

Seminar: Human-Environment
GEO873, 3 Credits, Spring 2016
Department of Geography, Michigan State University

Instructors:

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Course web page: <http://lees.geo.msu.edu/courses/geo873.html>

We will distribute the course syllabus, schedule, presentation files, readings, assignments, evaluation policies, and grades through email listserv.

Lecture: Tu, 1:30-4:30 pm; 218A, Berkey Hall

Office hours: by appointment only

Description:

This seminar will provide a forum to examine the broad range of approaches being used by scientists to address human-environment, coupled systems, and the integration of social and natural sciences in environmental research. We will look at expert panel assessments of what urgent questions are driving research at this time (and how this has changed over time), and how a range of teams are approaching the challenge of coupling the natural and human systems to address issues such as global change, climate change, food security, land use/cover, and sustainability.

Required readings:

Readings will be provided on the class web pages as well as <https://d2l.msu.edu/>

Assignments and Grading:

Throughout the semester we will ask for 12 short reflection papers (Week 2-13) on two pages (double spaced) where you can discuss readings, lectures, and visiting lecturer's approaches to coupling the human-natural system. Engagement in class discussions is expected. A final research paper, on the student's presumed research focus, should discuss the choices of theory/method on coupled systems and pick an approach that best suits the research question(s) that you focus on.

The final paper will be valued at 30%, class presentation at 10%, short papers at 48% (4% per paper), and class participation at 12%.

Instructions for the short/final papers:

1. Weekly Discussions: Students will participate in class discussion sessions during the semester. Each student will **lead one discussion period**. The faculty member will attend the discussion. Students should come prepared to each class to discuss the assigned readings during class, bring up at least one question that addresses a main idea presented in the readings, including its strengths and shortcomings. The weekly reflection paper should be no more than 2 pages (singled spaced) and will be due before the class begins at 1:30 pm. Beginning with the class meeting on Jan. 19 (i.e., Week 2), and at the end of the two page discussion, you are expected to include **at least two questions** to stimulate the discussion. Be ready to bring them up during discussion. *Late assignments will not be graded and will receive a zero. Each of these weekly essays will count for 4% of final grade, and in total will account for 48% of the grade, so take time to make them thoughtful.*

2. Final Term Paper: Each student will choose a topic for a term paper by discussing potential ideas with the instructors. Students will conduct a literature search of major scientific journals (*e.g., Ecology and Society, PNAS, BioScience, Environmental Research Letters, etc.*) to find at least five relevant papers as sources of information and as references for the term paper. Papers are to be formatted according to the guidelines for authors for “*Ecology and Society*” submissions (<http://www.ecologyandsociety.org/about/submissions.php>) and are limited to 10 pages (double-spaced, excluding references, tables, and figures). The deadlines for successful term papers include: formulating a title/topic choice by Jan. 26 and having an outline with bibliographic sources identified by Feb. 15 (optional). The final papers are due at **5:00 pm on April 29, 2016**.

About the Instructors:

Jiquan Chen is Professor of Geography and Director of the LEES Lab. His current research lies in the coupled effects of global climate change and human activities on ecosystems, global change ecology, bioenergy, and carbon/water fluxes.

Jianguo Qi is Professor of Geography and Director of the Center for Global Change and Earth Observations (CGCEO). His research focuses on several technical areas critical to global change science, including remote sensing and geospatial technologies, environmental monitoring, assessment and modeling, land use and land cover change dynamics, and decision support systems for sustainable development strategies.

Emilio Moran is John A. Hannah Distinguished Professor in the Geography Department and in CGCEO. His research is focused largely on Brazil and the Amazon Basin; and on human-environment interactions and land use and land cover change.

