CLIMATE 530
Syllabus, Winter 2024

Class details
Instructor: Dr. Jeremy Bassis
Class Times: Tuesday 3:30-6PM
Physical class location: 2238 CSRB

About Jeremy
How to address me: Jeremy/Dr. Jeremy
Pronouns: He/Him/His
Email: jbassis@umich.edu
Office hours: (All times are Eastern)
Tuesday from 2:30-3:30
Online anytime, send me an email or drop by my office

Textbooks: None

Course Overview:
This course explores the intersections of climate change with society including policy, business, economics, public health, energy, ecosystems, environmental engineering, information science, journalism, religion. This course is interdisciplinary and multidisciplinary and will require that you learn not only about the physical climate system, but also how climate change shapes and reshapes our society. The climate science part of the class relies on scientific reasoning. This involves rigorous, but not mathematical reason. You will be introduced to methodologies of complex, multi-disciplinary, and multi-jurisdictional problem solving. These problems are always nuanced and frequently messy compared to the artificial problems you may have encountered previously. The course varies from year to year based on what is happening with climate change in the news and student interests. A key component of this course are the reading and discussions that we will have in class.

Project:
As part of this course we will engage in a team project. For this year we are going to try something new. It is an experiment and we will see how it works. The city of Detroit has convened a task force focused on reparations. The environmental subcommittee of the task force has requested a harms report that includes past, present and future damage associated with climate. As part of our project, we will work in teams to examine the relationship between infrastructure and climate on past, present and future climate vulnerability. This project is part of a broader education effort at the University of Michigan that looks at the effect of housing, policing, health on the citizens of Detroit. Students interested in participating in a deeper look at the intersection of these problems can register for a credit course HIST 590 (Course #40120) that will convene for

two hours once a month this semester and for a half day symposium in Detroit in April. During the final week of class teams will present the results of their semester long.

Learning objectives:

The focus of this course is on the synthesis of information in the context of applying knowledge to solving problems related to climate change. Students who successfully complete this course will ...

- Be able to *apply the fundamentals of scientific reasoning to problems related to climate science*. Solutions to climate change require a foundational understanding of key concepts and processes associated with climate change. Our treatment of climate science will not require a detailed mathematical exposition of key processes and concepts but will instead focus on applying reasoning to identify cause and effect, uncertainty, social-economic impacts, and other implications of climate change. A particular focus of this class is on identifying what we know, what we don't know and how this translates to decision making.
- Be able to *iteratively communicate with a wide variety of stakeholders* to understand, restate and frame stakeholder concerns, values and needs. Climate change touches on all aspects of society and a key component of successful adaptation and mitigation policies involves listening to and synthesizing information from a wide variety of sources to cogenerate knowledge. Although rarely emphasized in academia, listening is a key component of communication.
- Be able to *identify and apply historical precedents, social and economic theories, and ethics in the development of an informed and multi-faceted approach to the solution space associated with climate problems*. Climate science impacts all aspects of society with disparate impacts on vulnerable communities. Adaptation decisions also have unequal impact and this needs to be understood and weighed. This often involves *communication* with less vocal and/or marginalized stakeholders along with historical perspectives on precedents that can impact trust and the available solution space.
- Be able to *synthesize knowledge across disciplines to create solution strategies for complex problems*. Complex intersectional problems invariably involve synthesizing information from multiple disciplines that not only use different language, but also conflict. For example, concerns about the ethical implication about toxic pollution associated with refineries can intersect with the economic benefit of jobs in economically vulnerable communities. Successful problem-solving strategies not only acknowledge but address (or at least mitigate) these issues.

These skills will be developed through real-world projects that illustrate the essential need to develop innovative ways to integrate climate change into business, planning, and management. Successful students will need to acquire an Entrepreneurial mindset to fully identify available opportunities in the solution space.

