GEOG 696I
Foundations and contemporary debates in human-environment science
FALL 2022
Wednesdays 11:30 – 2:00 PM
ENR2, Rm. S495

Updated 1/6/21
Professor: Beth Tellman
Office: ENR2 Rm. S-527
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Zoom: https://arizona.zoom.us/j/86293884564
Password: humans

We will meet virtually for January 2022 (first three class periods)

Description:
What are the consequences of humans adapting to the environment? How do vulnerability and resilience shape who bears the burden or reaps the benefits of environmental change? This seminar will give students foundational concepts and frameworks in human-environment and sustainability science, including vulnerability, adaptation, resilience/robustness, transformation, politics/power/access, institutional analysis, coupled human natural systems (CHANS)/socio-ecological technical systems (SETS), and land system science. In the 2nd half of the course, we will use these frameworks to debate contemporary issues (based on class interests!), such as geoengineering, "half-earth"/ nature positive development, Artificial Intelligence (AI)/ Big Data for development, climate finance and justice, limits to adaptation/managed retreat, and outcomes of the Feb. 2022 working group 2 IPCC report on Impacts, Adaptation, and Vulnerability. The final project will apply course concepts/ frameworks to investigate a mechanism or feedback loop in the human-environment system of your choice.

This course is designed for disciplinary backgrounds ranging from engineering, to geoscience, to geography and political science. There are no prerequisites. Each discipline may use terms in this course in distinct ways. To avoid confusion and increase communication across disciplines, in this course we will use terms based in sustainability science (see: https://www.sustainabilityscience.org/pub/blr4rdyc/release/2 for a glossary). I encourage you in discussions to give the perspective of how you have understood or used the term in your field if it differs from Sustainability Science.

Learning Outcomes:
By the end of the semester students will:
1) Understand what frameworks (vs. theory and models) are, and how to use or develop one effectively to study human-environment relationships
2) Be able to differentiate vulnerability, adaptation, resilience, robustness, and transformation, how each could be measured quantitatively, and limits to these measurements

3) Articulate and frame their research/theses questions as advances in sustainability science for proposals, grant writing, and in comprehensive exams beyond the context of their "discipline"

Class Anti-Discrimination Policy

"As a classroom community, our capacity to generate excitement is deeply affected by our interest in one another, in hearing one another's voices, in recognizing one another's presence."
― bell hooks, Teaching To Transgress: Education as the Practice of Freedom

I encourage you to bring your whole self to the classroom, and to actively make the classroom a respectful place so that others can bring their whole selves if they desire to do so. We will learn more by welcoming a diversity of perspectives and life experiences. Creating a respectful space and being anti-racist is an intentional act. Racism, discrimination, and microagressions will not be tolerated. If you feel another student, or the instructor has done or said something disrespectful to you or others please let me know to address the issue. You may also say "oops" or "ouch" if something says something you feel is disrespectful during class to let them know. If you unintentionally make a comment that may feel like a microaggression, racist, or disrespectful, and someone points it out, I invite you to gratefully accept the learning experience.

Land Acknowledgement
We respectfully acknowledge the University of Arizona is on the land and territories of Indigenous peoples. Today, Arizona is home to 22 federally recognized tribes, with Tucson being home to the O'odham and the Yaqui.

Readings:
Through March 23, all students must submit an annotation of 2 of the 4-5 articles each week (you may select from optional articles), due at midnite Tuesday (the night before class). Students can select which article to annotate. Annotations should be between 250-500 words for each article. The goal of writing an annotation is for reference in comprehensive exams or proposals without having to re-read the article. Annotations should include a short summary (3-4 sentences) of the main contribution of the article, followed by several sentences placing it into the context of other literature read in this course or elsewhere, one's own research, discipline, work or personal experience. Annotations will be graded on a 5 point scale, and returned electronically through D2L with feedback from the instructor on a weekly basis.

