

GCC 5008: SCIENCE AND POLICY OF GLOBAL ENVIRONMENTAL CHANGE
Spring 2016
Course Syllabus

LOCATION AND TIME

Learning and Environmental Science 380 (Institute on the Environment)
Tuesdays and Thursdays from 10:15 to 11:30AM

INSTRUCTORS

Sarah Hobbie, Ecology, Evolution and Behavior

Email: shobbie@umn.edu

Phone: 5-6269

Office: 502 Ecology

Steve Polasky, Applied Economics

Email: polasky@umn.edu

Phone: 5-9213

Office: 337E Ruttan or 503 Ecology

Elizabeth Wilson, Humphrey School of Public Affairs

Email: ewilson@umn.edu

Phone: 6-4410

Office: 158 Humphrey Center

COURSE WEBSITE: On Moodle.

OFFICE HOURS:

In person: *by appointment*.

Via email: *Anytime*. We encourage you to use email to contact us (and your classmates) with any questions, concerns, or comments. Email is the surest way to receive a prompt reply (usually within the day) and is the easiest way to set up an appointment to meet with us.

OBJECTIVES

Through exploring the links between global environmental change science and policy, with an emphasis on learning through writing, discussion, and oral presentations, this course meets the Liberal Education Environment Theme goals. Specifically, the course aims to help students:

- A. Gain a better understanding of how human actions influence the environment and in turn how environment change impacts on human well-being.
- B. Explore a range of scientific and policy issues related to global environmental change as it influences ecosystem processes and human well-being at multiple scales.
- C. Learn how to read, interpret, and critically evaluate the primary literature.
- D. Learn how to think critically about the intended and unintended consequences of alternative environmental policies.

E. Discuss important ethical and moral issues related to global environmental change including the effects of environmental change on disadvantaged groups within society and questions of treatment of future generations and the ethical implications of policy choices.

F. Gain experience in effectively communicating environmental science and policy issues to lay audiences.

COURSE DESCRIPTION

Through readings, lectures, discussions, written assignments, and presentations, this course introduces the critical issues underpinning global change and its environmental, socio-economic, and ethical implications. The course examines current literature in exploring evidence of human-induced global environmental change, the social and economic drivers of environmental change, its potential effects on a wide range of biological processes, and social and economic consequences. The course also examines potential policy responses to global change and political processes at local, national and international scales.

COURSE SCHEDULE

This schedule is tentative and subject to change. DQ: Daily Questions, due if checked.

DATE	DAY	TOPIC (Readings)	SPEAKER	DQ	ASSIGNMENTS
19-Jan	T	Course Overview and Introduction to International Climate Negotiations	SP, EW		
21-Jan	Th	Student Presentations – INDCs	Students		Group Presentations – 10 min.
26-Jan	T	Introduction to Climate Change Science (Walsh et al. 2014; also browse Hayhoe et al. 2014)	SH	<input type="checkbox"/>	
28-Jan	Th	Energy Systems – Existing (Davies et al. 2014 – Chapter 2)	EW	<input type="checkbox"/>	
2-Feb	T	Energy Systems – Future (Davies et al. 2014 – Chapters 3, 4; NAS 2009; Service 2015)	EW	<input type="checkbox"/>	
4-Feb	Th	Climate Change Projections/2° Target (See Jan 26; Gasser et al. 2015)	SH	<input type="checkbox"/>	
9-Feb	T	Energy System by Country	Students		Individual Presentations – 10 min.
11-Feb	Th	Global Carbon Cycle (Pan et al. 2011, Schimel et al. 2015)	SH	<input type="checkbox"/>	
16-Feb	T	Land Use Change – Food and Agriculture (Foley et al. 2011, Tilman et al. 2011)	SP	<input type="checkbox"/>	