Attendance policy: Because discussions and reading are key components of this course, attendance is required. You can attend in-person (so long as it remains safe) or (synchronously virtually). Lectures will be recorded but are a poor substitute for active learning during class. This is a pandemic and things happen. Missing one class is fine. Don't worry about it. But things happen and if you need to miss multiple classes then let us know (preferable in advance!) let us know so we can work out a plan.

Why me, why this course? The goal of this course is to introduce you to the nuanced world of problem solving associated with climate change. You don't need a background in climate science *or* engineering to be successful, although you will need to understand some of the physical foundations of climate science to think through the implications of climate science and the solution space. You also don't need a background in community engagement or social science, although you will need to read and learn about key aspects of social science that tell us how to best engage with communities.

How to attend class? We will maintain a synchronous virtual option for class over Zoom. While it is safe, we will also have an in-person option. This will be maintained so long as it is safe and we have a critical mass of students participating in-person: if people stop showing up to the in-person class, we will shift to a fully virtual environment. We anticipate that some of you may need to miss class for a variety of reasons. You need to let us know (preferably in advance) if you are unable to attend class either in-person or virtually. Because discussions are a key component of the class, however, we are not offering an asynchronous option.

Health and wellbeing: We embark on this adventure in the midst of a pandemic surrounded by upsetting social turmoil. You are encouraged to make use of resources available at the CARE center and/or contact us. If you don't feel well stay home. If you do need to miss significant class time, then let us know so we can come up with a plan to get back on track.

Prerequisites: None.

Honor Code: You are free to collaborate. When working collaboratively you must credit classmates and or all sources. This is good ethical practice.

Class Conduct: A positive learning environment relies upon creating an atmosphere where diverse perspectives can be expressed. This is especially challenging in the mixed in person and virtual environment that we will experience this semester. Each student is encouraged to take an active part in class discussions and activities. Honest and respectful dialogue is expected, especially on the virtual chat sessions that we will work with. Disagreement and challenging of ideas in a supportive and sensitive manner is encouraged. Just as we expect others to listen attentively to our own views, we must reciprocate and listen to others when they speak, especially when we disagree with them. You are all encouraged to work together to learn the material but try to give everyone in your group an opportunity to contribute and participate.

Disability: Don't hesitate to bring any issues or requests for accommodations to our attention. The mixed virtual and in person learning environment presents new challenges, opportunities, and obstacles that we are all learning to navigate together. I am excited to learn about any new technology or best practices that makes my material accessible so please bring any ideas my attention. Our goal is to provide you with the opportunities you need to be successful. The University of Michigan is also committed to providing equal opportunity for participation in all programs, services and activities. Request for accommodations by persons with disabilities may be made by contacting the Services for Students with Disabilities (SSD) Office located at G664 Haven Hall. The SSD phone number is 734- 763-3000. Once your eligibility for an accommodation has been determined you will be issued a verified individual services accommodation (VISA) form. Please present this form to me at the beginning of the term, or at least two weeks prior to the need for the accommodation (test, project, etc...).

What do <u>you</u> need to be successful in this class? Student enrolled in this class come from a variety of backgrounds, majors, experiences. Some parts of this class might be a review of material you have already seen while other parts might challenge your comfort zone.

The following are some guidelines to help you be successful in this class.

<u>Attend classes</u>. This is an active class and we will use large portions of class time to work through some challenging class material. Attending and participating in discussions is an important part of the learning environment. Missing a class is <u>not</u> a problem and can be made up, but missing many classes means that you don't benefit from the group interactions.

<u>Ask for help.</u> Contact us outside of class (email, phone, carrier pigeon) if you need help or need to miss class. Lots of unexpected things can happen during the semester. Let us know if you are struggling, need help on assignments or are just confused about something. Letting us know that you need help or are struggling means that we can work together to make sure you are on a path to be successful.

<u>Ask lots of questions</u>. Ask questions when you don't understand. Ask questions when you disagree. Ask questions when you think you understand but aren't sure. Ask questions about things that you have read and about things that we haven't talked about that you would like to talk about.

