POSC333: Sustainability Science

**Syllabus**

Mondays and Wednesdays 1:15p.m – 3:00p.m  
April 2 – June 4, 2013  
Laird 212

The Department of Political Science  
Carleton College, Northfield, MN

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**Preface**

“Just providing knowledge, even if communicated well, without offering spaces to discuss the implications, will no longer suffice. If sustainability were something we could achieve by holding hands and singing “kumbaya” despite all our differences, we’d already be there!”  

“The big question in the end is not whether science can help. Plainly it could. Rather, it is whether scientific evidence can successfully overcome social, economic and political resistance.”  
Donald Kennedy, *Science Magazine’s State of the Planet 2006-2007*

The continual existence and betterment of humankind depends on the ability and intellect of human beings to make educated choices (rightly understood) in living with nature and to govern themselves. At the center of this challenge for human beings in the age of Anthropocene is the need for systematic and scientific understanding of how the dynamic relationship between societal changes and environmental changes influence change, adaptation, and evolution of coupled human-environment systems. This seminar will introduce students to theories, concepts, analytical frameworks, and research designs that will help us advance in understanding the dynamic relationship between societal changes and environmental changes. In so doing, we will study empirical cases and experimental results of real world sustainability problems.

As the two quotes above indicate, understanding dynamics of human-environment interactions is only half way to achieving sustainability of social ecological systems. The additional and more intriguing challenge is in analyzing, explaining, and understanding the circumstances under which these scientific understandings are translated into public policy and governance of human
interactions. Therefore, achieving sustainability of human societies is a dual challenge. This course is conceived within the dual challenge of the need to understand how societal dynamics and environmental dynamics interact over time and how they help induce or inhibit sustainability of social ecological systems. For the lack of a better term, scholars who engage in the field of analyzing and explaining these challenges generally call their intellectual endeavor “Sustainability Science.”

How do social changes and ecological changes interact? How do livelihood systems of individuals and groups interact with social changes and ecological changes? What are the roles of human institutions and human values in dynamic relationship between social changes and ecological changes? Why is “science” in traditional sense of it insufficient to address sustainability problems? What does “science” mean in sustainability science? How does emergence occur and how does it shape complexity of human-environment relationship? What are existing theories and methods that address sustainability science? How would you improve these theories and methods? How can these theories and concepts guide environmental policy and governance? These questions form a source of intellectual motivation for this seminar.

There are three learning goals in this seminar. First, students will learn key trends of literature that addresses the challenge of the field amplifying the pivotal role of social dimensions in sustainability science. Second, students will gain knowledge of key concepts and theories in sustainability science that are developed and improved by scholars from multiple academic disciplines. Third, students will gain practical experience and skills of linking theories to practices of sustainability challenges by conducting team projects.

In order to achieve these goals, we will actively read and engage our class discussions on the literature on sustainability science from multiple academic disciplines; study cases that illustrate the dual challenge of understanding and developing theories in the field of sustainability science; and conduct team projects that will allow students to analyze, challenge, and develop theories and research methods by linking theories to practices. The seminar is organized with the following outline.

Course Outline

Week One: Ontological Foundations
Week Two: Epistemic Foundations
Week Three: A New Kind of Science
Week Four: Dynamics and Diversity of Ecosystems
Week Five: Dynamics and Diversity of Human Institutions
Week Six: Understanding Social Ecological Transformations
Week Seven: Collapses and Survival of Social Ecological Systems
Week Eight: Vulnerability, Adaptation, and Resilience
Week Nine: Crossing Boundaries and Building Bridges
Week Ten: Sustainability Science (or) Social Ecological Sciences
**Required Texts:**


In addition to reading chapters from these texts, we will also read articles from peer-reviewed academic journals and also watch documentaries and videos illustrating the concepts we struggle to understand in this course. In addition to readings listed in this syllabus, I have placed additional relevant readings on E-Reserve at the Gould Library. Feel free to browse and read as relevant. Team project related readings will be provided for the teams separately once teams are established.

**Expectations, Assignments, and Grading Procedures**

The following four components of assignments will be used to evaluate your performance in this seminar. Percentage worth of each assignment is in parentheses. The details of each assignment are below.

