

# ECONOMICS OF NATURAL RESOURCES & CLIMATE CHANGE

Fall 2019

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<b>Dates:</b>	Thursdays, from Oct 3rd to Nov 21st	(excluding Nov 7th)
<b>Time:</b>	8:45 - 10:15 & 10:30-12:00	
<b>Location:</b>	IDEC-201	

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**This is the tentative syllabus. There may be minor changes to reflect the number of students enrolled. If changes are made, they will be decided by October 3rd.**

**Objectives:** On Fall 2019, the main topic of the course X0050050 will be the economics of natural resources, with a focus on climate change. This course is designed for graduate students at IDEC. It will have a combination of theoretical and empirical studies related to the management of natural resources and government regulation. At the end of the course, a successful student should be able to:

- Understand the way economics conceptualizes the allocation of natural resources,
- Understand the issues that the society is currently facing, and
- Prepare a research proposal.

**Prerequisites:** There are no prerequisites to this course, however it is strongly suggested to have a solid background on microeconomics, especially for the material covered during the first two weeks.

**Grading:** Grading will be based on:

- 20% Attendance and class participation.
- 30% Midterm.
- 50% Final presentation.

**Course Outline:****Week 1, October 3rd: Introduction, Revision to Microeconomics, and Coase Theorem****Main readings:**

- <https://www.cbo.gov/sites/default/files/108th-congress-2003-2004/reports/04-25-climatechange.pdf>
- Lecture notes

**Supplementary readings:**

- Coase, R. 1960. "The Problem of Social Cost" *Journal of Law and Economics* 3: 1-44.
- Nordhaus, W.D. (2007). "A Review of the Stern Review on the Economics of Climate Change." *Journal of Economic Literature* 45:686-702.
- Stern, N. (2008). "The Economics of Climate Change." Richard T. Ely Lecture, *American Economic Review: Papers & Proceedings* 98(2):1-37.
- <https://unfccc.int/resource/docs/convkp/kpeng.html>
- [https://unfccc.int/resource/docs/publications/unitingonclimate\\_eng.pdf](https://unfccc.int/resource/docs/publications/unitingonclimate_eng.pdf)
- [https://www.ipcc.ch/pdf/assessment-report/ar4/syr/ar4\\_syr\\_spm.pdf](https://www.ipcc.ch/pdf/assessment-report/ar4/syr/ar4_syr_spm.pdf)
- Stroeve, Julianne, et al. "Arctic Sea Ice Extent Plummetts in 2007." *EOS Transactions of the American Geophysical Union* 89 (2008): 13-14.
- Tedesco, Marco. "A New Record in 2007 for Melting in Greenland." *EOS Transactions of the American Geophysical Union* 88 (2007): 383.
- Wolff, Eric. "Whither Antarctic Sea Ice?" *Science* 302 (2003): 1164.
- Whitfield, John. "Alaska's Climate: Too Hot to Handle." *Nature* 425 (2003): 338-339.
- Kerr, Richard. "Confronting the Bogeyman of the Climate System." *Science* 310 (2005): 432-433.
- Harvell, C. Drew, et al. "Climate Warming and Disease Risks for Terrestrial and Marine Biota." *Science* 296 (2002): 2158-2162.
- Kerr, Richard. "A Bit of Icy Antarctica Is Sliding Toward the Sea." *Science* 305 (2004): 1897.
- Morton, Oliver. "Is This What it Takes to Save the World?" *Nature* 447 (2007): 132-136.
- Mann, Michael, et al. "Atlantic Tropical Cyclones Revisited." *EOS Transactions of the American Geophysical Union* 88 (2007): 349.
- Emanuel, Kerry. "Increasing Destructiveness of Tropical Cyclones Over the Past 30 Years." *Nature* 436 (2005): 686-688.
- Schiermeier, Quirin. "Clear Skies Raise Global-Warming Estimates." *Nature* 435 (2005): 1142-1143.