<u>Do the reading and assignments</u>. We will have a variety of readings, often with short written assignments associated with the reading. The assignments are designed to encourage you to engage with the material. Some of the reading is going challenge you and that is the point. We expect that some of the reading is going to be a slog because it is too technical, too dense, too much jargon. Don't get frustrated. Not everything is going to be easy. Ask for help if you get confused, lost, or stumped.

Be respectful. We will do a lot of in class discussions and group assignments. Take time to listen to everyone. Try not to let any one person crowd out others from the conversation. Use people's pronouns. Come with good intentions and assume good intentions.

Grading:

Homework:	60%
Project:	30%
Participation:	10%

Homework: We will typically have reading assignments for each lecture. Each reading assignments will be paired with a set of open-ended response questions. The response questions need to be turned in before class and will often form the basis of in-class discussions. We encourage everyone to turn in responses on time. If you cannot turn in responses before class, then let us know.

Homework grading: Homework will be graded on an approximately 3-point scale corresponding to the following:
0 – 1 (Below expectations C+ and lower): Not turned in or turned in late.
1 – 2 (Meeting expectations B- to B+): Response's paraphrase or regurgitate words in the reading or previous reading. Little evidence of synthesis of knowledge or application of key concepts.
2 – 3 (B+ to A): Meets expectations. Starting to synthesize knowledge and apply concepts from reading to real world problems. This doesn't mean a complete understanding of material but shows evidence that the student identifies what they don't understand well enough to ask questions.
3+ (A+): Above and beyond expectations. Goes beyond the reading and identifies extra references.

To consider in projects:

- For the locality / problem that you considered, what are the issues that will be important in successful problem solving? Think beyond "climate," for example, political buy in, competing interests, etc. What are the primary barriers?
- We considered the approach in a locality or, perhaps, a couple of localities. What motivates these localities, and how does history, either environmental or political, influence their approach and progress on addressing climate change.
- Has the region adopted a climate change (e.g., sea level rise) scenario in their planning? Is this "official" or coming from an advocacy organization?
- What is your analysis of the role of scientific uncertainty in the ability of a region to address climate change? How could better description or framing of uncertainty accelerate addressing climate change?

Participation: Participation is hard to evaluate, and we recognize that not everyone is comfortable speaking. The participation grade will depend on a holistic assessment of attendance, contribution to class discussions (quality and not just quantity), listening to others during class discussions and contribution to group project(s).

(Very) Tentative Schedule

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Provided below is a very outline. We reserve the right to rearrange, add or subtract topics depending on our progress and class interest.

1. ***Climate Science Background***: "One Hour" Introduction/Summary of climate change science (Rood Lectures)
    1. WMO State of the Global Climate: Information is presented at several levels of detail, it is worth exploring the site.
2. ***Uncertainty***
    1. Introduction to Uncertainty in the Scientific Investigation of Earth's Climate (Rood Lectures) This series of lectures introduces uncertainty, in general, and the most common classification of uncertainty as model uncertainty, scenario uncertainty, and internal variability. The representation of these uncertainties, as well as observational uncertainty is discussed using IPCC surface temperature figures.
    2. The potential to narrow uncertainty in regional climate predictions (Hawkins and Sutton (2009)) This paper is an important paper by climate scientists on how to think about uncertainty at different spans of time and different size regions.
3. ***Assessments***: Assessments are formal synthesis by the community of the state of the science. They are intended to translate the scientific knowledge to policy makers, perhaps, the public. A question always arises, are they effective at this translation? Is the information provided usable in problem solving? For this part of the course, it is best to have selected or be in the process of selecting a problem to focus on. It is good to have a particular locality (e.g, Great Lakes shoreline) and perhaps a particular climate impact (e.g. high lake levels). Then the student has a foundation to evaluate the usability of the information in the assessments. (These resources should be updated regularly.)
    1. Intergovernmental Panel on Climate Change (IPCC) assessments (Synthesis Report: Summary for Policy Makers (AR5))
    2. U.S. National Climate Assessment (NCA) (2018 US NCA)
    3. There may be more local assessments or "boundary" organizations that tailor climate knowledge for a region or a certain climate impact. The Great Lakes Integrated Sciences and Assessment Center (GLISA) is such an organization. GLISA is part of the Regional Integrated Sciences and Assessment (RISA) network. (Great Lakes Climate Change 101, GLISA Annual Climate Trends and Impacts)
4. ***Problem Solving***:

1. Knowledge Systems: This is material which introduces knowledge system theory and science usability theory. For this course the student should be familiar with the concepts of legitimacy, credibility, and salience. A good exercise is to choice at least one of the papers, and read, respond, and discuss in class. For a class, spread the papers out. If only one paper is chosen Dilling and Lemos has proved to be an excellent resource. (slides, pdf)
    1. Introduction, Organizing Complex Systems, "Taxonomy" (16:11 minute Lecture,)
    2. Knowledge System, Legitimacy, Credibility, Salience (25:20 minute Lecture,)
    3. Problem Solving: Time, Space, Wealth / Inventory, Analysis, Evaluation, Synthesis (29:17 minute Lecture,)
    4. Knowledge System and Science Usability References
        1. Dilling and Lemos, 2011, Usable Science
        2. Cash et al., 2003, Knowledge Systems
        3. Lemos and Rood, 2010, Climate Projections in Policy and Practice
        4. Lemos et al., 2014, Moving Climate Information off the Shelf: Boundary Chains and the Role of RISAs as Adaptive Organizations
        5. Hines, Hungerford, Tomera, 1987, Responsible Environmental Behavior
        6. Rood, 2014, Solving the Problems of Climate Change and Sustainability
        7. Tang and Dessai, 2012, Usable Science?
        8. Lemos and Morehouse, 2005, Co-production of science and policy
        9. Barsugli et al., 2013, The Practitioner's Dilemma
2. Overview Lecture: These lectures are public lectures that serve as overview lectures of complex problem solving.
    1. Framing Climate Change Problem Solving (University of Michigan Biological Station May 2020).
    2. The Usability of Climate Science in Planning and Management (Lake Levels Use Case): (Colorado State University September 2019)
3. Communication: This collection of materials has proved of interest to all of my classes, whether or not they are on climate change (Rhetoric and Argumentation).

5. ***Scenario Planning***:
    1. A Practitioner's Guide to Climate Model Scenarios: This Guide is written for practitioners already using or wanting to use future climate information in their work, but who are not familiar with the underlying assumptions and choices surrounding climate data. Here, we introduce the climate model scenarios that are used to "drive" climate models forward in time.

    2. Scenario Planning: GLISA's scenario planning approach describes plausible future events and has actors (i.e., stakeholders) respond to them. The goal is to account for uncertainty by developing a framework to plan for potentially disastrous disruptions, rather than only focusing on specific, likely outcomes.
    3. Using Climate Change Scenarios to Explore Management at Isle Royale National Park: This is a reference that provides an introduction to scenario planning, as well as good examples of disruptive climate scenarios. (Fisichelli et al. (2013))
6. ***Framing Uncertainty***:
    1. Reducing doubt about uncertainty: Guidance for IPCC's third assessment (Moss (2011))
    2. Ethical considerations with downscaled data (Hewitson et al. (2014))
    3. The Uncertainty Fallacy: Climate projections and their impact on policy and practice (Lemos and Rood (2010))
    4. Risk and reason (Recordings of radio series): (National Public Radio)
    5. What do policy-makers do with scientific uncertainty? The incremental character of Swedish climate change policy-making (Knaggard (2014))
7. ***News Cycle***: Many of problems we work on are emerging and active in the news. There are stories of direct and indirect relevance. Some of these stories can change the path of a project. All stories should be evaluated for legitimacy and credibility. A set of news articles is captured and tagged at https://openclimate.tumblr.com/.
8. ***Lecture from Local or Discipline Expert***