Two students will be assigned to lead the discussion each week (January 19-March 23) for the first half of class. The week you lead the discussion, you must annotate all the articles assigned for that week (but not the optional articles). Leading implies you summarize the main points for the class before opening it up for discussion, are taking stack/calling on students to structure the conversation, and keeping time for how long we spend on each article and when its time to move on. You may select one other week of your choosing to NOT submit annotations. Thus over our 8 weeks of discussion, you will only submit annotations for 7 of the weeks. Optional articles are ones I will lecture on or touch on, but student leaders do NOT need to be responsible for reading or leading them.

Debates:
We will have seven debates about human-environment topics. I have proposed topics with three "audible" debate topics we pick together. We may also change debate topics based on class interest. Each student will sign up for two debates, with the expectation that you will take feedback from the first debate to improve in your second debate. Improvement will be part of your final grade. We will flip a coin as to the "side" or position you will take in the third week of class. The "pro" side is written as Resolved: xxxx, and the "con" side can negate that position by showing its weakness or offering an alternative solution. You and your debate partner must select 2-3 required readings (depending on length) for your debate by **March 16.** Readings do not have to be academic and can include op-eds, videos, or other media (I have included suggestions and examples for the first 4 debates). Considering including a diversity of voices (e.g. not just articles by white male authors) in your selections. For the five debates in which you are an audience member, you will deliver written feedback (just 2-3 sentences each) to each of the four debate participants regarding at least once thing you think they did well (good use of a certain concept, an effective visual or metaphor, a convincing piece of data or argument, etc) and one area for improvement (an ineffective visual or metaphor, misuse of a concept, or an idea of a fact or metaphor they could have employed etc). Feedback will be **due BEFORE the next class period** (e.g. one week after the previous debate) on D2L.

You will be graded on your preparation and performance in the debate, improvement from first to the second debate, ability to integrate course concepts or frameworks from earlier readings, and participation in the debate via written feedback submitted to participants. I will facilitate a rubric for debate performance by March 2nd.

Debate format
We will use a debate format called "Public Forum" which I have altered to last ~60 minutes. In this format, there are two teams of two people each (we may have a few debates with 3 person teams pending final class size). The teams can decide who speaks or presents in each section (it could be both, or alternating). The class will participate by asking clarifying questions, and then examining each argument and voting for the winner. See more: https://www.mustangps.org/Downloads/Chapter%20I%20-%20PFD%20Overview.pdf. Voting outcomes of debates (who wins) will have no bearing on the grade received. We will rotate being "judge" (keeping time).

Section	Time Limit	Speaker(s)
Presentation	7 min	Pros
Presentation	7 min	Cons
Clarifying questions	5 min	Class+cons+pros
1st Crossfire	3 min	Pros+Cons

Rebuttal	4 min	Pros
Rebuttal	4 min	Cons
2nd Crossfire	3 min	Pros+Cons
BREAK	10 min	debate teams can pull in new material or discuss their strategy during this time
Summary	3 min	Pros
Summary	3 min	Cons
Grand Crossfire	3 min	All speakers
Class Examination	10 min	Audience + speakers
Final Focus	2 min	Pros
Final Focus	2 min	Cons
Vote	5 min	Anonymous virtual voting of which side won the debate and why

Final Papers:
You will take a deeper dive into a human-environment feedback or mechanism in a system or location of your choice drawing on course concepts and frameworks. You will prepare a ~5 page paper and 10 minute presentation communicating your findings. A well-constructed and submitted op-ed may be accepted in lieu of the case paper pending instructor approval. PhD students are strongly encouraged to examine a new human-environment aspect of their dissertation topic. Rubrics will be posted on D2L by March 16. Final paper proposals (~500 words) are due March 30th. Final papers are due May 10th.

Course Feedback:
In addition to the course evaluation at the end of the semester, I will elicit feedback two points during the semester to improve the pace of the course, my teaching, and take feedback on suggestions to improve the classroom experience. I welcome at any time articles you think would be important in topics we will cover that are not currently on the reading list- just let me know after class or in an email!