**Week 2, October 10th: Public Goods and Regulation****Main readings:**

- Lecture notes

**Supplementary readings:**

- Samuelson, P. 1954. "Pure Theory of Public Expenditures." *Review of Economics and Statistics* 36: 387-389.
- Baumol, W. 1972. "On Taxation and the Control of Externalities." *American Economic Review* 62: 307-322.
- Stavins, R.N. 2011. "The Problem of the Commons: Still Unsettled after 100 Years" *American Economic Review* 101(1):81-82, 96-103.
- National Research Council 2010. "Hidden Costs of Energy: Unpriced Consequences of Energy Production and Use." Committee on Health, Environmental, and Other External Costs and Benefits of Energy Production and Consumption, National Academies Press: Washington, D.C.
- Tietenberg, T. 1980. "Transferable Discharge Permits and the Control of Stationary Source Air Pollution" *Land Economics* 5: 391-416.
- Joskow, P., R. Schmalensee, E. Bailey. 1998. "The Market for Sulfur Dioxide Emissions" *American Economics Review* 88: 669-685.
- Muller, N. and R. Mendelsohn. 2009. "Efficient Pollution Regulation: Getting the Prices Right" *American Economic Review* 99: 1714-1739.
- "Rethinking How to Split the Costs of Carbon Emissions." Eduardo Porter, *The New York Times*, December 24th, 2013.
- Jaffe, A.B., S.R. Peterson, P.R. Portney, and R.N. Stavins (1995). "Environmental Regulation and the Competitiveness of U.S. Manufacturing: What Does the Evidence Tell Us?" *Journal of Economic Literature* 33(1):132-163.
- Heinzerling, L. and F. Ackerman (2007). "Law and Economics for a Warming World." *Harvard Law & Policy Review* 1(2):331-362.
- Weitzman, M.L. (1974). "Prices vs. Quantities." *Review of Economic Studies* 41(4):477-491.
- Helfand, G.E. (1992). "Standards versus Standards: The Effects of Different Pollution Restrictions." *American Economic Review* 81(2):622-634.
- Ellerman, A.D. and J.-P. Montero (1998). "The Declining Trend in Sulfur Dioxide Emissions: Implications for Allowance Prices." *Journal of Environmental Economics and Management* 36:26-45.

**Week 3, October 17th: Midterm and discussion about research paper**

**Information:** The midterm is scheduled from 8:45 to 10:15. The midterm will consist of theoretical and mathematical questions. The students have to answer it in English, the handwriting has to be legible, and the conclusions have to be derived in a logical way.

From 10:30 on: After the break, we will discuss your research proposals. The discussion will include: topic, scope, methodology, format, and expectations.

**Week 4, October 24th: Miscellaneous Topics I****Main readings:**

- Hotelling, H. 1931. "The Economics of Exhaustible Resources." *Journal of Political Economy* 39: 137-175.
- Holtz-Eakin, D. and T. Seldon (1995). Stoking the fires? CO2 emissions and economic growth. *Journal of Public Economics* 57(1):85-101.
- Carson, Richard T. (2010). The Environmental Kuznets Curve: Seeking Empirical Regularity and Theoretical Structure." *Review of Environmental Economics and Policy* 4(1), pp 3-23.
- Stern, David (2004). The rise and fall of the environmental Kuznets curve. *World Development* 32(8). pp 1419-1439.

**Supplementary readings:**

- Krautkraemer J., and M. Toman. "Fundamental Economics of Depletable Energy Supply." *Resources for the Future, Discussion Paper 03-01* (2003).
- Berck, P. and M. Roberts. 1996. "Natural Resource Prices: Will They Ever Turn Up?" *Journal Environmental Economics Management* 31: 65-78.
- Sohngen, B., R. Mendelsohn, and R. Sedjo. 1999. "Forest Conservation, Management, and Global Timber Markets", *American Journal of Agricultural Economics* 81: 1-13.
- Gordon, H.S. 1954. "The economic theory of a common property resource: The Fishery" *Journal of Political Economy* 62: 124-142.
- Scott, A., 1955. "The fishery: the objectives of sole ownership." *Journal of political Economy*, 63(2), pp.116-124.
- [https://web.mit.edu/coal/The\\_Future\\_of\\_Coal.pdf](https://web.mit.edu/coal/The_Future_of_Coal.pdf)  
Webster, Mort, et al. "Uncertainty Analysis of Climate Change and Policy Response." *Climatic Change* 61 (2003): 295-320.
- Prinn, Ronald, et al. "Integrated Global System Model for Climate Policy Assessment: Feedbacks and Sensitivity Studies." *Climatic Change* 41 (1999): 469-546
- Toth, Ferenc, et al. "Exploring Options for Global Climate Policy: A New Analytical Framework." *Environment* 44 (2002): 23-33.

