Course description
This is an upper-level course that will examine tools from economics as they relate to two timely environmental issues: climate change and debates over the future of the Clean Air Act. The environmental economics tools we will cover in depth include: dynamic optimization, non-market valuation, and estimation of treatment effects. This is not a survey course, but rather one that will cover a limited number of topics in depth. There are two learning objectives for this course. First, you will learn how statistical tools can be used for economic analysis. Second, you will be able to describe how economic theory informs empirical analysis. We will specifically focus of measuring outcomes, identifying causal relationships between economic factors and environmental and social outcomes, and valuing those outcomes.

Goals of an integrated experience
This course will satisfy the General Education Integrative Experience requirement for Resource Economics majors when taken with Res-Econ 394LI and Res-Econ 471.

The Integrative Experience (IE) requirement at UMass Amherst addresses the challenges associated with educational fragmentation. Positioned in the upper-division, the IE provides students with a structured opportunity to look back on their early college learning experiences, reflect upon and make connections between those earlier experiences and the more advanced work in their major, and use their integrated learning to prepare for the demands of the world beyond the University.

Integrative experience in Resource Economics 472
In this course we will strive towards the goals of an integrated experience in three ways.

1. Integrating knowledge and experiences from General Education courses and Resource Economics.

   You will apply your knowledge of intermediate microeconomics (Resource Economics 202) and environmental and resource economics (262 and 263) to examine economic models of climate change and the impacts of regulations on environmental and economic criteria. You will draw on your experiences in general education courses to question the assumptions of these standard economic models and to question the validity of the resulting policy recommendations.

2. Actively practicing learning objectives including public speaking, collaboration, critical thinking, and integrating perspectives from multiple disciplines.

   There will be extensive student interaction during weekly discussion of lecture and reading materials. Your empirical literature review will draw upon your critical thinking skills and challenge you to apply
them in a new context. See the section “Details on Assignments” for additional information on these assignments.

By their very nature, understanding climate change and environmental regulation require an interdisciplinary perspective and throughout the course you will be challenged to integrate your knowledge and experiences across disciplines.

3. Applying your previous intellectual experiences to challenging policy questions in a shared learning experience with your classmates.

By attending seminars outside this course and summarizing them for fellow students, you will draw on your individualized learning experiences to communicate the seminar content to others. Your personal knowledge and experiences will shape how you approach all assignments for the class, each of which are designed to challenge you to grapple with the complex problems of climate change and environmental regulation.

Requirements
25% --- In-class exam (October 14)
25% --- Community profile (15% written report and 10% presentation) (Report due December 2 and presentations will be December 9.)
15% --- Written summary of 2 external seminars and presentation to class (December 7)
10% --- Written responses to lecture questions (bi-weekly) and participation in discussion (each lecture)

* The community profile will be a group project. I will assign you to a group and a community.
** Your grade on any of these assignments will drop by ONE letter grade for each day that the assignment is late.

Format for assignments
• All written materials should be printed and handed when they are due. Please use 12-point font and 1½ line-spacing. Include your name, assignment number and date on all materials.

• If at any time I ask that you email materials, file names should follow this format “your last name.assignment name.doc”.

Class policies
• Please do not use mobile phones or PDAs during class.
• Please use laptops ONLY if instructed during group exercises.
• Students are expected to come to class AND participate. This is an important portion of your grade AND central to the integrated experience.
• Please do not fall behind. I am always happy to meet to answer questions to clarify material, but it is your responsibility to contact me.
ACADEMIC HONESTY

All members of the University community must participate in the development of a climate conducive to academic honesty. While the faculty members, because of their unique role in the educational process, have the responsibility for defining, encouraging, fostering, and upholding the ethic of academic honesty, students have the responsibility of conforming in all respects to that ethic.

Intellectual honesty requires that students demonstrate their own learning during examinations and other academic exercises, and that other sources of information or knowledge be appropriately credited. Scholarship depends upon the reliability of information and reference in the work of others. No form of cheating, plagiarism, fabrication, or facilitating of dishonesty will be condoned in the University community.

Academic dishonesty includes but is not limited to:

**Cheating** - intentional use, and/or attempted use of trickery, artifice, deception, breach of confidence, fraud and/or misrepresentation of one’s academic work.