Grades:
25% annotated readings (14 total)
25% debate (the two debates you lead)

25% participation (debate feedback, leading discussion, attending class)
25% Final paper

Grade policies and Letter Grade Distribution:
University policies regarding grades and grading systems are available at:
http://catalog.arizona.edu/2015-16/policies/grade.htm
Grade distribution for this course:
A: 90% and above
B: 80% to 89%
C: 70% to 79%
D: 65% to 69%
E: below 65%

Requests for incomplete (I) or withdrawal (W) must be made in accordance with University policies, which are available at
http://catalog.arizona.edu/policy/grades-and-grading-system#incomplete and http: //catalog.arizona.edu/policy/grades-and-grading-system#Withdrawal respectively. Please be aware of deadlines for requesting these grades. Requests for reconsideration of a grade received on a paper, project, or exam must be made to the instructor no later than 1 week after the assignment is made available to be returned to the student. There is no final exam for this course.

Late work
Assignments that are not completed or handed in on time, without prior arrangement with the instructor, will receive no more than 50% of the assigned points. Assignments not completed within 1 week of the original deadline, without prior arrangement with the instructor, receive no points for the assignment.

COVID-19 Policies
Face coverings are required in our classroom As of the rst week of class and per University of Arizonas Directive (https://covid19.arizona.edu/face-coverings), face coverings that cover the nose, mouth, and chin are required to be worn in all indoor spaces where it is not possible to adequately and continuously maintain social distance, including classrooms. Updated university policy requires the use of surgical or higher-grade (KN95, KF94 and N99) face masks be worn Any student who violates this directive will be asked to put on a mask or immediately leave the learning space and will be allowed to return only when they are wearing a face covering. Subsequent episodes of noncompliance will result in a Student Code of Conduct complaint being led with the Dean of Students Office, which may result in sanctions being applied. The student will not be able to return to the learning space until the matter is resolved. The Disability Resource Center is available to explore face coverings and accessibility considerations if you believe that your disability or medical condition precludes you from utilizing any face covering or mask option. DRC will explore the range of potential options as well as remote course offerings. Should DRC determine an accommodation to this directive is reasonable, DRC will communicate this accommodation with your instructor.

Classroom Attendance

1. If you feel sick or may have been in contact with someone who is infectious, stay home. Except for seeking medical care, avoid contact with others and do not travel.
2. Notify your instructors if you will be missing a course meeting or an assignment deadline.
3. Non-attendance for any reason does not guarantee an automatic extension of due date or rescheduling of examinations/assessments. Please communicate and coordinate any request directly with your instructor.
4. If you must miss the equivalent of more than one week of class, you should contact the Dean of Students Office DOS-deanofstudents@email.arizona.edu to share documentation about the challenges you are facing.
5. Voluntary, free, and convenient COVID-19 testing is available for students on Main Campus -https://covid19.arizona.edu/covid19-testing
6. If you test positive for COVID-19 and you are participating in on-campus activities, you must report your results to Campus Health. To learn more about the process for reporting a positive test, visit the Case Notification Protocol.
7. COVID-19 vaccine is available for all students at Campus Health - https://covid19.arizona.edu/vaccine
8. Visit the UArizona COVID-19 page for regular updates (https://covid19.arizona.edu/)

Life challenges
If you are experiencing unexpected barriers to your success in your courses, please note the Dean of Students Office is a central support resource for all students and may be helpful. The Dean of Students Office can be reached at (520) 621-2057 or DOS-deanofstudents@email.arizona.edu.

Physical and mental-health challenges
If you are facing physical or mental health challenges this semester, please note that Campus Health provides quality medical and mental health care. For medical appointments, call (520) 621-9202. For After Hours care, call (520) 570-7898. For the Counseling & Psych Services (CAPS) 24/7 hotline, call (520) 621-3334.

Remaining flexible
If pandemic conditions warrant, the University may require that we return to remote operations. If that is the case, we will notify you by D2L Announcement and email that we are moving to remote operations. We will start the first 3 class periods remote.