1. **Active Reading and Class Participation (20%)**: Reading assigned materials is crucial for understanding class discussion and cases we will unpack in this seminar. Readings are assigned to facilitate and complement the class discussion and interactive lectures. In this sense, readings are not substitutable for class discussion and interactive lectures. For each week, active reading questions will be provided which will serve as a guide to active reading. Active reading demands not only your understanding of the language of the texts but also your critical ‘conversation’ with the author on subject matter. I will send out two sets of active reading questions (ARQs) on Fridays for the following Tuesday and Thursday readings. You have to respond to two sets of ARQs out of all ARQs for the term. If you respond to three sets of ARQs responsibly, you earn 5% of class grade. And your responses should be sent to class listserv: posc333-00-s13@lists.carleton.edu. To be a good standing citizen of this seminar, you are required to: (1) have good attendance; (2) read assigned materials before the class; (3) have timely notification and communication with me when you have to be absent or if you need to request extension for personal reasons; and (4) exercise self-respect and responsibility of a student for
success of the learning mission of this seminar and Carleton College as a whole; and (5) exercise your intellectual freedom in discussions and the assignments.

2. **Discussion Leaders (10%)**: A group of two students will self-assign to lead class discussion for each class. A student must lead two classes, preferably one before mid-term and one after mid-term. Leaders are responsible to prepare leading discussion sheet composed of prompts and questions directly related to assigned readings for the day. You are highly recommended to bring visual materials such as video clips or news articles that relate directly to your discussion questions for the readings. A model of discussion sheet will be provided in class during the first week. Students will sign up for two dates on April 4 when I will have signup sheet.

3. **Critical Review of a Documentary Video (10%)**: This assignment requires students to review a documentary movie out of three movies assigned for the seminar. This essay is to critically reflect on complexity of social ecological systems illustrated in the documentary after identifying key theme(s) of the documentary. Students will pick one of three movies we watch for the seminar and write a critical and reflective essay on human-environment interactions. In so doing, you are encouraged to draw upon concrete examples or cases that shed light on the identified theme(s) you gained from the documentary. The essay should be no written between 1500 and 2000 words. Students will sign up for the documentary video they plan to review and the review essay is due within seventh day after the designated viewing day in this syllabus.

4. **An Essay on Your Social Ecological System: (20%)**: Each student will recollect items brought to Carleton College in their freshman year and put in a log sheet. Students then will select three items that were deemed necessary (frequently used). After selection of these three items, student will draw a livelihood map of a freshman student life at Carleton College during their respective freshmen years. Key activities that were directly related to the three items must be described, discussed, and analyzed to write about the relationships between an individual livelihood system and the nature. Along with study of their own livelihood systems, students will interview a parent, a relative, a teacher, or a person who went to a college at least 20 years ago and find out what items they brought to their respective college freshman years and what they did with them. If you have parents who did not go to college, ask your uncles or aunts. If none of your relatives went to college in the United States, then conduct an interview with one of your professors, staff members at Carleton or a resident in Northfield. This paper requires a light research yet in-depth investigation of your own livelihood systems and that of one other individual. This paper should be no longer than 3500 words excluding diagram, tables, and references. More detailed guidelines will be provided in a separate handout on April 4. This analysis is due on **May 3 at 5:pm**.
5. **Group Project and Presentation (40%)**: A team of four students will select a project out of five projects outlined here. The **first** project asks: how many trees does the Eastside Neighborhood in Northfield, MN need to sequester all carbon dioxide emitted by human activities of the residents. In answering this question, students will investigate physical science of carbon sequestration, the validity of the question in regard to the purpose of the answer, and legal and policy science aspects of urban trees, city codes, state laws, and federal laws that govern the answer to this question. The **second** project asks: What are the political and economic consequences of the United States’ energy independent status? What does the goal of energy independence require the United States to do? What are the domestic sources of energy? On March 22, 2012, *New York Times* reported that the United States is inching toward goal of energy independence. Students will examine data on consumption of imported energy and its contribution to greenhouse gas emission and economic benefits for related industries. The project requires students to examine political, economic, and scientific dimension of energy independent status for the United States. The **third** project is about the removal of Ames Mills Dam in downtown Northfield, MN. Students will investigate social and ecological consequences of removing AMD. In so doing, students will identify key issues, interests, and actors that are at the center of the removal issue. For the **fourth** project, student will conduct political, economic, and ecological dimensions of Nissan Leaf and Toyota Prius cars. How would electric and hybrid cars influence global climate change regime? How can we understand the influence of these cars in daily life of citizens’ environmental decision and action? The **fifth** project will investigate Carleton College’s carbon emission data and key areas of Carleton’s livelihoods that have largest impact on climate change issue. Final report should be 25 to 30 pages excluding maps, pictures, tables, figures, diagrams, and references. More details about these four projects and project guidelines will be provided on Wednesday April 10 in a separate handout.

**IMPORTANT NOTE:** All assignments should be written with 12 point Times New Roman font on double-spaced pages with page numbers inserted on 1 inch page margin of A4 size. It is highly encouraged that students use the Write Place or available writing services on campus to achieve high quality product. Electronic copy is acceptable in pdf or rtf format or other read only format. You do not need to submit a printed copy when you send me electronic copy. However, final group paper has to be submitted both electronically and printed copy.

