | *EPA (2014). Regulatory Impact Analysis for the Proposed Carbon Pollution Guidelines for Existing Power Plants and Emission Standards for Modified and Reconstructed Power Plants. Chapter 3 - Cost, Economic, and Energy Impacts.<br><br>*McKinsey & Company (2010). Impact of the financial crisis on carbon economics. Version 2.1 of the Global Greenhouse Gas Abatement Cost Curve.<br><br>*Newell, R.G. and D. Hall (2007). U.S. mitigation in the context of global stabilization. Issue Brief 2 in Assessing U.S. Climate Policy Options. Washington: RFF. <EMF-22 instead><br><br>McKinsey & Company (2009). Pathways to a Low-Carbon Economy. Version 2 of the Global Greenhouse Gas Abatement Cost Curve.<br><br>EIA (2013). Electricity Market Module.<br><br>EIA (2010). Energy Market and Economic Impacts of the American Power Act of 2010. Washington: EIA.<br><br>EPA (2009). EPA Analysis of the American Clean Energy and Security Act of 2009 H.R. 2454 in the 111th Congress. Washington: EPA.<br><br>Aldy, J.E. (2007). Assessing the costs of regulatory proposals for reducing U.S. greenhouse gas emissions. Issue Brief 3 in Assessing U.S. Climate Policy Options. Washington: RFF.<br><br>Questions for discussion:<br>(1) What are the main approaches to modeling costs and how do they differ?<br>(2) What drives differences in cost estimates?<br>(3) How do we think about national costs in a global context? |
| | W 1/21 | **Assignment #1 part I due at 9am** |
| 5 | Th 1/22 | **What is the role of benefit-cost analysis in climate change policy?**<br><br>*Stern, Nicholas (2013). The Structure of Economic Modeling of the Potential Impacts of Climate Change: Grafting Gross Underestimation of Risk onto Already Narrow Science Models. *Journal of Economic Literature* 51(3).<br><br>*IPCC (1996). Applicability of techniques of cost-benefit analysis to climate change. Chapter 5 in Climate Change 1995: Economic and Social Dimensions of Climate Change. Contribution of Working Group III to the Second Assessment of the IPCC. Cambridge: Cambridge University Press. (required pp. 149-152).<br><br>*Portney, P.R. (1998). Applicability of cost-benefit analysis to climate change: In Nordhaus, ed., Economics and Policy Issues in Climate Change. Washington: RFF. pp. 111-127. (required 117-121) |

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| | | Shogren, J.F. and Michael Toman (2001). How much climate change is too much? An economics perspective. Chapter 4 in Climate Change Economics and Policy: An RFF Anthology.<br><br>Heinzerling, L. (2010).Why care about the polar bear?: economic analysis of natural resources law and policy. The Evolution of Natural Resources Law and Policy. 53-76.<br><br>Clark, D. (2011). What's the target for solving climate change? The Guardian. http://www.guardian.co.uk/environment/2011/nov/14/climate-change-targets<br><br>Friedman, T.L. (2009). Going Cheney on climate. The New York Times. http://www.nytimes.com/2009/12/09/opinion/09friedman.html<br><br>Questions<br>(1) What are the challenges to current CBA of climate change?<br>(2) How should we answer the fundamental question of "how much" mitigation to pursue? |
| | M 1/26 | **Assignment #1 part II due at 9am** |
| 6 | T 1/27 | **If benefit-cost, how do we monetize mitigation benefits?**<br><br>*Tol, Richard S.J. (2009). The Economics Effects of Climate Change, *Journal of Economic Perspecitves* 23(2). P 29-51.<br><br>*National Research Council (2010). "Climate change," Chapter 5 of Hidden Costs of Energy. Pp 294-308.<br><br>*Interagency Working Group on Social Cost of Carbon, United States Government (2013). Technical Update of the Social Cost of Carbon for Regulatory Impact Analysis. Executive Summary.<br><br>Rose, Steven, Delavane Turner, Geoffrey Blanchard, John Bistline, Francisco de la Chesnaye, Tom Watson (2014). Understanding the Social Cost of Carbon: A Technical Assessment. Executive Summary. Palo Alto: Electric Power Research Institute.<br><br>Tol, R.S.J. (2005). The marginal damage of carbon dioxide emissions: An assessment of the uncertainties. Energy Policy 33: 2064-2074.<br><br>Tol, R.S.J., S. Fankhauser, R.g. Richels, and J.B. Smith (2000). How much damage will climate change do? Recent estimates. World Economics 1(4): 179-206.<br><br>IPCC (1996). The social costs of climate change: Greenhouse damages and the benefits of control. Chapter 6 in Climate Change 1995: Economic and Social Dimensions of Climate Change. Contribution of Working Group III to the Second |