DATE	DAY	TOPIC	SPEAKER	DQ	ASSIGNMENTS
------	-----	-------	---------	----	-------------

		(Readings)			
18-Feb	Th	Land Use by Country	Students		Individual Presentations – 10 min.
23-Feb	T	State Level Politics and Policy Responses to Climate Change	Melissa Hortman		
25-Feb	Th	Urbanization – Challenges & Opportunities (Grimm et al. 2008)	SH, EW	□	
1-Mar	T	Urbanization – Building Design	Richard Graves		
3-Mar	Th	Urbanization by Country	Students		Individual Presentations – 10 min.
8-Mar	T	Implementation – Economics & Policy (Aldy et al. 2010)	SP	□	First Draft Brief 1 Due – bring 2 hard copies to class
10-Mar	Th	Implementation – Technologies & Policy (Loftus et al. 2014)	EW	□	Peer Response Workshop – First Drafts Brief 1
22-Mar	T	Implementation Strategies by Country	Students		Individual Presentations – 10 min.
24-Mar	Th	Implementation – Political Context	Wendy Rahn		
29-Mar	T	Implementation – Utilities Perspectives	Judy Poferl		
31-Mar	Th	Climate Change Impacts (Frelich and Reich 2010, Grimm et al. 2013)	SH	□	Final Draft Brief 1 Due
5-Apr	T	Climate Change Impacts (see March 31)	SH	□	
7-Apr	Th	Climate Change Impacts by Country	Students		Individual Presentations – 10 min.
12-Apr	T	Climate Change Adaptation – Strategies (Nicholis and Cazanave 2010, Mills et al. 2015)	SP	□	

DATE	DAY	TOPIC	SPEAKER	DQ	ASSIGNMENTS
------	-----	-------	---------	----	-------------

		(Readings)			
14-Apr	Th	Geoengineering & Negative Emissions Technologies (NAS 2015 Geoengineering Reports: Carbon dioxide removal and albedo manipulation)	SH	□	
19-Apr	T	Climate Change Adaptation by Country	Students		Individual Presentations – 10 min.
21-Apr	Th	Climate Change Adaptation – Resilient Infrastructure	Shalini Vajjhala		
26-Apr	T	Revise INDCs	EU, Brazil		Group Presentations – 30 min. Final Draft Brief 2 Due
28-Apr	Th	Revise INDCs	USA, India		Group Presentations – 30 min.
3-May	T	Revise INDCs	Saudi Arabia, China		Group Presentations – 30 min.
5-May	Th	Conference of the Parties: Negotiate a New Agreement	All		Discussion

COURSE GRADE

Two Group Oral Presentations	5% each (10% total, group grade)
Two Individual Oral Presentations	10% each (20% total, individual grade)
Two Written Briefs	25% each (50% total, individual grade)
Daily Questions	10% total (individual grade)
Participation	10% total (individual grade)

COURSE ASSIGNMENT OVERVIEW

During the semester, you will participate in a series of group presentations and related individual written assignments. Your group will be assigned a country and the goal of these presentations and written assignments is to help you explore the vulnerabilities, challenges, and opportunities facing your assigned country as it grapples with environmental change more broadly and the realities of adapting to and mitigating climate change more specifically. At the recent global climate change conference in Paris in December 2015, countries committed to reduce their emissions of greenhouse gases by issuing a statement of Intended Nationally

Determined Contributions (INDC). Now it is time for each country to address some difficult questions:

- A. How will your country meet its INDC for reducing greenhouse gas emissions in the face of constraints imposed by your country's unique challenges and opportunities related to global environmental change?
- B. Given that the sum total of INDCs will not reach the global target of limiting emissions to avoid dangerous climate change, what prospects are there for further emissions reductions?
- C. How will your country adapt to any climate change that does occur (or is already occurring)?