**Fabrication** - intentional and unauthorized falsification and/or invention of any information or citation in any academic exercise.

**Plagiarism** - knowingly representing the words or ideas of another as one’s own work in any academic exercise. This includes submitting without citation, in whole or in part, prewritten term papers of another or the research of another, including but not limited to commercial vendors who sell or distribute such materials.

**Facilitating dishonesty** - knowingly helping or attempting to help another commit an act of academic dishonesty, including substituting for another in an examination, or allowing others to represent as their own one’s papers, reports, or academic works.

Sanctions may be imposed on any student who has committed an act of academic dishonesty. Any person who has reason to believe that a student has committed academic dishonesty should bring such information to the attention of the appropriate course instructor as soon as possible.

Formal definitions of academic dishonesty, examples of various forms of dishonesty, and the procedures which faculty must follow to penalize dishonesty are contained in *The Code of Student Conduct*, a publication of the Dean of Student Affairs. A student accused by an instructor or another student of having committed a breach of the academic honesty regulations has the right to appeal before any penalty can be imposed. Appeals must be filed within ten days of notification by the instructor that s/he suspects dishonesty. Information on the appeals process is also contained in *The Code of Student Conduct*, or can be obtained from the **Ombuds Office**, where appeals are filed.
SCHEDULE OF TOPICS & READINGS

The number of lectures per topic is approximate. As the semester unfolds, we will adjust the time in response to general interest and need. The dates below are to give you a sense of timing. Readings will be available through the Moodle web page or online as noted. In addition to these readings, I will occasionally hand out short readings for you to review for the next class.

| September 9 | Introduction to the course  
|            | Climate change: Environmental impacts of carbon emissions |
| September 14 | Climate change: Brief history of international agreements, policy options, introduction to economic models, introduction to dynamic optimization  
|              | Readings:  
| September 16 | Climate change: Discounting and social welfare functions in dynamic optimization  
|              | Readings:  
|              | 1. The economics of climate change, Stern, 2008. Part II. |
| September 21 & 23 | Climate change: One specific dynamic optimization model --- the Ramsey-Koopmans-Cass Model --- and details on the elasticity of marginal utility  
|                  | Readings:  
| September 28 & 30 | Climate change: Policy instruments  
|                   | Readings:  
|                   | 1. The economics of climate change, Stern, 2008. Parts III and IV.  
| October 5 | Guest lecturer: James Boyce, Cap and dividend  
|            | Readings:  
| October 7 | Climate change: Critique of economic modeling  
|            | Readings:  
|            | 1. (Mis)understanding climate policy: The role of economic modeling. Ackerman, 2014.  
<p>| October 13 | Guest lecturer |
| October 14 | Midterm exam in class |
| October 26 &amp; 28 | Environmental regulation in the US: Measuring the impact |</p>
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<tr>
<th>Date</th>
<th>Topic</th>
<th>Readings</th>
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<td>November 23</td>
<td>Non-market valuation: Examples of stated preference</td>
<td>Readings to be determined.</td>
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<td>2. Is environmental justice good for white folks? Ash et al., 2010.</td>
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<td>December 7</td>
<td>Small group discussions and presentations of reflections on external seminars.</td>
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<tr>
<td>December 9</td>
<td>Group presentations of community profile.</td>
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DETAILS ON ASSIGNMENTS

Interdisciplinary Seminars on the Environment

You will choose and attend two seminars on an environmental topic presented outside of Resource Economics. You can select any department at Umass or the area colleges. For each seminar prepare a three to five-paragraph summary. Your summary should include: a brief description of the environmental issue (key players, effects etc.), the economic principles at play (e.g. how to price the ecological impact of an oil spill) and your assessment in terms of what you learned and what questions remain for you. If economic aspects are not directly addressed in the seminar, then reflect on what economic issues are related to the topic.

In one class session we will divide into small groups to discuss the seminars. You will be responsible for describing to your fellow students the seminars you attended. You should focus on the topic, methods used by the researchers, and new ideas. Describe how the seminar changed (or did not change) how you thought about the topic and what economists could take away from the seminar. At the end of that class, the groups will report out to the entire class the themes in common across the seminars.