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| | | Assessment of the IPCC. Cambridge: Cambridge University Press. Pp 179-209 (section on regional/country-level impacts can be skimmed).<br><br>Smith, J.B. (2004). A Synthesis of Potential Climate Impacts on the U.S. Washington: Pew Center on Global Climate Change. Executive summary required.<br><br>Tol, R.S.J. (2007). The social cost of carbon: Trends, outliers and catastrophes. Working paper, Economic and Social Research Institute, Dublin.<br><br>**Assignment #2: Simulation analysis 1 with DICE** |
| 7 | Th 1/29 | **More details on benefit modeling**<br><br>*Nordhaus and Boyer (1999). "Impacts of Climate Change", Chapter 4 of Roll the DICE Again: Economic Models of Global Warming.<br><br>*Moore, F.C. and Delavane Diaz (2015). Temperature impacts on economic growth warrant stringent mitigation policy. *Nature Climate Change* 2481.<br><br>*Pizer, W. et al (2014). Using and improving the social cost of carbon. *Science* 346(6214). Pp 1189-1190.<br><br>Interagency Working Group on Social Cost of Carbon, United States Government (2010). Appendix 15a. Social cost of carbon for regulatory impact analysis under executive order 12866. Washington. Section 15.A.4.<br><br>Dell, Melissa, Benjamin Jones, and Benjamin Olken (2012). Temperature Shocks and Economic Growth: Evidence from the Last Half Century. *American Economic Journal: Macroeconomics* 4(3). Pp 66-95.<br><br>EPA Slides (2013).<br><br>Nordhaus (2010). Economic aspects of global warming in a post-Copenhagen environment. *PNAS* 107(26). Pp 11721-11726.<br><br>Deschênes, Olivier, and Michael Greenstone. 2011. "Climate Change, Mortality, and Adaptation: Evidence from Annual Fluctuations in Weather in the US." *American Economic Journal: Applied Economics*, 3(4): 152–85. |
| | M 2/2 | **Assignment #1 part III due at 9am** |
| 8 | T 2/3 | **Discounting future generations (and intrageneration equity)**<br><br>*Arrow K., M. Cropper, C. Gollier, B. Groom, G. Heal, R. Newell, W. Nordhaus, R. Pindyck, W. Pizer, P. Portney, T. Sterner, R. S. J. Tol, M. Weitzman (2013). Determining Benefits and Costs for Future Generations. *Science* 341(6144). Pp 349-350. |

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| | | *Newell, R.G. and W.A. Pizer (2001). Discounting the Benefits of Climate Change Mitigation: How Much Do Uncertain Rates Increase Valuations? Report prepared for the Pew Center on Global Climate Change. Arlington. pp 1-26 required.<br><br>*United States Environmental Protection Agency (2010). "Guidelines for Preparing for Economic Analyses." Chapter 6: Discounting Future Benefits and Costs.<br><br>IPCC (1996). Intergenerational equity and discounting. Chapter 4 in Climate Change 1995: Economic and Social Dimensions of Climate Change. Contribution of Working Group III to the Second Assessment of the IPCC. Cambridge: Cambridge University Press. pp 129-144.<br><br>"Discount Rates." Interagency Working Group on Social Cost of Carbon, United States Government. pp 18-24.<br><br>Nordhaus, W.D. (2007). A review of the Stern Review on the Economics of Climate Change. Journal of Economic Literautre 45: 686-702.<br><br>OMB (2003). Circular A-4. Regulatory Analysis (9/17/2003). pp 31-37. http://www.whitehouse.gov/sites/default/files/omb/assets/regulatory_matters_pdf/a-4.pdf.<br><br>Moore, M.A. et al (2004). "Just give me a number!" Practical values for the social discount rate. Journal of Policy Analysis and Management 23(4): 789-812.<br><br>1. What are the different ways to explain the discount rate and/or come up with a number?<br>2. Why are taxes important?<br>3. Why does uncertainty matter? |
| | T 2/3<br>6pm | **Don Fullerton Lecture**<br>**Rhodes Conference Room, Sanford** |
| | Th 2/5 | TBD |
| 9 | T 2/10 | **Economics of catastrophic risk**<br><br>*Nordhaus, William (2008). Question of balance: Economic Modelling of Global Warming pp 30-45 and 205-208.<br><br>*Nordhaus, W.D. (2011). The Economics of Tail Events with an Application to Climate Change. Review of Environmental Economics and Statistics 5(2). pp 240-257<br><br>Pindyck, R.S. (2011). Fat Tails, Thin Tails, and Climate Change Policy. Review of Environmental Economics and Statistics 5(2). pp 258-274 |