**Schedule of Assignments and Due Dates**

- 4/4 - Sign up due dates for quantitative and critical review and documentary review
- 5/3 - Social Ecological System essay due

**MIDTERM BREAK 5/3 – 5/6**
5/15  - First draft of team paper is due
5/26  - The final draft of team paper is due
5/28  - Group presentation
5/30  - Group presentation …
6/4   - Group presentation & Conclusion of the seminar
6/10  - Final group paper is due

Course Conduct

a. Attendance: Attendance is required for this course. If you need to be absent from the class, it is your responsibility to notify me in advance. When you are absent, it is in your benefit to borrow notes from your classmate or ask your classmates to learn what you missed. If you wish, I will be available during office hours or by appointment at your request to meet with you and go over what you missed while you were absent.

b. Plagiarism: There is zero tolerance for plagiarism. A summary of the College’s policy on plagiarism states: “At Carleton College, an act of academic dishonesty is therefore regarded as conflicting with the work and purpose of the entire College and not merely as a private matter between the student and an instructor; all cases involving such dishonesty are referred for appropriate action to the Academic Standing Committee (ASC) via the Associate Dean of Students or the Associate Dean of the College.” For more information on Carleton’s policy on academic honesty, please consult http://apps.carleton.edu/campus/dos/handbook/academic_regs/?policy_id=21359

c. Late assignments: Assignments are due on the dates specified in this syllabus or in the assignment sheet. Late work will receive half point reduction per late day. If you are unable to complete an assignment on time due to illness or personal emergency, you can request an extension with the supporting documents such as a medical note from a doctor or the Wellness Center.

d. Special needs: If you require special accommodation due to a documented physical or medically classified different learning strategy, please come see me during the first week of class or any time throughout the semester to discuss how I might best assist you in meeting the objectives and requirements of this course.

NOTE: This is a provisional syllabus and subject to change.

Schedule of the Course and Readings

WEEK ONE: ONTOLOGICAL FOUNDATIONS
April 2: Introduction to the Seminar

Essential readings:

This syllabus. Overview and the roadmap of seminar.

April 4: Nature of Life

Essential readings:

  Chapter 1: The Nature of Life, p. 3-32.
  Chapter 3: Social Reality, p. 70 - 96.


WEEK TWO: EPISTEMIC FOUNDATION

April 9: Science and Sustainable Societies

Essential readings:

  Chapter 4: Life and Leadership in Organizations, p. 97 -128.
  Chapter 5: The Networks of Global Capitalism, p. 129 - 157
  Chapter 6: Biotechnology at a Turning Point, p. 158 - 185.


April 8 – Movie screening – Life after People

April 11: Concepts, Theories, and Paradigms of Sustainability
Essential readings:


**WEEK THREE: SOCIAL ECOLOGICAL COMPLEXITY**

April 16: **Social Control of Nature and People**

James C. Scott, “Domestication of Fire, Plants, Animals and Us”


Introduction
Chapter 1: Nature and Space
Chapter 8: Taming Nature
Chapter 9: Thin Simplification and Practical Knowledge

April 17: Documentary screening – Queen of Tree

April 18: **Fundamental Questions**

Essential readings:


**WEEK FOUR: DYNAMICS AND DIVERSITY OF ECOSYSTEMS**

**April 23: A Mystery or Complexity**

*Essential readings:*

  - Chapter 5: Ecological Assembly, p. 81 – 115.
  - Chapter 6: The Evolution of Biodiversity, p. 117 – 156.

**April 24: Documentary screening – Mystery in Alaska**

**April 25: Ecosystem Rules as Sources of Dynamics and Complexity**

*Essential readings:*


  - Chapter 1: In Quest of a Theory of Adaptive Change, p. 3 – 21.
  - Chapter 5: “Back to the Future: Ecosystem Dynamics and Local Knowledge” by Fikret Berkes and Carl Folke, p. 121-146.

The case of Thai villagers’ research.

**WEEK FIVE: DYNAMICS AND DIVERSITY OF HUMAN INSTITUTIONS**

**April 30: Foraging Experiment in the Lab at CMC**

*Essential readings:*

May 2: Understanding Evolution of Human-crafted Rules

Essential readings:


   Chapter 1: Understanding the Diversity of Structured Human Interactions, p. 3-31.
   Chapter 4: Animating Institutional Analysis, p. 99-133.