Written Responses to Discussion Questions

Approximately weekly I will provide a handout summarizing the main terms and concepts and listing several discussion questions. A subset of these questions will be assigned for you to reflect upon and respond to in writing (please type your responses). The next class meeting we will take turns presenting our responses either to the entire class or in small groups. I will collect your written responses at the end of class. Note that I will also draw on these questions to cold call in lecture to promote discussion and participation.
Community Profile

There are many ways to describe the impacts of environmental regulation on a community. The goal for this assignment is to describe the air quality in your community in a written report and class presentation. Please address each of the following. In some cases you will be able to find data on the community level, in others you will need to use county-level data or even the closest metropolitan area.

1. Describe the social-demographics of your community
   a. What is the mean and median income? What percentage of families are below the poverty line?
   b. What is the total population?
   c. Describe the demographics of the community (race/ethnicity, age, etc.)
   d. Are there available indicators of environmental inequality, economic inequality?

2. Describe the toxic releases in your community.
   a. What percentile is your county in terms of:
      i. Total environmental releases?
      ii. Air releases of carcinogens?
      iii. Air releases of developmental toxicants?
      iv. Air releases of reproductive toxicants?
   b. What are the major health effects of the TRI releases?
   c. Graph the total volume of air releases since 1988 (or earlier if possible). Describe the trend.
   d. What is the top ranked cancer risk? (Include both the chemical and facility.)
   e. What is the top ranked non-cancer risk? (Include both the chemical and facility.)
   f. Are there any companies from the toxic 100 in your community?

3. Describe the exposure to pollution from major roadways.
   a. What are the major roads in your community?
   b. What proportion of the population lives near those roads? Describe their demographics.
   c. What other measures can you use to describe traffic pollution in your community?

4. Describe the ambient air quality in your community.
   a. Detail the six criteria pollutants covered by the National Ambient Air Quality Standards.
   b. Are there air quality monitoring stations in your community (or county)?
      i. IF YES
         1. For which pollutants were NAAQS exceeded?
         2. How many person-days did your area exceed NAAQS? (Define person-days)
         3. What is the attainment status of your area?
         4. What percentage of days does your area have good air quality, moderate, unhealthy for sensitive individuals or kids, and unhealthful for all?
         5. What were the maximum, median and 90th percentile for Air Quality Index?
         6. Include the summary of the criteria pollutants (NAAQS, highest concentration, second highest, number of NAAQS exceedances, number of monitoring stations).
ii. If NO

1. Describe the most recent year available for criteria air pollutants emissions.
2. Then identify a metropolitan area (need not be MA) where you suspect that NAAQS might NOT be met. Complete the “If YES” section of questions above for that area.
3. Reflect on your findings. What are your impressions of the air quality in your community?

5. Outline a proposal for study of the status of the environment and the related economic questions for your community. Draw on the materials on identifying and measuring health outcomes and valuing those outcomes.
   a. What are the large data issues for such a study?
   b. What are the big conceptual issues in measuring and valuing impacts?

**Suggested resources**

http://www.scorecard.org/env-releases/cap/
http://airnow.gov/
http://www.peri.umass.edu/justice/
http://www.epa.gov/tri/tridata/current_data/index.html
Empirical Literature Review

Your first task for this paper is to find an environmental economic topic that is of interest to you. I suggest you peruse periodicals that cover current policy and cultural issues. Or you could listen to programs on NPR such as “Living on Earth”. You will report on the topic(s) you have selected in class. Be prepared to discuss WHY you have chosen your topic. The next step is to find four to five papers that offer differing viewpoints on this issue. You will turn in abstracts for each paper for my approval. These must be papers from the peer-reviewed literature. You should start with a search of EconLit (available through the library) and may also look in the NBER or SSRN working paper web sites (http://www.nber.org/papers.html and http://www.ssrn.com). Your final review should be no longer than eight pages, 12 point New Times Roman, 1.5 spaced. I prefer a well-written, tightly reasoned paper to a long, rambling paper. I want you to consider the topic using the tools of the course, not explain your personal thoughts or reactions to the papers.