University Policies

Course Communications
All communications concerning class are via official UA email addresses. It is the student's responsibility to regularly check for email communications concerning class information and policies, and to contact the instructor from the student's official UA email address.

Course materials
Course materials will be available online via D2L (http://d2l.arizona.edu)

Absence and Class Participation Policy
The UAs policy concerning Class Attendance, Participation, and Administrative Drops is available at
http://catalog.arizona.edu/policy/class-attendance-participation-and-administrative-drop. The UA policy regarding absences for any sincerely held religious belief, observance or practice will be accommodated where reasonable:
http://policy.arizona.edu/human-resources/religious-accommodation-policy. Absences pre-approved by the UA Dean of Students (or the dean's designee) will be honored. Active participation in the course is vital to the learning process. As such, attendance is strongly encouraged at all meetings of the class.

Assignment and Grading Policy for Students Who Register Late
Students who register late for the course will be required to complete all assignments. Due dates for assignments given prior to the student adding the course will be agreed upon my both student and the instructor.

Code of Academic Integrity
Students are encouraged to share intellectual views and discuss freely the principles and applications of course materials. However, graded work/exercises must be the product of independent effort unless otherwise instructed. Students are expected to adhere to the UA Code of Academic Integrity as described in the UA General Catalog. See
http://deanofstudents.arizona.edu/academic-integrity/students/
academic-integrity. The University Libraries have some excellent tips for avoiding plagiarism, available at:
https://new.library.arizona.edu/research/citing/plagiarism.

Selling class notes and/or other course materials to other students or to a third party for resale is not permitted without the instructors express written consent. Violations to this and other course rules are subject to the Code of Academic Integrity and may result in course sanctions. Additionally, students who use D2L or UA e-mail to sell or buy these copyrighted materials are subject to Code of Conduct Violations for misuse of student e-mail addresses. This conduct may also constitute copyright infringement.

UA Nondiscrimination and Anti-Harassment Policy

The University is committed to creating and maintaining an environment free of discrimination; see http://policy.arizona.edu/human-resources/nondiscrimination-and-anti-harassment-policy. Our classroom is a place where everyone is encouraged to express well-formed opinions and their reasons for those opinions. We also want to create a tolerant and open environment where such opinions can be expressed without resorting to bullying or discrimination of others.

Survivor Advocacy
In an effort to be supportive and affirming of students impacted by gender-based and sexual violence, it is important that students are aware of confidential options for survivors. The

University of Arizona's Survivor Advocacy Program is a free and confidential resource for students impacted by gender-based or sexual violence. Confidential advocates work with students to support overall wellbeing, academic and emotional needs. This includes explaining rights and options, resource referral and safety planning. You can reach a confidential advocate by visiting www.survivoradvocacy.arizona.edu or calling 520-621-5767. Find out more information about the program by visiting www.survivoradvocacy.arizona.edu.

Additional Resources for Students
UA Academic policies and procedures are available at:
http://catalog.arizona.edu/policies.
Student Assistance and Advocacy information is available at:
http://deanofstudents.arizona.edu/student-assistance/students/student-assistance
Confidentiality of Student Records
Please see the University's policy on the confidentiality of student records here:
http://www.registrar.
arizona.edu/ferpa/default.htm

Subject to Change Statement
Information contained in the course syllabus, other than the grade and absence policy, may be subject to change with advance notice, as deemed appropriate by the instructor.

Draft Course Schedule

Jan 12 **Human Environment Frameworks I: understanding frameworks, origins of sustainability science, and the history and consequences of underrepresentation of women, Black, Indigenous and People of Color, and scholars from the Global South**

+ Debate topic proposals, sign up for which course to lead

PAGES 7-9 ONLY: Ostrom, E., 2011. Background on the Institutional Analysis and Development Framework. Policy Stud. J. 39, 7–27. https://doi.org/10.1111/j.1541-0072.2010.00394.x

Pages 232-236 ONLY: Poteete, A.R., Janssen, M.A., Ostrom, E., 2010. Pushing the frontiers of the theory of collective action and the commons. Work. together. Collect. action, commons Mult. methods Pract. 346.