Attendance:

There is no university-wide regulation requiring class attendance. However, attendance is an essential and intrinsic element of the educational process. In any course in which attendance is necessary to the achievement of a clearly defined set of course objectives, it may be a valid consideration in determining the student's grade. It is the responsibility of the instructor to define the policy for attendance at the beginning of the course. Students may be dropped from a course for non-attendance by a departmental administrative drop after the fourth class period, or the fifth class day of the term of instruction, whichever occurs first.

Academic Honesty:

Students are expected to adhere to principles of academic honesty in all aspects of this course. We follow Michigan State University policies on academic integrity (<https://www.msu.edu/unit/ombud/academic-integrity/student-faq.html>). Plagiarism, the use of published material without correct attribution, is not allowed, and will result in a zero in that assignment. A repeat will result in an F for the course.

Schedule

Date	Topic
Jan 12	1) Class introduction (Chen and Moran) 2) Human dimension in ecological studies (Chen, PPT) 3) Environmental social science (Moran)
Jan 19	The history of human dimensions of global change research (Moran)
Jan 26	Integrative Science (Moran)
Feb 2	Future Earth: History and Priorities (Qi)
Feb 9	CHANS and Telecoupling approaches (Moran), guest lecture by Jack Liu
Feb 15	Approaches from Ecology (Chen)
Feb 23	Food Security and Land Use Change (Moran)
Mar 1	Nature-Based Solutions (Chen); guest lectures by Raffaele Lafortezz and Catherine Lindell
Mar 15	WEF Nexus – Concept and frameworks (Qi)
Mar 22	WEF Nexus - From water perspective (Qi)
Mar 29	WEF Nexus – From food & livelihood perspectives (Qi)
Apr 5	CNH systems across the globe: from Mongolia to Central Asia (Chen)
Apr 12	Urban CHN Systems (Chen); guest lecture by Peilei Fan
Apr 19	Student paper presentations (Moran)
Apr 26	Student Paper Presentations (Chen/Qi)
Apr 29	Term paper due at 5:00 pm

Detailed Schedule

Jan. 12. An Introduction to Human-Environment Research (Chen and Moran)

- Discussion of the syllabus, and course expectations, introductions of students and instructors, and plans for the semester.
- Introduction of priorities in human-environment research and the challenge of linking the natural and the social sciences

Jan. 19. The History of Human Dimensions of Global Change Research (Moran)

- Discussion of the origins of global change research in the natural sciences, the rise of human dimensions research, linking natural and social dimensions, and its evolution from 1988 to the present.

Readings:

- Bonan. 2008. Forests and climate change: Forcings, feedbacks, and the climate benefits of forests. *Science* 320: 1444.
- Carpenter et al. 2009. Science for managing ecosystem services: beyond the millennium ecosystem assessment. *PNAS* 106:1305-1312.
- Chapin et al. 2014. Ecosystem Stewardship: sustainability strategies for a rapidly changing planet.
- Future Earth, Strategic Research Agenda: priorities for a global sustainability research strategy
- Moran. 2010. Environmental Social Science: Human Environment Interactions and Sustainability. Malden, MA: Wiley-Blackwell. **Chapter 1.**
- Moran and Lopez. 2016. Future directions in human-environment research. *Environmental Research* 144:1-7.

Jan. 26. Integrative Science: Approaches (Moran)

- Discussion of current priorities, as defined by expert panels and recent calls for proposals by NSF and other agencies that fund research.

Readings:

- Liu et al. 2007 Complexity of coupled human and natural systems. *Science* 317: 1513-1516.
- Liu et al. 2015 Systems Integration for Global Sustainability. *Science* 347: 963.
- Ostrom 2009. General framework for analyzing sustainability of socio-ecological systems. *Science* 325: 419.
- Alessa et al. 2015. Best practices for integrating social sciences into social ecological systems science: Future directions for building a more resilient America.

Feb. 2. Future Earth: History and Priorities (Qi)

- Discussions will be around the following questions: 1) What are the motivations to create FE initiative? 2) What are the innovations and challenges of FE initiative? 3) What aspects of the FE research priorities or challenges are most appealing to you and why? 4) How do the sustainable developments of the FE help meet the MDGs?

