Earth Institute Practicum
SUMA K4734.001
Science-Based Solutions for Sustainability

Time: Wednesdays, 4:10 – 6:00pm
Location: TBD

Instructor Information
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Course Description

The Earth Institute Practicum is designed to be a broad survey of the applications of frontier research to the practice of sustainable development, environmental policy, and sustainability management.

The course is open to both graduate and undergraduate students. Undergraduate students with the Special Concentration in Sustainable Development are required to take a practicum and this course fulfills that requirement.

The Practicum is a dynamic forum featuring a series of lectures and discussions by faculty and scientists representing different Earth Institute centers, departments, and laboratories. These lectures will emphasize key concepts in applied earth and environmental sciences and the social sciences relevant to sustainability practice, including introductions to data sources, analytical methods, and decision tools. This course emphasizes the importance of science and how it critically advances society's knowledge and our ability to improve our resilience in the face of environmental change. Along with case studies and background reading, the lectures will illustrate how innovative, cutting-edge scientific research can be used to provide the rational basis for the actions by governments, the private sector, international organizations and advocacy groups needed to address the challenging relationships between sustainability challenges. We'll explore how academic research can help address real world problems. Through these examples, students will explore different approaches to research and data and how they can be applied to policy and management solutions using evidence-based, analytic approaches.

Through a group debate exercise and a final paper, students will put into practice the ability to form reasoned arguments based on fact, data, and evidence. They will use that evidence to recommend specific policy and management decisions. In an era where facts are being questioned regularly, opposing sides choose "their facts," and scientific discourse is attacked, this course will demonstrate the ability of science to illuminate opportunities for meaningful solutions related to sustainability.

Most class sessions will comprise a guest lecture followed by class discussion. We will also engage in structured in-class debates on topics explored in the lectures and conducted by assigned debate teams. The debates will allow students to engage in evidence-based verbal arguments against opposing viewpoints in a mock setting.

Fall 2019 Course Calendar

- **Sept. 4**: Intro to the Course; Intro to Earth Institute; Intro to Research Techniques & Methods
- **Sept. 11**: Lecture & Discussion
- **Sept. 18**: Lecture & Discussion
- **Sept. 25**: Lecture & Discussion
- **Oct. 2**: Debates 1 & 2
- **Oct. 9**: Lecture & Discussion
- **Oct. 16**: Lecture & Discussion
- **Oct. 23**: Lecture & Discussion; **Midterm Abstracts Due**
- **Oct. 30**: Debates 3 & 4
- **Nov. 6:** Lecture & Discussion
- **Nov. 13**: Lecture & Discussion
- **Nov. 20**: Lecture & Discussion
- **Nov. 27: Thanksgiving Break, No Class**
- **Dec. 4**: Lecture & Discussion
- **Dec. 11**: No Class; **Final Papers Due**

Speakers and Topics (Dates TBD)

1. **Air Pollution and the Human Capital Impact**: **Belinda Archibong** (Assistant Professor of Economics, Barnard College)

2. **Climate-Induced Migration: Alex de Sherbinin** (Associate Director for Science Applications in the Center for International Earth Science Information Network)

3. **Sustainable Mining: Impacts on Local Communities: Joshua Fisher** (Director, the Advanced Consortium on Cooperation, Conflict and Complexity; Associate Research Scientist)

4. **Carbon Dioxide Removal and Management: Julio Friedmann** (Senior Research Scholar at the Center for Global Energy Policy)

5. **Climate Services to Enhance Food Security: Lisa Goddard** (Director and Senior Research Scholar, the International Research Institute for Climate and Society)

6. **Urban Resilience and Climate Adaptation: Thaddeus Pawlowski** (Managing Director, Center for Resilient Cities & Landscapes; Research Scholar in the School of Architecture, Planning and Preservation)

7. **Resiliency and Vulnerable Populations: Jeff Schlegelmilch** (Deputy Director, the National Center for Disaster Preparedness)

8. **Wildlife Response to Environmental Change:** [Natalie Boelman](#) (Lamont Associate Research Professor, Lamont-Doherty Earth Observatory) – INVITED; TO BE CONFIRMED

9. **Data, Technology and Transportation:** [Jacqueline Klopp](#) (Co-Director and Research Scholar, the Center for Sustainable Urban Development) – INVITED; TO BE CONFIRMED

10. ***Hurricanes, Predictive Modeling and Risk Assessment:*** [Chia-Ying Lee](#) (Lamont Assistant Research Professor, Lamont-Doherty Earth Observatory) – INVITED; TO BE CONFIRMED

Method of Evaluation

There are two methods of evaluation for this course. Students may elect to take the course for 1 credit or for 3 credits.