Schipper, E.L.F., Ensor, J., Mukherji, A., Mirzabaev, A., Fraser, A., Harvey, B., Totin, E., Garschagen, M., Pathak, M., Antwi-Agyei, P., Tanner, T., Shawoo, Z., 2021. Equity in climate scholarship: a manifesto for action. Clim. Dev. 13, 853–856. https://doi.org/10.1080/17565529.2021.1923308

Nagendra, H., Bai, X., Brondizio, E.S., Lwasa, S., 2018. The urban south and the predicament of global sustainability. Nat. Sustain. 1, 341–349. https://doi.org/10.1038/s41893-018-0101-5

Kates, R.W., Clark, C.W., Corell, R., Hall, J.M., Jaeger, C.C., Lowe, I., McCarthy, J.J., Schnellhuber, H.J., Bolin, B., Dickinson, N.M., Faucheux, S., Gallopin, G.C., Grubler, A., Huntley, B., Jager, J., Jodha, N.S., Kasperson, R.E., Mabogunje, A., Matson, P., Mooney, H., Ill, B.M., O'Riordan, T., Svedin, I., 2001. Sustainability Science. Science (80-.). 292, 641–642. https://doi.org/10.1126/science.1059386

Turner, B.L., 2002. Contested Identities : Human-Environment in a Restructuring Academy. Ann. Assoc. Am. Geogr. 92, 52–74.

Lubchenco, J., Rapley, C., 2020. Our moment of truth: The social contract realized? Environ. Res. Lett. 15. https://doi.org/10.1088/1748-9326/abba9c

Jan 19 **Human Environment Frameworks II: IAD, Ecosystem Services, SETS,**

*Clark, W.C., Harley, A.G., 2020. Sustainability science: Toward a synthesis. Annu. Rev. Environ. Resour. 45, 331–386. https://doi.org/10.1146/annurev-environ-012420-043621

*if you choose to annotate this article, you only need to do ONE annotation since it is so long.

Ostrom, E., 2011. Background on the Institutional Analysis and Development Framework. Policy Stud. J. 39, 7–27. https://doi.org/10.1111/j.1541-0072.2010.00394.x

Díaz, S., Demissew, S., Carabias, J., Joly, C., Lonsdale, M., Ash, N., Larigauderie, A., Adhikari, J.R., Arico, S., Báldi, A., Bartuska, A., Baste, I.A., Bilgin, A., Brondizio, E., Chan, K.M.A., Figueroa, V.E., Duraiappah, A., Fischer, M., Hill, R., Koetz, T., Leadley, P., Lyver, P., Mace, G.M., Martin-Lopez, B., Okumura, M., Pacheco, D., Pascual, U., Pérez, E.S., Reyers, B., Roth, E., Saito, O., Scholes, R.J., Sharma, N., Tallis, H., Thaman, R., Watson, R., Yahara, T., Hamid, Z.A., Akosim, C., Al-Hafedh, Y., Allahverdiyev, R., Amankwah, E., Asah, T.S., Asfaw, Z., Bartus, G., Brooks, A.L., Caillaux, J., Dalle, G., Darnaedi, D., Driver, A., Erpul, G., Escobar-Eyzaguirre, P., Failler, P., Fouda, A.M.M., Fu, B., Gundimeda, H., Hashimoto, S., Homer, F., Lavorel, S., Lichtenstein, G., Mala, W.A., Mandivenyi, W., Matczak, P., Mbizvo, C., Mehrdadi, M., Metzger, J.P., Mikissa, J.B., Moller, H., Mooney, H.A., Mumby, P., Nagendra, H., Nesshover, C., Oteng-Yeboah, A.A., Pataki, G., Roué, M., Rubis, J., Schultz, M., Smith, P., Sumaila, R., Takeuchi, K., Thomas, S., Verma, M., Yeo-Chang, Y., Zlatanova, D., 2015. The IPBES Conceptual Framework - connecting nature and people. Curr. Opin. Environ. Sustain. 14, 1–16. https://doi.org/10.1016/j.cosust.2014.11.002

Ostrom, E., 2009. A general framework for analyzing the sustainability of Social-Ecological Systems. Science (80-.). 325, 1–53.