Readings:

- Future Earth Initial Design (pg. 1-52)
- Strategic Research Agenda 2014: Priorities for a global sustainability research strategy

- Future Earth 2025 Vision
- The Millennium Development Goals Report 2015 (focus on Goals 1 & 7)

Feb. 9. CHANS and Telecoupling Approaches (Moran)

- Discussion of coupled human natural systems and telecoupling approaches to human-environment research
- Jack Liu visiting speaker for half the class to discuss telecoupling and CHANS

Readings:

- Liu et al. 2015. Systems integration for global sustainability. *Science* 347: 963.
- Moran 2010. Environmental Social Science: Human Environment Interactions and Sustainability. Malden, MA: Wiley-Blackwell. **Chapter 2 & 3.**

Feb. 16. Concepts from Ecology (Chen)

- The foundation of ecosystem ecology
- Case examples for the needs of including human influences

Readings:

- Chen et al. 2015. Policy shifts influence the functional changes of the CNH systems on the Mongolian Plateau. *Environmental Research Letters* [10: 085003. DOI: 10.1088/1748-9326/10/8/085003](https://doi.org/10.1088/1748-9326/10/8/085003)
- Chen and Liu. 2014. Coupled natural and human systems: a landscape ecology perspective. *Landscape Ecology* 29: 1641-1644.
- Franklin et al. 2014. Interactions between societal goals and restoration of dry forest landscapes in western North America. *Landscape Ecology* 29:1645-1655.
- Pongratz et al. 2011. Coupled climate-carbon simulations indicate minor global effects of wars and epidemics on atmospheric CO₂ between AD 800 and 1850. *Holocene* 21: 843-851.

Feb. 23. Food Security and Land Use Change (Moran)

- Discussion of the challenge of food security in a global system as it copes with climate change.

Readings:

- Brown et al. 2014. Experiments in globalization, Food Security and Land Use Decision Making, PLOSone
- Fraser. 2006. Food system vulnerability: using past famines to help understand how food systems may adapt to climate change. *Ecological Complexity* 3(4):328-335.
- Misselhorn. 2005. What drives food insecurity in southern Africa? a meta-analysis of household economy studies. *Global Environmental Change* 15(1): 33-43.
- Schmidhuber and Tubiello. 2007. Global food security under climate change, *PNAS* 104 (50): 19703-19708.

Mar. 1. Nature-Based Solutions (Chen)

- Discussion of the concept and applications of NBS, with a focus on European landscapes
- Raffaele Laforteza and Catherine Lindell, visiting lectures on European and MI perspectives

Readings:

- Laforzezza et al. 2015. Prioritizing people when mitigating wildfire risks. *Ecological Indicators* 48: 342-347.
- Lazos et al. Stakeholders and tropical reforestation: challenges, trade-offs, and strategies in dynamic environments. In review. *Biotropica*.
- Kross et al. 2012. Effects on introducing threatened falcons into vineyards on abundance of Passeriformes and bird damage to grapes. *Conservation Biology* 26(1) 142-149.
- Sutherland et al. Solution scanning as a key policy tool: identifying management interventions to help maintain and enhance regulating ecosystem services. *Ecology and Society* 19(2): 3. <http://dx.doi.org/10.5751/ES-06082-190203>.

Mar. 15 FE and WEF Nexus (1) – Concept and Frameworks (Qi)

- Discussion will focus on: 1) WEF Nexus frameworks and their key elements and priorities; 2) Historical trend, current state and future trajectories of WEF, from as observed from space and on the ground to understand the issues and their complexities.
- Short paper: Design or adopt a WEF Nexus framework, and identify 1-2 pathways that connect WEF and elaborate ways to examine or quantify the linkages, including the use of observational, empirical or modeling methods or tools.