1 Credit:	3 Credit:
- Participation: 20% - Discussion posts: 10% - Group debate: 30% - Midterm abstract (1 page): 10% - Final paper (4-6 pages): 30%	- Participation: 20% - Discussion posts: 10% - Group debate: 30% - Midterm abstract (1 page): 10% - Final paper (8-10 pages): 30%

Participation and Weekly Discussion Posts

Participation is expected during in-class discussion following the guest lectures. All students are also expected to attend and participate in the audience portion for all four debates, which will also count towards participation evaluations.

In addition, as preparation for weekly discussions with lecturers, students are expected to prepare a thoughtful and critically reflective statement related to the week's readings. Weekly reflections should be posted on the discussion board **by midnight the day before the respective class session**. Students will be assigned 1-2 short readings related to the class topic in advance. Posts should be roughly 250-350 words. When posting to the board, you may respond with your own observations or comments on what you find interesting, controversial or useful in the readings and in other students' reflections. These statements should be used to help stimulate questions and issues, and to set the agenda for in-class discussions.

Group Debates

We will have <u>four</u> in-class debates. The debate topics are focused on topical sustainability challenges. The structure and terms of the debates will be discussed during the first class session when you will have an opportunity to indicate preferences for your debate group/topic. You will be assigned to a debate group by the second class session. Grades are assigned as a group, not for each individual member. An important part of your professional work will be learning how to work in groups, even if every member does not contribute equally. This involves assigning roles, developing a work plan, creating and sticking to deliverable deadlines, and mediating conflicts if they arise. If you have a serious issue with a group member, contact the professor or instructional assistant.

Format

There will be two sides to each debate: affirmative (pro) and negative (con). The moderator will begin the debate by briefly summarizing the background of the debate topic. Each side will then present their position with an opening statement (affirmative goes first). This will be followed by short rebuttals from each side, and then closing statements from each. The debate will conclude with audience questions fielded by the moderator. The total time for each debate is 45 min. A detailed timeline is below:

- Moderator introduction (summary of the issue): 2 minutes
- Opening audience vote tally (yes/no/undecided)
- Affirmative opening statement: 6 minutes
- Negative opening statement: 6 minutes
- *Break: 2 minutes*
- Affirmative rebuttal: 4 minutes
- Negative rebuttal: 4 minutes
- Affirmative closing statements: 5 minutes
- Negative closing statement: 5 minutes
- Audience questions (moderator fields questions): 10 minutes
- Closing vote tally (yes/no/undecided)

Tips/Notes on Format:
- Opening statements: Clearly state the question and your team's position. Present the major arguments for that position, and support those with reasoning and evidence (including specific examples and noting the sources for all evidence. They should be reputable and citable!)
- Rebuttals: Respond to opening statements by questioning and refuting their arguments. Focus on the substance of the opposing team's arguments. Avoid arguing over specific language or terminology. You should know enough about the opposing sides' general arguments (through your own research before the debate) to be prepared with evidence refuting their points.
- Closing statements: Summarize your team's arguments and present concluding points.

No PowerPoints or other visuals will be allowed. These are oral arguments only, so you can't rely on slides to keep your audience focused. Keep your argument down to a few key points. You want the audience to understand and take your side, so concise, reasoned arguments are stronger than listing 12 reasons why you're right. Less than five points keeps your debate presentation brief and coherent but memorable. Choose the strongest points that demonstrate your position on the issue. Try not to bombard the audience with statistics; they won't follow it all. Use a few key data points that support your argument.

There is no written output required, however it is important to come prepared, having done sufficient background research. Teams will be judged on the structure of their arguments and use of supporting facts, data, evidence, and examples. It is up to each group to ensure that each team member has contributed to the debate preparation and execution. You may assign your roles internally.

Midterm Abstract and Final Paper:

Please note that the final paper is required for all students taking the course for credit.

- 1 credit students: 4-6 pages, double-spaced
- 3 credit students: 8-10 pages, double-spaced

Both 1 credit and 3 credit students are required to turn in the **1-page abstract** for their paper midway through the course **(Due: October 23).** Abstracts are concise summaries of full papers, but are often requested in advance of the full paper's completion. To do this, include the major topics you will address, describe the problem/purpose of the paper, scope of the work, your thesis, relevant case material, and your expected conclusions. It is not a table of contents, outline, or introduction to the report.

For your final paper, choose a **topic related to the relationship between human and natural systems and develop policy or management implications using an evidence-based, analytical approach**. You are surveying and analyzing a sustainability problem – who, what, why, where, and when – and developing a recommended course of action based on a reasoned analysis, with a scientific basis for your rationale. While many sustainability challenges are global, solutions are place-based, and analyses should consider local and regional impacts. Explicitly state who your audience is in your paper. Select a specific geographic location. Construct your paper with a clear introduction (including thesis statement), body and conclusion. Make sure you clearly introduce the scientific problem you are addressing, and the policy or policies you are analyzing and recommending. Your recommendation should be directed to a particular audience, i.e. non-profit, corporate, government, depending on the issue. (Think about who would implement your recommendation).