The class will be divided into **groups of 3 students each**. Each **group** is responsible for **8 presentations** over the course of the semester. **Two** of the presentations (the first and last) will receive **group grades**. For these two presentations related to your country's INDC, your group should work on the research for the presentations together and may present orally together as a group. For **six** of the presentations (Energy, Land Use, Urbanization, Implementation, Climate Change Impacts, Adaptation), your group will select a **single presenter** so that **each student will present twice on her or his own and receive an individual grade**, although all group members should help with the research that supports every presentation (note, if there are any groups of four, the instructors will come up with an additional two topics/dates so that all group members will present on 2 unique topics over the course of the semester). All presentations are brief, **10 minutes**, except the last one "Revisiting INDCs", which is **30 minutes**. Details follow.

In addition to the presentations, **each individual student** must write up their two presentation topics (Energy Systems, Land Use, Urbanization, Implementation, Climate Change Impacts, or Adaptation) as a country-specific **1200 word briefing document**. These written assignments, while brief, will allow you to delve more deeply into a topic affecting your country and will be **individually graded**. One brief is due **March 31** and the other is due **April 26**. **Note that your first brief may be due before you've given your presentation on that topic**. Details about the brief assignment follow.

In addition to the presentations and written briefs, you will be graded on your submitted Daily Questions about course readings and on course participation. Details follow.

PRESENTATION DETAILS

For all presentations, your target audience should be policy makers/decision makers/stakeholders who are familiar with climate change, but not with the detailed situation in your country. You will be graded on the organization of the presentation, relevance and completeness of content, support of your arguments using relevant and current evidence and examples, effective use of visuals (figures, tables, photographs), and clarity and readability of slides and oral presentation. Some helpful hints for effective PowerPoint presentations can be found at: <http://www.slideshare.net/treubold/fight-the-powerpoint>.

Presentation Schedule

Due Date	Presentation
January 21	INDCs and position on the Paris negotiations (group)
February 9	Energy System (group research, individual presentation and grade)*
February 18	Land Use (individual)*
March 8	Urbanization (individual)*
March 22	Implementation (individual)*
April 7	Climate Change Impacts (individual)*
April 19	Adaptation Presentation (individual)*
April 26	Revising INDCs – EU, Brazil (group)
April 28	Revising INDCs – USA, India (group)
May 3	Revising INDCs – Saudi Arabia, China (group)
May 5	Discussion of a new international agreement (all)

**Groups should conduct the research to support the presentations as a group, but select a single group member to give the presentation. Each group member is required to give two presentations during the semester. These “starred” presentations will be graded individually.*

Presentation Nuts and Bolts

INDCs and position on the Paris negotiations

Presentation length: 10 min.

Presenter: group (you can decide whether/how you want to divide up your presentation)

Goal: Provide an overview of your country’s Intended Nationally Determined Contribution (INDC) targets and position on the Paris negotiations.

What are your country’s GHG emissions? Total? Per capita?

What is your country’s INDC?

How will your country achieve your INDC?

Are there other positions related to the Paris negotiations that are relevant for your country?

Energy System

Presentation length: 10 min.

Presenter: single (each student should present twice during the semester)

Goal: Provide an overview of your country’s energy system, including the current system, the opportunities, and the challenges and vulnerabilities related to reducing reliance on fossil fuels.

What is the contribution of coal, oil, gas, wind, solar, nuclear, hydropower, biomass/biofuels, etc. to your country’s energy mix and to its greenhouse gas emissions?

What is the nature of transmission and distribution?

Does your country import or export energy? What types and how much?

What is the potential for renewable energy technologies?

What are some specific challenges and barriers related to reducing emissions from the energy system in your country? What are some opportunities?

Land Use

Presentation length: 10 min.

Presenter: single (each student should present twice during the semester)

Goal: Provide an overview of your country's existing land use picture.

What are the current land use patterns?

Are there significant existing carbon stocks that are vulnerable now or might be in the future?

How is land use changing and why (what are the pressures driving land use change)?

What are the opportunities and challenges for increasing carbon sequestration and/or increasing production of biofuels?

Urbanization

Presentation length: 10 min.