**Week 5, October 31st: Miscellaneous Topics II****Main readings:**

- 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.
- Jaffee, D.M. and Russell, T., 1997. Catastrophe insurance, capital markets, and uninsurable risks. *Journal of Risk and Insurance*, pp.205-230.
- Michel-Kerjan, E.O., 2010. Catastrophe economics: the national flood insurance program. *Journal of economic perspectives*, 24(4), pp.165-86.
- Mills, E., 2005. Insurance in a climate of change. *Science*, 309(5737), pp.1040-1044.
- Woodcock (2014). *Regulated and Deregulated Energy Markets, Explained*.
- Palmer, K.L. and D. Burtraw (2007). The electricity sector and climate policy.

**Supplementary readings:**

- “What if We Never Run Out of Oil”? Charles C. Mann, *The Atlantic Monthly*, April 24th, 2013.
- “Taxes Show One Way to Save Fuel.” Eduardo Porter, *The New York Times*, September 11th, 2012.
- Schmalensee, R. (2012). “Evaluating Policies to Increase Electricity Generation from Renewable Energy.” *Review of Environmental Economics and Policy* 6(1):45-64.
- “How We Learned Not to Guzzle.” Ralph Cavanagh, *The New York Times*, September 12th, 2013.
- Allcott, H. and M. Greenstone (2011). “Is There an Energy-Efficiency Gap?” *Journal of Economic Perspectives* 26(1):3-28.
- Millner, A. (2013). “On Welfare Frameworks and Catastrophic Risk.” *Journal of Environmental Economics and Management* 65:310-325.

**Week 6, November 14th: Climate Change I****Main readings:**

- Mendelsohn, R., W. Nordhaus and D. Shaw. 1994. "Measuring the Impact of Global Warming on Agriculture", *American Economic Review* 84: 753-771.
- Mendelsohn, R., A. Dinar, and L. Williams. 2006. "The Distributional Impact of Climate Change On Rich and Poor Countries" *Environment and Development Economics* 11: 1-20.
- Becker, G.S., K.M. Murphy, and R.H. Topel (2010). "On the Economics of Climate Policy." *B.E. Journal of Economic & Policy Analysis* 10(2): Article 19.
- Pindyck, R.S. (2013). "Climate Change Policy: What Do the Models Tell Us?" *Journal of Economic Literature* 51(3): 860-872.
- Hansen, James, et al. "Earth's Energy Imbalance: Confirmation and Implications." *Science* 308 (2005): 1431-1435.
- Penner, Joyce. "Climate Change: The Cloud Conundrum." *Nature* 432 (2004): 962-963.

**Supplementary readings:**

- Weitzman, M.L. (2013). "Tail-Hedge Discounting and the Social Cost of Carbon." *Journal of Economic Literature* 51(3): 873-882.
- Karl, Thomas R., and Kevin E. Trenberth. "Modern Global Climate Change." *Science* 302 (2003): 1719-1723.
- Andreae, Meinrat, Chris Jones, and Peter Cox. "Strong Present-Day Aerosol Cooling Implies a Hot Future." *Nature* 435 (2005): 1187-1190.
- <http://www.ipcc.ch/pdf/assessment-report/ar4/wg1/ar4-wg1-spm.pdf>
- "In the Philippines, Natural Disasters Are Common; Ways to Reduce Their Impact Aren't." Chico Harlan, *The Washington Post*, November 16th, 2013.
- "India Scores a Win in Warsaw on Emission Cuts Affecting Farmers." Nithin Sethi, *The Hindu*, November 14th, 2013.
- "Global Warming's Terrifying New Math." Bill McKibben, *Rolling Stone*, July 19th, 2012.
- Burgess, R., O. Deschenes, D. Donaldson, and M. Greenstone (2011). "Weather and Death in India." Mimeo.
- Anttila-Hughes, J. and Hsiang, S., 2013. "Destruction, disinvestment, and death: Economic and human losses following environmental disaster." Available at SSRN 2220501.
- Guiteras, R. (2009). "The Impact of Climate Change on Indian Agriculture." Mimeo.
- Muller and Mendelsohn 2007 "Measuring The Aggregate Damages of Air Pollution in the United States" *Journal of Environmental Economics and Management* 54: 1-14.
- Moore, F.C. and Delavane Diaz (2015). Temperature impacts on economic growth warrant stringent mitigation policy. *Nature Climate Change* 2481.
- Dell, Melissa, Benjamin F. Jones, and Benjamin A. Olken. "Temperature shocks and economic growth: Evidence from the last half century." *American Economic Journal: Macroeconomics* 4.3 (2012): 66-95.
- Nordhaus, William D. "Expert opinion on climatic change." *American Scientist* 82.1 (1994): 45-51.