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| | | Weitzman, M.L. (2011). Fat-Tailed Uncertainty in the Economics of Catastrophic Climate Change. Review of Environmental Economics and Statistics 5(2). pp 275-292<br><br>IPCC (1996). Decision making frameworks for addressing climate change. Chapter 2 in Climate Change 1995: Economic and Social Dimensions of Climate Change. Contribution of Working Group III to the Second Assessment of the IPCC. Cambridge: Cambridge University Press.<br><br>CBO (2005). Uncertainty and analyizing climate change: Policy implications. Washington.<br><br>**Assignment #3: Simulation analysis 2 with DICE** |
| | | **International Policy Background** |
| 10 | Th 2/12 | **International climate policy background to Durban**<br><br>*UNFCCC (2004). "The First Ten Years." p. 12-17.<br><br>*Aldy, J. and R. Stavins (2008). Climate Policy Architectures for the Post-Kyoto World. Environment.*<br><br>*Sunstein, Cass (2007). "Of Montreal and Kyoto: A tale of two protocols," Harvard Environmental Law Review 31, pp. 1-29. |
| | F 2/13 | **Assignment #2 due at 9am.** |
| 11 | Th 2/19 | Durban and looking forward<br><br>*UNFCCC (2011). Establishment of an Ad Hoc Working Group on the Durban Platform for Enhanced Action. Draft decision -/CP.17. Geneva: UNFCCC.<br><br><Durban paper by Rajamani><br><br>*Diringer (2013). A patchwork of emission cuts. *Nature*.<br><br>*C2ES (2014). Outcomes of the U.N. Climate Change Conference in Lima.<br><br>Levi, Michael (2011). A Misplaced Climate Celebration In Durban. http://blogs.cfr.org/levi/2011/12/11/a-misplaced-climate-celebration-in-durban/<br><br>Houser, Trevor (2011). Dissecting Durban. http://rhgroup.net/notes/dissecting-durban<br><br>Council on Foreign Relations (2007). Confronting Climate Change: A Strategy for U.S. Foreign Policy. Washington: CFR. Executive summary required. |

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| | | **Economics of Climate Mitigation Policies** |
| 12 | T 2/24 | **Taxes and Cap & Trade**<br><br>*Gruber, J. Distinctions Between Price and Quantity Approaches to Addressing Externalities. Section 5.4 in *Public Finance and Public Policy*.<br><br>*Aldy, J.E. and W.A. Pizer (2009). Issues in Designing U.S. Climate Change Policy. Energy Journal 30(3). pp 179-209.<br><br>*World Bank (2014). State and Trends of Carbon Pricing. Washington: World Bank. Executive Summary.<br><br>*Center for Climate and Energy Solutions (2013). Options and Considerations for a Federal Carbon Tax. Washington: C2ES.<br><br>Summers, L. (2015). Let this be the year when we put a proper price on carbon. London: Financial Times. January 4.<br><br>Parry, I.W.H. and W.A. Pizer (2007). Emissions Trading versus $CO_2$ Taxes versus Standards. *Assessing U.S. Climate Policy Options*. Washington: RFF.<br><br>Ellerman, A.D. and Paul Joskow (2008). The European Union's Emissions Trading System in perspective. Washington: Pew Center. pp 1-11 required; skim other sections.<br><br>Center for Climate and Energy Solutions (C2ES) (2011). Australia's Carbon Pricing Mechanism. Washington: C2ES.<br><br>Center for Climate and Energy Solutions (C2ES) (2011). Market Mechanisms: Understanding the Options. Washington: C2ES.<br><br>Holtz-Eakin, Douglas (2011). Beware Liberals Bearing Miracle Cures: Blinder's Case for a Carbon Tax. National Review Online. January 31.<br><br>Blinder, Alan (2011). The Carbon Tax Miracle Cure. Wall Street Journal. January 31.<br><br>D'Andrea Tyson, Laura (2013). The Myriad Benefits of a Carbon Tax. http://economix.blogs.nytimes.com/2013/06/28/the-myriad-benefits-of-a-carbon-tax/<br><br>Mankiw, N. Gregory (2013). A Carbon Tax That America Could Live With. http://www.nytimes.com/2013/09/01/business/a-carbon-tax-that-america-could-live-with.html |