Ramaswami, A., Weible, C., Main, D., Heikkila, T., Siddiki, S., Duvall, A., Pattison, A., Bernard, M., 2012. A Social-Ecological-Infrastructural Systems Framework for Interdisciplinary Study of Sustainable City Systems: An Integrative Curriculum Across Seven Major Disciplines. J. Ind. Ecol. 16, 801–813. https://doi.org/10.1111/j.1530-9290.2012.00566.x

Optional:

Binder, C.R., Hinkel, J., Bots, P.W.G., Pahl-Wostl, C., 2013. Comparison of frameworks for analyzing social-ecological systems. Ecol. Soc. 18. https://doi.org/10.5751/ES-05551-180426

Partelow, S., 2018. A review of the social-ecological systems framework: Applications, methods, modifications, and challenges. Ecol. Soc. 23. https://doi.org/10.5751/ES-10594-230436

Jan 26 **Vulnerability and Exposure**

Turner, B.L., Kasperson, R.E., Matson, P. a, McCarthy, J.J., Corell, R.W., Christensen, L., Eckley, N., Kasperson, J.X., Luers, A., Martello, M.L., Polsky, C., Pulsipher, A., Schiller, A., 2003. A framework for vulnerability analysis in sustainability science. Proc. Natl. Acad. Sci. U. S. A. 100, 8074–8079. https://doi.org/10.1073/pnas.1231335100

Thomas, K., Hardy, R.D., Lazrus, H., Mendez, M., Orlove, B., Rivera-Collazo, I., Roberts, J.T., Rockman, M., Warner, B.P., Winthrop, R., 2019. Explaining differential vulnerability to climate change: A social science review. Wiley Interdiscip. Rev. Clim. Chang. 10, 1–18. https://doi.org/10.1002/wcc.565

Cutter, S.L., Carolina, S., Boruff, B.J., Shirley, W.L., 2003. Social Vulnerability to Environmental Hazards. Soc. Sci. Q. 84.

Tate, E., Rahman, M.A., Emrich, C.T., Sampson, C.C., 2021. Flood exposure and social vulnerability in the United States. Nat. Hazards 106, 435–457. https://doi.org/10.1007/s11069-020-04470-2

(Pick one of the three articles below)

Farrell, J., Burow, P.B., McConnell, K., Bayham, J., Whyte, K., Koss, G., 2021. Effects of land dispossession and forced migration on Indigenous peoples in North America. Science (80-.). 374. https://doi.org/10.1126/science.abe4943

Rhiney, K., 2020. Dispossession, disaster capitalism and the post-hurricane context in the Caribbean. Polit. Geogr. 78, 102171. https://doi.org/10.1016/j.polgeo.2020.102171

Méndez, M., Flores-Haro, G., Zucker, L., 2020. The (in)visible victims of disaster: Understanding the vulnerability of undocumented Latino/a and indigenous immigrants. Geoforum 116, 50–62. https://doi.org/10.1016/j.geoforum.2020.07.007

Optional:

Tellman, B., Schank, C., Schwarz, B., Howe, P.D., Sherbinin, A. De, 2020. Using Disaster Outcomes to Validate Components of Social Vulnerability to Floods : Flood Deaths and Property Damage across the USA. Sustainability 15, 1–28. https://doi.org/10.3390/su12156006

Eakin, H., Luers, A.L., 2006. Assessing the Vulnerability of Social-Environmental Systems. Annu. Rev. Environ. Resour. 31, 365–394. https://doi.org/10.1146/annurev.energy.30.050504.144352

Buhaug, H., Von Uexkull, N., 2021. Vicious Circles: Violence, Vulnerability, and Climate Change. Annu. Rev. Environ. Resour. 46, 545–568. https://doi.org/10.1146/annurev-environ-012220-014708

Define final debate topics

Feb 2 **Adaptation**

Baldassarre, G. Di, Viglione, A., Carr, G., Kuil, L., Yan, K., n.d. Debates - Perspectives on Socio-Hydrology : Capturing Feedbacks between Physical and Social Processes 1–26.