Presenter: single (each student should present twice during the semester)

Goal: Provide an overview of urbanization in your country, including current and future trends.

What are the urban vs. rural demographics in your country and how are they changing?

What are the opportunities and challenges related to increasing the energy efficiency of transportation systems and the building stock in your country's cities?

What are the vulnerabilities facing your country's cities and how will they change with climate change?

Implementation of Low Carbon Initiatives

Presentation length: 10 min.

Presenter: single (each student should present twice during the semester)

Goal: Provide an overview of the opportunities and challenges related to implementing climate change mitigation policies and changing behavior in your country.

What is the political context/climate?

What policies are in place or on the horizon?

What is the role of the private sector?

What are the challenges and barriers (technological, political, economic, cultural, etc.) related to reducing greenhouse gas initiatives? Consider specific measures like conservation, energy efficiency, expanding use of renewables and reducing reliance on fossil fuels.

Climate Change Impacts

Presentation length: 10 min.

Presenter: single (each student should present twice during the semester)

Goal: Provide an overview of your country's vulnerabilities related to climate change.

How will climate change affect ecosystems and human health/well-being in your country?

Where are the greatest vulnerabilities? How are they expected to change?

Is your country affected by sea level rise, spread of diseases, increased storms, heat waves, and droughts? How and where?

Adaptation

Presentation length: 10 min.

Presenter: single (each student should present twice during the semester)

Goal: Provide an overview of your country's potential to adapt to climate change.

What are the most vulnerable sectors and which are the most promising strategies for adaptation?

What are the barriers to adaptation (economic, political, etc.)?

Revise INDCs

Presentation length: 30 min.

Presenter: group (you can decide whether/how you want to divide up your presentation)

Goal: Use what you have learned throughout the semester to revisit your country's INDC.

Provide an overview of your country's situation with respect to climate change that touches on the salient features of your past presentations.

What revisions will you make to the INDC and to your implementation strategy?

WRITTEN BRIEF DETAILS

You are responsible for writing two briefing documents over the course of the semester. You should write up the two topics that you present orally, and you should focus on your assigned country. Your writing should be done individually, even though it will draw on research done by your entire group. Your goal for the brief is to address your topic in objective, simple terms that could be understood by a non-expert on your country (e.g., a policy maker from another country, member of an international NGO, or other stakeholder or decision-maker) and that could inform international negotiations related to mitigating climate change. You will have a chance to revise

your first briefs after receiving responses and suggestions from your group in a brief in-class workshop.

Written Assignment Nuts and Bolts

Due Date: A first draft of the first brief is due **March 8**. At that time you will exchange briefs with your group members, and provide them with written and oral feedback in a peer response workshop two days later, on **March 10**. The final draft of the first brief is due **March 31**; the final draft of the second brief is due **Apr 26**. Note that your first brief may be due before you give the presentation on that topic. Please turn in the assignments using the *Turnitin* drop box on Moodle.

Length: As this is a “brief”, there is a 1200-word limit (not including references). Although the brief is short, the research to support the brief should be extensive. In a sense, you will need to do almost as much research as you would to write a full-length research paper. However, you will need to convey what you’ve learned in very concise and simple language.

Target Audience: The target audience is a policy maker from another country, member of an international NGO, or other stakeholder or decision-maker who is not an expert in your country. Therefore, jargon should be avoided or defined, and concepts should be explained in non-technical language. This does not mean overly simplistic or vague language or concepts though—instead, the brief should be written clearly with appropriate levels of focus and detail.

Organization: The brief should be organized into well-constructed paragraphs that have topic sentences. To be successful, the brief should:

1. Introduce the “problem” (your particular topic area). **The central question to be answered or objective to be addressed should be stated clearly at the end of the first paragraph.**
2. Review the state of current knowledge in concise terms, discussing what is known and what remains unknown; it should be explicit about levels of certainty and uncertainty. Be sure to refer to the guiding questions that are listed under each topic in the **Presentation Nuts and Bolts** section.
3. Reach some conclusions about the problem. (cont. on next page)
4. Include a bibliography of sources.