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| | | Waxman, Henry, Sherwood Boehlert, Edward J. Markey and Wayne Gilchrest (2012). Carbon emission policy could slash debt, improve environment. Washington Post. February 23.<br><br>Metcalf, Gilbert (2007). A proposal for a U.S. carbon tax swap. Washington: The Brooking Institution. |
| | Th 2/26 | **No Class** |
| 13 | T 3/3 | **Subsidized Finance**<br><br>*Newell, Richard (2007). Climate Technology Deployment Policy. *Assessing U.S. Climate Policy Options*. Washington: RFF. Pages 140-145 (on subsidies and limited liability).<br><br>*EIA (2011). Direct Federal Financial Interventions and Subsidies in Energy in Fiscal Year 2010. Washington: EIA. Executive summary.<br><br>http://www.eia.gov/analysis/requests/subsidy/ <2015 version><br><br>*Allaire M., and S. Brown (2012). U.S. Energy Subsidies: Effects on Energy Markets and Carbon Dioxide Emissions.<br><br>*Metcalf, Gilbert (2009). Tax Policies for Low-Carbon Technologies. National Tax Journal 62(3). pp 519-533.<br><br>Aldy, JE (2013). A Preliminary Assessment of the American Recovery and Reinvestment Act's Clean Energy Package. *Review of Environmental Economics and Policy.*<br><br>Miller, Daniel (2014). What is the Coalition's direct action climate change policy? ABC News. http://www.abc.net.au/news/2013-12-20/coalition-climate-change-direct-action-policy-explained/5067188. Accessed February 17, 2015. |
| 14 | T 3/5 | **Offsets and linking**<br><br>*Hall, D.S. (2007). Offsets: incentivizing reductions while managing uncertainty and ensuring integrity. Issue Brief 15 in *Assessing U.S. Climate Policy Options*. Washington: RFF.<br><br>*Ranson, Matthew and Robert Stavins (2015). Linkage of Greenhouse Gas Emissions Trading Systems: Learning from Experience. *Climate Policy*<br><br>*Pizer, W. and A. Yates (2014). Terminating Links Between Emission Trading Programs. NBER Working Paper 20393. Pages 1-7 (introduction and history). |

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| | | CCAP (2012). NAMAs and the Clean Development Mechanism (CDM): An Overview.<br><br>Vivid Economics (2013). The market impact of a CDM capacity fund<br><br>Richards, Kenneth and Krister Andersson (2001). The leaky sink: Persistent obstacles to a forest carbon sequestration program based on individual projects. *Climate Policy* 1:41-54.<br><br>Siikamäki, J. and J. Maher (2007). Climate change and U.S. agriculture. Issue Brief 13 in *Assessing U.S. Climate Policy Options.* Washington: RFF.<br><br>Trexler, Mark, et al (2006). A stastically-driven approach to offset-based GHG additionality determinations. *Sustainable Development Law & Policy* 6(2):30-40.<br><br>**Assignment #4 & 5: Domestic Policy and International Negotiations** |
| | T 3/10 | **Spring Break** |
| | Th 3/12 | **Spring Break** |
| 15 | T 3/17 | **Emission allowance allocation, cost distribution, and revenue disposition**<br><br>*Blonz, Joshua, Dallas Burtraw, and Margaret A. Walls (2011). How do the costs of climate policy affect households? The distribution of impacts by age, income, and region. RFF DP 10-55. Washington, RFF. Sections 1-2 required.<br><br>*U.S.E.P.A. (2014). Regulatory Impact Analysis for the Proposed Carbon Pollution Guidelines for Existing Power Plants and Emission Standards for Modified and Reconstructed Power Plants. Section 3.7.7-3.7.10 (p. 3-36 to 3-43).<br><br>*Stavins (2009). The Wonderful Politics of Cap-and-Trade: A Closer Look at Waxman-Markey. http://www.robertstavinsblog.org/2009/05/27/the-wonderful-politics-of-cap-and-trade-a-closer-look-at-waxman-markey/<br><br>*Parry, I.W.H. (2001). Revenue recycling and the cost of reducing carbon emissions. Chapter 11 in: M.A. Toman, ed: Climate Change Economics and Policy: An RFF Anthology. Washington, RFF.<br><br>Waxman and Markey (2009). Proposed Allowance Allocation. http://democrats.energycommerce.house.gov/Press_111/20090515/allowanceallocation.pdf<br><br>Kopp, R.J. (2007). Allowance allocation. Issue Brief 6 in *Assessing U.S. Climate Policy Options*. Washington: RFF.<br><br>Goulder, L.H. 2001. Confronting the adverse industry impacts of CO2 abatement policies: What does it cost? Chapter 12 in: M.A. Toman, ed: Climate Change Economics and Policy: An RFF Anthology. Washington, RFF. |