**Week 7, November 21st: Climate Change II****Main readings:**

- Nordhaus, W. D. 1991. "To Slow or Not to Slow: The Economics of the Greenhouse Effect." *Economic Journal* 101: 920–937.
- Schelling, T. (1997). "The Cost of Combating Global Warming: Facing the Tradeoffs." *Foreign Affairs* 76:8-14.
- Arrow, K.J. and A.C. Fisher (1974). "Environmental Preservation, Uncertainty, and Irreversibility." *Quarterly Journal of Economics* 88(2): 312-319.
- Stern, N. (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): 838-859.
- 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.
- Ambec et al (2013). The Porter Hypothesis at 20: Can Environmental Regulation Enhance Innovation and Competitiveness. *Review of Environmental Economics and Policy*. Pages 1-9.

**Supplementary readings:**

- Aldy, J.E., S. Barrett, and R.N. Stavins (2003). "Thirteen Plus One: A Comparison of Global Climate Policy Architectures." *Climate Policy* 3: 373-397.
- Greenstone, M., E. Kopits, and A. Wolverton (2011). "Estimating the Social Cost of Carbon for Use in Federal U.S. Rulemakings: A Summary and Interpretation." NBER Working Paper 16913.
- 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*.
- Newell, Richard (2007). *Climate Technology Deployment Policy*.
- Metcalf, Gilbert (2009). Tax Policies for Low-Carbon Technologies. *National Tax Journal* 62(3)
- Talbot, David. "Planning for a Climate-Changed World." *Technology Review*, May-June 2007, pp. 63- 70.
- [https://www.ipcc.ch/site/assets/uploads/2018/02/ar5\\_wgII\\_spm.en.pdf](https://www.ipcc.ch/site/assets/uploads/2018/02/ar5_wgII_spm.en.pdf)



**Week 7, November 28th: Student Presentations**

**Final evaluation:** Students have to prepare a research proposal, satisfying the following as minimum requirements (minimum requirements do not guarantee a full grade):

- The document has to be clear, written in English, and has to be logically coherent. A printed version should be handed in to the instructor on November 28th, by 8:45 AM.
- Format:
  - Font: Times New Roman 12pt,
  - Spacing: 1.5,
  - Margins: 2.5cm each side,
  - Length: at least six full pages long.
- Organization: The document should be sub-divided in the following parts.
  - A clear motivation that implicitly answers: Why is your chosen topic interesting? And why is it relevant? (about 2 pages)
  - A literature review of papers (not book chapters) that is comprehensive, relevant, and reflecting the latest research related to your chosen topic, with a minimum of ten published papers, from which none should have been covered during lecture (Supplementary readings are acceptable. Readings covered during lecture can be mentioned, but not described as part of the literature review.). (about 3 pages)
  - A clear research question and a hypothesis. Additionally, this section should discuss potential policy implications of any findings. (about 1 page)
  - A complete plan of how you would proceed with your research, and what difficulties you may find. Some hints: (i) If the data does not exist, it should be feasible to get it. (ii) If your work is experimental, you should consider power calculations, etc. (about 2 pages)