DAILY QUESTIONS

Required Reading

Throughout the course we will supplement lectures and discussions with current readings, mainly from the primary literature. We expect you to read assigned material before each class period and participate in discussions. Readings are available through the course **Moodle** site. Our lectures will usually focus on the same topics, but may address either the specific reading or completely different materials, depending on the comprehensiveness or importance of the reading, its difficulty, and the total information that needs to be covered. Therefore, do not assume that materials in the readings will be covered in class. Sometimes they will, sometimes not.

Daily Questions/Insights

For each of the assigned readings indicated in the "Lecture Topics..." above, prepare at least one question or comment. These daily questions or comments should be 3-5 sentences in length, and should be posted on the Moodle by **noon the day before each class** when daily questions are due, so we can address them in lecture the following day. Note that the questions can only be read by the course instructors, and there are no questions due the days we have guest speakers. Questions will be scored 1=poor (your question required very little reflection on the reading); 2=good (it's evident that you read the paper, but you only put a moderate amount of thought into the question); 3=excellent (it's clear that you read the paper carefully and put a lot of effort into reflecting on the reading and formulating a question).

The objectives of these required "daily questions" are:

- to provide practice at critical thinking
- to give us constant feedback on your level of understanding
- to help move classroom focus to issues you find interesting and important
- to increase the likelihood that required reading will be completed in a timely fashion

What types of questions make good questions for discussion?

A question should indicate some depth of thought. A question could be something you don't understand (e.g., "under cap-and-trade policies how are greenhouse gas emissions measured and how are caps enforced?"), or that seems to contradict something else we've heard (e.g., "how can we reconcile these results with those of Sarah Smith who found opposite results in Borneo?") or something that was not clarified by the paper in question. Comments could for instance, indicate what you think is a novel approach by the author; highlight an important, but underemphasized point; make a linkage with another paper we read previously, etc. Or perhaps you might disagree with the data, methods, interpretation of data, interpretation of results, conclusions, speculation, or extrapolation.

CLASS PARTICIPATION

Required Reading

This course brings together diverse instructor and student perspectives, representing wide-ranging knowledge, expertise, and insight. In addition, the topics we cover in the course are extremely current, and it is impossible for any one person to stay abreast of recent developments for all of the topics that we cover. Therefore, for all of us to learn as much as we can in the course, it is important that everyone participate in class fully, by asking questions, sharing their knowledge and expertise, and being actively engaged in the class discussions. Active engagement means both speaking up, and making substantive contributions—drawing from the course readings, outside lectures, and relevant experience – we’re interested in quality more than in quantity of contributions. **If you need to miss a class, please notify one of the instructors before class. Attendance is required.**

In addition, we will be posting on the class Facebook Page: Energy and Environmental Policy <http://www.facebook.com/EnergyandEnvironmentalPolicy>. Your participation, by posting energy and environment related content and commenting on other posts, counts towards your class participation grade.

Your participation will be scored 1=poor; 2=good; 3=excellent, where "poor" means that you attend class semi-regularly but do not ask questions or participate in discussions or post to Facebook; "good" means you attend class regularly, ask questions and participate in discussion and post to Facebook a few times over the course of the semester; and "excellent" means you attend class regularly and ask questions and bring an informed perspective to class discussion frequently and post to Facebook weekly.

POLICIES

Late Assignments All assignments are due at the beginning of class on the due date. If you have extenuating circumstances that prevent you from turning an assignment in on time, you must make arrangements with the instructor **ahead of time**. Students who turn in assignments after the due date will have their grades reduced by one grade for each late day after the due date. Further, students who don’t hand in drafts on time will forgo the chance to participate in peer response workshops and will lose that portion of their participation grade.