MIDTERM BREAK APRIL 28-30

WEEK SIX: ECOLOGY, ECONOMICS AND INSTITUTIONAL CHANGES

May 7: The Role of Human Values and Knowledge Systems

Essential readings:

   Chapter 1: Professional Challenge, p. 1-16.


May 9: Economic Values of Ecology and Institutions

Essential readings:
Chapter 4: Values in Use and in Exchange or What Does Willingness to Pay Measure?

WEEK SEVEN: COLLAPSES AND SURVIVAL OF SOCIAL ECOLOGICAL SYSTEMS

May 14: Why some social ecological systems collapse and some don’t

*Essential readings:*


May 16: Empirical Evidences

*Essential readings:*


*of Sciences* 100(14) (July 8): 8074-8079.
WEEK EIGHT: ADAPTATION, VULNERABILITY, AND RESILIENCE

May 21: Adaptation and Resilience

Essential readings:


May 23: Vulnerability and Shocks

Essential readings:


Chapter 1: Living in a Complex World
Chapter 3: Crossing the Threshold
Chapter 4: In the Loop: Phases, Cycles, and Scales

WEEK NINE: CROSSING BOUNDARIES AND BUILDING BRIDGES

May 20: Mini-Conference

May 30: Mini-Conference

WEEK TEN:

June 4: Mini-conference
Appendix A

Guideline for Review of Documentary Videos

Assignment

Student will select one documentary video out of three shown for the class discussion. Each of these videos deals with quantitative and qualitative arguments dimensions of complexity of social ecological systems. These arguments are weaved into motion pictures and narratives. The central task for students is to identify key theme of documentary in defining complexity of social ecological system. How does the documentary unpack the complexity of human society and ecological systems in the case of Mystery in Alaska? How does the documentary portray the relationship between social change and ecological changes in the case of Life after People? How does the documentary define ecosystem dynamics and complexity in the case of Queen of the Tree? You will review both qualitative and quantitative arguments made by producers using images and narratives.

Goals

As you will see in each documentary, the concept of complexity and dynamics are defined in each movie. In addition, the notion of livelihood system of both human and non-human systems plays a central thread in weaving the complexity. In so doing, the producers uses images and narrative qualitatively and quantitatively.

1. to introduce students to quantitative critical thinking.
2. to learn how to present powerful narratives with quantitative evidences and images.
3. to prepare for the main assignment of this course (term paper) which requires critical understanding of quantitative data from multiple dimensions and applying quantitative evidences and critical thinking in writing persuasive narratives.

Evaluation of Your Assignment

Your movie review will be evaluated by: (1) your identification and analysis of key quantitative and qualitative arguments made by producers using motion pictures and human expressions in words, gestures, and actions; (2) your identification and analysis of the central theme of the film and your analysis of how the key qualitative and quantitative arguments identified in step 1 frame the central theme of the documentary; (3) organization of review essay; (4) control of language and errors; (5) application of concepts and theories from assigned reading in analyzing the themes of the movie; and (7) your critical thinking. It should be written between 1500 words and 2000 words which is roughly between 4 and 6 double-spaced pages with Time News Roman 12-point font. If you need more pages, please do so as long as your essay justifies it but no more than 7 pages in total.

Due Date

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To be self-assigned but the due time and date has to be no later than at 5:00p.m. on the 7\textsuperscript{th} day after the movie is shown at the LIBE 344 as scheduled in the Syllabus.

**Grading Rubric for Movie Review Essay**

The following is my guideline for your movie review.

<table>
<thead>
<tr>
<th>Category</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Main theme of documentary</td>
<td>Have you identified the theme(s) of the documentary? What are they?</td>
</tr>
<tr>
<td>Clarity and organization</td>
<td>Do you have organization along the themes? How do you organize your ideas to support your themes?</td>
</tr>
<tr>
<td>Appropriate language and control of errors</td>
<td>Do you have a good control of language, voice, errors?</td>
</tr>
<tr>
<td>Application of the concepts from readings and class discussions</td>
<td>How do you apply the concepts from readings in reviewing the documentary? Do you demonstrate your understand of readings that are directly relevant to the themes of the documentary?</td>
</tr>
<tr>
<td>Quantitative and Qualitative Review of the central Argument(s) of the movie</td>
<td>How do producers of the documentary make both qualitative and quantitative arguments using images and narrative? Are they effective?</td>
</tr>
<tr>
<td>Critical thinking and evaluation</td>
<td>What do you learn from the documentary? What are questions raised by the documentary with regard to the themes you identified?</td>
</tr>
<tr>
<td>Proper citations</td>
<td>Citations are fine.</td>
</tr>
<tr>
<td>TOTAL Points</td>
<td></td>
</tr>
</tbody>
</table>