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| | | Pizer, William A., Sanchirico, James N. and Batz, Michael B. 2009. Regional Patterns of U.S. Household Carbon Emissions. Climatic Change, September 2009. Available at SSRN: http://ssrn.com/abstract=1480408<br><br>National Commission on Energy Policy (2007). Allocating allowances in a greenhouse gas trading system. Washington: NCEP.<br><br>Blonz, Burtraw, Walls (2010). RFF DP 10-12-REV |
| 16 | Th 3/19 | **Competitiveness impacts and approaches**<br><br>*Fischer, Carolyn and Alan Fox (2011). Comparing Policies to Combat Emissions Leakage. http://www.rff.org/rff/documents/rff-dp-09-02-rev.pdf<br><br>*Interagency Competitiveness Analysis Team. (2009). The effects of H.R. 2454 on international competitiveness and emission leakage in energy-intensive trade-exposed industries, from http://www.epa.gov/climatechange/economics/pdfs/InteragencyReport_Competitiveness-EmissionLeakage.pdf. Executive summary, Sections VI-VII.<br><br>*Stavins (2009). Worried About International Competitiveness? Another Look at the Waxman-Markey Cap-and-Trade Proposal. http://www.robertstavinsblog.org/2009/06/18/climate-cap-and-trade-and-international-competitiveness-another-look-under-the-hood-of-waxman-markey/<br><br>Morgenstern, R.D. et al. (2007). Competitiveness impacts of carbon dioxide pricing policies on manufacturing. Issue Brief 7 in *Assessing U.S. Climate Policy Options*. Washington: RFF.<br><br>Morgenstern, R.D. (2007). Addressing competitiveness concerns in the context of mandatory policy for reducing U.S. greenhouse gas emissions. Issue Brief 8 in *Assessing U.S. Climate Policy Options*. Washington: RFF.<br><br>Pauwelyn, Joost (2007). U.S. federal climate policy and competitiveness concerns: The limits and options of international trade law. Durham: Nicholas Institute for Environmental Policy Solutions. |
| | | **Domestic and International Policy Developments** |
| 17 | T 3/24 | **US Federal Policy**<br><br>*US EPA (2014). Proposed Rule: Carbon Pollution Emission Guidelines for Existing Stationary Sources: Electric Utility Generating Units. Executive Summary p. 34832-34841. |

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| | | *Larsen et al (2014). Remaking American Power. CSIS<br><br>*Aarons (2014). Carbon Pollution Standards for Existing Power Plants: Key Challenges. C2ES.<br><br>Fowlie et al (2014). An economic perspective on the EPA's Clean Power Plan. *Science.* |
| 18 | Th 3/26 | **Adaptation**<br><br>*Bierbaum et al (2013). A comprehensive review of climate adaptation in the United States: more than before, but less than needed. Mitigation and Adaptation Strategies for Climate Change.<br><br>*World Bank (2010). "Reducing Human Vulnerability: Helping People Help Themselves" Chapter 2 in *World Development Report: Development and Climate Change.*<br><br>*Agrawala et al (2010). "Plan or React? Analysis of Adaptation Costs and Benefits Using Integrated Assessment Models", OECD Environment Working Papers, No. 23, OECD Publishing. http://dx.doi.org/10.1787/5km975m3d5hb-en Sections 1-3<br><br>Shardul Agrawala and Samuel Fankhauser (2008). Economic Aspects of Adaptation to Climate Change: Costs, Benefits and Policy Instruments. Paris: OECD. *Read executive summary.*<br><br>de Bruin, K., R. Dellink and S. Agrawala (2009), "Economic Aspects of Adaptation to Climate Change: Integrated Assessment Modelling of Adaptation Costs and Benefits", OECD Environment Working Papers, No. 6, OECD Publishing. *Read abstract and sections 1 & 2.*<br><br>Cruce, Terri L. (2009). Adaptation Planning – What U.S. States and Localities are Doing. C2ES.<br><br>White House Council on Environmental Quality (2010). Progress Report of the Interagency Climate Change Adaptation Task Force: Recommended Actions in Support of a National Climate Change Adaptation Strategy. |
| 19 | T 3/31 | **Domestic Policies in Other Countries** |
| 20 | Th 4/2 | **Domestic Policies in Other Countries** |
| 21 | T 4/7 | **International Negotiations** |
| 22 | Th 4/9 | **International Negotiations** |