Identify the environmental problem that you are seeking to address and explain the scientific basis behind the issue. What's the problem? Why do we care? Who is impacted? Who are the stakeholders? What are possible (technical, scientific, and/or policy) solutions that have been proposed? Depending on the problem, a solution could be specific policy actions or, in some cases, further scientific study. If the latter, articulate what sort of additional scientific research might be needed. If the science is already clear enough to act on, what are the policy options and how do they compare? What are the political realities facing the solution(s)? Consider the budgetary constraints of possible solutions. Are there similar cases to learn from (either from other problems in that location and/or similar sustainability problems in other places)? Make a recommendation based on your analysis of the problem. Assess the overall effectiveness of the policy/management decision you've chosen in addressing the problem it is supposed resolve.

Your paper should include the following elements: (1) thesis statement, (2) relevant background information, including data, case studies and/or prior findings that inform your discussion, (3) your analysis and discussion of the policy implications, including the development of new policies if warranted, and (4) conclusions, recommendations and rationale for any further work. You must support your arguments, key points, and analysis with clear evidence, logic, or theory. This is not an opinion paper or a reflection piece. **All sources and evidence must be properly cited and referenced in your paper.**

The questions posted below are provided to help guide your analysis; you do not have to provide answers to all of them. It's recommended that you consider the ones that are most pertinent to your topic and explore those in depth.

The sustainability problem:
- Why is this a critical problem that warrants attention?
- Who is affected by the problem and who was (or is) causing the problem?
- What is the scientific basis for the problem you are trying to solve?
- What is the level of certainty from a scientific perspective about the nature of the problem? Are there areas of scientific uncertainty?
- Is the science settled related to the solution(s)?

The institutional setting:
- Who are the key stakeholders (e.g. political actors, community members, NGOs, activists, businesses, etc.)?
- What are the stakeholders' perspectives and interest in the problem?
- What is the level of legitimacy of this issue within the political arena? Do relevant key political actors care?
- Where is the problem you are analyzing and how does the location impact the relevance of the problem and possible solutions?

The possible solutions:
- What policy solutions have been proposed, if any? Describe and compare solutions.
- Have such policies, programs, or actions been successful in other cases?
- What factors contributed to that success? What lessons (good or bad) can be drawn from those cases to this situation?
- Do policy solutions involve market-based tools or regulatory functions or both?
- Are other incentives/disincentives involved?
- Are there technological solutions available to address the problem?
- Is more research needed before policy solutions can be considered?
- Who is regulated, and/or who must comply with the policy? How willing are affected stakeholders going to be in complying with the policy tools?
- What are the costs associated with the policy tools?
- Do the organizations who would implementing your recommendation have the capacity to do so? What experience do these organizations have with similar or related policies?

Paper Format:
- Use Size 12 font, Times New Roman, 1-inch margins all sides, double spaced, with page numbers. Include a title and clear headings if or when appropriate.
- Include an updated abstract (not included in above page limits, but no longer than 1 page). The final abstract summarizes the paper's topic and key findings; it is not an outline in narrative form, nor is it an introduction. It should have its own introduction, problem statement, approach, findings, conclusions, and recommendations. It should emphasis key ideas or results. It is a concise description of your full paper.

- You may include appendices, such as tables, graphs or other supplemental data if it is relevant and clearly discussed and cited in the text of your paper. Appendices will not count towards the page limits.
- All information that is directly quoted must be placed in quotation marks and cited in text. Be sure to *give reference even when you summarize the main idea of something*. Properly refer to any tables or data sources that you use in the text as well as in your bibliography.
- Citations/references must be formatted according to APA style. Here's a good resource: https://owl.purdue.edu/owl/research_and_citation/apa_style/apa_style_introduction.html References will not count towards the page limits.
- Include a minimum of 10 sources.
- Submit your paper on Canvas as a Word document (not a PDF).

If you have any questions about how to structure the paper, or would like feedback on your topic, please reach out to Professor Miller (alisonmiller@ei.columbia.edu), or Alix Schroder (aschroder@ei.columbia.edu).

About The Earth Institute

Columbia University's Earth Institute is the world's leading academic center for the integrated study of Earth, its environment, and society. The Institute's overarching goal is to help achieve sustainable development primarily by exploring and expanding the knowledge surrounding environmental issues. Through education, scientific research and practical application, the Earth Institute tackles real-world challenges. With 850 scientists, postdoctoral fellows and students working in and across more than 20 Columbia University research centers, the Earth Institute is helping to advance understanding of nine interconnected global issues: climate and society, water, energy, poverty, ecosystems, public health, food and nutrition, hazards and urbanization.

The Earth Institute builds upon excellence in the core disciplines – earth sciences, biological sciences, engineering sciences, social sciences, and health sciences – and stresses cross-disciplinary approaches to complex problems. Through its research, training, and global partnerships, it mobilizes science and technology to advance sustainable development.

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