Readings:

- The Water-Energy-Food Nexus - A new approach in support of food security and sustainable agriculture
- The Water-Energy-Food Nexus at FAO - Concept Note
- Bizikova et al. 2013, The Water–Energy–Food Security Nexus: Towards a practical planning and decision-support framework for landscape investment and risk management
<http://www.wefnexus.org/news.php>; <http://www.water-energy-food.org>

Mar. 22 FE and WEF Nexus (2) – From Water Perspective (Qi)

- Discussion will focus on: 1) Water uses and trade-offs with other ecosystem services including food and hydropower dams as well as residential uses. 2) Water across boundaries
- Short paper: Building upon previous paper, add 1-2 trade-offs between water uses and detail methods, data or tools to assess them.

Readings:

- Water security: the water-food-energy-climate nexus
- Proceedings of the TAMUS/Future Earth Water-Energy-Food Nexus Workshop - Research gaps in the integrated observations and improved governance for the W-E-F Nexus.
http://www.water-energy-food.org/en/news/view_2691/reconciling-resource-uses-in-transboundary-basins-assessment-of-the-water-food-energy-ecosystems-nexus.html

Mar. 29. FE and WEF Nexus (3) – From Food & Livelihood Perspectives (Qi)

- Discussion will focus on 1) Food systems, production, processing, consumption; 2) Livelihoods; 3) Big picture of social systems in WEF Nexus from consumption perspectives.
- Short Paper: Building upon previous two reports, add food systems, linking production, processing and consumption patterns as nexus to water resources, climate variability, and energy. Develop a synthesis of the nexus and linkages among WEF, including challenges,

gaps, and recommendations. You are encouraged to develop these homeworks into a review paper.

Readings:

- Biggs et al. 2015. Sustainable development and the water–energy–food nexus: A perspective on livelihoods. *Environmental Science & Policy* 54: 389–397.
- Godfray et al. 2015. Food Security: The challenge of feeding 9 billion People. *Science* 327:812-818.

Apr. 5. CHANS across the Globe (Chen)

- Discussion of the CNH studies in several regions
- Case studies on livestock, water crises in Mexico, and elsewhere

Readings:

- Asbjornsen et al. 2015. Assessing impacts of payments for watershed services on sustainability in coupled human and natural systems. *BioScience* 65(6): 579-591.
- Alberti et al. 2011. Research on coupled human and natural systems (CHANS): Approach, challenges, and strategies. *Bulletin of the Ecological Society of America* 92: 218–228.
- Chen et al. 2015. Divergences of two coupled human and natural systems on the Mongolian Plateau. *BioScience* 65(6): 559-570.
- Qi et al. 2012. Understanding the coupled natural and human systems in the Dryland East Asia. *Environmental Research Letters* 7: 015202, doi:10.1088/1748-9326/7/1/015202.
- Stuard et al. 2015. The need for a coupled human and natural systems understanding of agricultural nitrogen loss. *BioScience* 65(6): 559-570. 571-578.

Apr. 12. Urban CHN Systems (Chen)

- Discussion of the urban systems on their land use dynamics and socioeconomics/policies
- Peilei Fan, visiting lecture on SENA urban systems

Readings:

- Fan et al. 2016. Urban landscape and environmental change during the economic transition on the Mongolian Plateau: Hohhot and Ulaanbaatar. *Environmental Research* 144: 96-112.
- Gadda and Gasparatos. 2009. Land use and cover change in Japan and Tokyo's appetite for meat. *Sustainability Science* 4(2): 165-177.
- Güneralp and Seto. 2013. Futures of global urban expansion: Uncertainties and implications for biodiversity conservation. *Environmental Research Letters* 8(1): 014025.
- Seto et al. 2012. Urban land teleconnections and sustainability. *PNAS* 109(20): 7687-7692.

Apr. 19. Student Presentations (Moran)

Apr. 26. Student Presentations (Chen/Qi)

Apr. 29 Term paper ***due at 5:00 pm, EST***