Academic Dishonesty and Plagiarism The University of Minnesota’s Student Conduct Code classifies scholastic dishonesty as a disciplinary offense actionable by the University. Scholastic dishonesty is defined as “Submission of false records of academic achievement; cheating on assignments or examinations; plagiarizing; altering, forging, or misusing a University academic record; taking, acquiring, or using test materials without faculty permission; acting alone or in cooperation with another to falsify records or to obtain dishonestly grades, honors, awards, or professional endorsement.” Plagiarism is deliberately handing in another person's work as your own. It may be something you pulled off the internet, the work of a classmate, or that of another scientist whose work you read while researching a topic. It may be overt, in the form of copying answers from a colleagues' test, or it may be subtle, in the form of quoting or paraphrasing information from another source without properly acknowledging that source. If you want to use *the exact wording* from a published work, because you think it effectively

makes a point, you must put the passage in quotation marks and cite the reference. More often, you will want to paraphrase another's ideas. Paraphrasing consists of expressing what an author is saying in your own words. In this case you should include reference to the author you paraphrase to indicate that the ideas are someone else's and not yours. If you are not clear about the differences between scholarly citation, collaboration and paraphrasing, please consult either instructor or see the resources available at <http://writing.umn.edu/tww/plagiarism/index.htm>. Evidence of academic dishonesty in any form will be forwarded to the Student Scholastic Conduct Committee. According to University policy, academic dishonesty in any portion of academic work shall be grounds for awarding a grade of F for the entire course. We will use TurnItIn to check for plagiarism of first and final drafts.

Grading Grades will be assigned as follows based on the total number of points possible, weighted as shown above: 90-100 A, 80-89 B, 70-79 C, 60-69 D, 0-59 F. We may lower grading criteria at the end of the semester if assignments or exams are more difficult than we intended in order to achieve the University Grading Standards, outlined as follows: **A** - achievement that is outstanding relative to the level necessary to meet course requirements. **B** - achievement that is significantly above the level necessary to meet course requirements. **C** - achievement that meets the course requirements in every respect. **D** - achievement that is worthy of credit even though it fails to meet fully the course requirements. **S** - achievement that is satisfactory, which is equivalent to a C- or better (achievement required for an S is at the discretion of the instructor but may be no lower than a C-). **F** (or **N**) - Represents failure (or no credit) and signifies that the work was either (1) completed but at a level of achievement that is not worthy of credit or (2) was not completed and there was no agreement between the instructor and the student that the student would be awarded an I. **I** (Incomplete) - Assigned at the discretion of the instructor when, due to extraordinary circumstances, e.g., hospitalization, a student is prevented from completing the work of the course on time. Requires a written agreement between instructor and student.

Credits and Workload Expectations One credit is defined as equivalent to an average of three hours of learning effort per week (over a full semester) necessary for an average student to achieve an average grade in the course. For example, a student taking a three credit course that meets for three hours a week should expect to spend an additional six hours a week on coursework outside the classroom.

Students with Disabilities *The University of Minnesota is committed to providing equitable access to learning opportunities for all students. Disability Services (DS) is the campus office that collaborates with students who have disabilities to provide and/or arrange reasonable accommodations. If you have, or think you may have, a disability (e.g., mental health, attentional, learning, chronic health, sensory, or physical), please contact DS at 612-626-1333 to arrange a confidential discussion regarding equitable access and reasonable accommodations. If you are registered with DS and have a current letter requesting reasonable accommodations, we encourage you to contact one of us early in the semester to review how the accommodations will be applied in the course.*

Students with Mental Health Issues *As a student you may experience a range of issues that can cause barriers to learning, such as strained relationships, increased anxiety, alcohol/drug problems, feeling down, difficulty concentrating, and/or lack of motivation. These mental health concerns or stressful events may lead to diminished academic performance or reduce your ability to participate in daily activities. University of Minnesota services are available to assist you with addressing these and other concerns you may be experiencing. You can learn more about the broad range of confidential mental health services available on campus via www.mentalhealth.umn.edu.*