Impacts on climate change on agriculture

Examples of topics
Antibiotic resistance

Preserving farmland
- The Trade-off between Private Lots and Public Open Space in Subdivisions at the Urban–Rural Fringe, RFF Report (PLUS one other document)

Water quality
- Incentive-Based Land Use Policies and Water Quality in the Chesapeake Bay, RFF Report

Your paper should be a critical assessment of the literature not simply a summary. At the minimum you should address these questions. A grading rubric follows on the next page.

- What is the policy issue examined? What are the economic elements of the issue?
- What question does the paper ask?
- What data are used? What are the key variables?
- What empirical model is used? Is the empirical model appropriate?
- What assumptions of firm/household behaviors are made?
- Assess the validity of the behavioral assumptions?
- What are the results of the paper? What questions remain?
- What are the key weakness of the papers? What are areas for improvement?
- How does this paper inform your belief about what policy approaches should be used? In other words, propose a policy solutions and use the literature you reviewed to justify and evaluate those policy solutions.
- What other information would you need to develop policy?
## Grading Rubric for Empirical Literature Review

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<th>Exemplary</th>
<th>Acceptable</th>
<th>Needs Improvement</th>
<th>Unacceptable in this form</th>
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<tr>
<td><strong>Structure of paper</strong></td>
<td>Paper states a main thesis or argument, presents evidence in support of it, and draws a logical conclusion.</td>
<td>Introduction or conclusion doesn’t do what it’s supposed to, or body of paper doesn’t develop an argument, or just describes readings.</td>
<td>Body of paper fails to present evidence, or drifts away from original topic, or contains arguments that seem to contradict each other</td>
<td>Organizational logic is unclear.</td>
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<td><strong>Identification of appropriate literature</strong></td>
<td>The selected papers are focused on same topic, use acceptable methodologies and data, and provide insight into policy question.</td>
<td>The selected papers are focused on same topic, use acceptable methodologies and data, but do not provide insight into policy question.</td>
<td>Required number of papers are reviewed, but they are not focused on one theme or issue</td>
<td>Paper does not review the required number of studies.</td>
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<td><strong>Relating literature to policy issue</strong></td>
<td>Paper analyzes the argument and evidence pertaining to the policy recommendations. Paper has internal consistency, addressing all of questions it raises, applying same standards for empirical methods as presented in class. Paper makes recommendations that follow logically from analysis.</td>
<td>Analysis is accurate and adequate, but not quite complete.</td>
<td>Paper makes an effort at comparing/contrasting literature and linking that to policy recommendations, but has problems with clarity or accuracy</td>
<td>Paper misses an obvious point of comparison or contrast or neglects to relate literature to policy recommendations</td>
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<td><strong>Critical review of literature</strong></td>
<td>Paper clearly and completely responds to the questions presented in syllabus.</td>
<td>Some questions are not raised or addressed adequately.</td>
<td>Paper describes literature accurately, but doesn’t get to evaluation or analysis</td>
<td>Inaccuracies in analysis</td>
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<td><strong>Writing style</strong></td>
<td>Paper is correct length with few or no editorial mistakes (spelling, grammar, punctuation)</td>
<td>Paper is over or under length, though well-written, or of correct length with more than a few editing mistakes.</td>
<td>Regardless of length, paper has a consistent problem with one of the following areas: paragraph structure, sentence structure, economy and clarity of expression, grammar &amp; spelling</td>
<td>Regardless of length, paper has a consistent problem in more than one of the areas</td>
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Resources

- **Country/region-level impacts**
  - Climate Change Convention (UNFCCC)
  - WHO report

- **Detailed environmental data**
  - Carbon Dioxide Information Analysis Center (CDIAC) of the US Department of Energy

Reference books


Saving Kyoto (Paperback), 2009. (not yet available) **Graciela Chichilnisky** (Author)

Climate Change and Agriculture (New Horizons in Environmental Economics Series) by Robert Mendelsohn and Ariel Dinar (Hardcover - Oct 2009)

Distributional Impacts of Climate Change and Disasters: Concepts and Cases (New Horizons in Environmental Economics Series) by Matthias Ruth and Maria E. Ibarraran (Hardcover - Oct 2009)


References on science of climate change
http://www.nap.edu/openbook.php?record_id=10139