Eriksen, S., Schipper, E.L.F., Scoville-Simonds, M., Vincent, K., Nicolai Adam, H., Brooks, N., Harding, B., 2020. Adaptation interventions and their effect on vulnerability in developing countries: help, hindrance or irrelevance? World Dev. Rev. 141, 105383. https://doi.org/10.1016/j.worlddev.2020.105383

Eakin, H.C., Lemos, M.C., Nelson, D.R., 2014. Differentiating capacities as a means to sustainable climate change adaptation. Glob. Environ. Chang. 27, 1–8. https://doi.org/10.1016/j.gloenvcha.2014.04.013

Johnson, D.E., Parsons, M., Fisher, K., 2021. Indigenous climate change adaptation: New directions for emerging scholarship. Environ. Plan. E Nat. Sp. 0, 251484862110224. https://doi.org/10.1177/25148486211022450

Adger, W.N., Dessai, S., Goulden, M., Hulme, M., Lorenzoni, I., Nelson, D.R., Naess, L.O., Wolf, J., Wreford, A., 2009. Are there social limits to adaptation to climate change? Clim. Change 93, 335–354. https://doi.org/10.1007/s10584-008-9520-z

Huq, S., Roberts, E., Fenton, A., 2013. Loss and damage. Nat. Clim. Chang. 3, 947–949. https://doi.org/10.1038/nclimate2026

Optional:

Turner, B.L., Shajaat Ali, A.M., 1996. Induced intensification: Agricultural change in Bangladesh with implications for Malthus and Boserup. Proc. Natl. Acad. Sci. U. S. A. 93, 14984–14991. https://doi.org/10.1073/pnas.93.25.14984

Debate assignments

Feb 9 **Resilience and Transformation**
-Lakshmi Charli-Joseph guest speaker
http://lancis.ecologia.unam.mx/personal/lakshmi

Scoones, I., Stirling, A., Abrol, D., Atela, J., Charli-Joseph, L., Eakin, H., Ely, A., Olsson, P., Pereira, L., Priya, R., van Zwanenberg, P., Yang, L., 2020. Transformations to sustainability: combining structural, systemic and enabling approaches. Curr. Opin. Environ. Sustain. 42, 65–75. https://doi.org/10.1016/j.cosust.2019.12.004

O'Brien, K., 2012. Global environmental change II: From adaptation to deliberate transformation. Prog. Hum. Geogr. 36, 667–676. https://doi.org/10.1177/0309132511425767

*Umbela Conversatorio 2: Planting Shared Dreams
https://umbela.org/blog/conversatorio-2/
*this is a 30 min video

Olsson, L., Jerneck, A., Thoren, H., Persson, J., O'Byrne, D., 2015. Why resilience is unappealing to social science: Theoretical and empirical investigations of the scientific use of resilience. Sci. Adv. 1, e1400217–e1400217. https://doi.org/10.1126/sciadv.1400217

Holling, C.S., 2001. Understanding the complexity of economic, ecological, and social systems. Ecosystems 4, 390–405. https://doi.org/10.1007/s10021-001-0101-5

Meerow, S., Newell, J.P., Stults, M., 2016. Defining urban resilience : A review. Landsc. Urban Plan. 147, 38–49. https://doi.org/10.1016/j.landurbplan.2015.11.011

Optional:

Eakin, H., Bojórquez-Tapia, L.A., Janssen, M.A., Georgescu, M., Manuel-Navarrete, D., Vivoni, E.R., Escalante, A.E., Baeza-Castro, A., Mazari-Hiriart, M., Lerner, A.M., 2017. Opinion: Urban resilience efforts must consider social and political forces. Proc. Natl. Acad. Sci. 114, 186–189. https://doi.org/10.1073/pnas.1620081114

Chambers, J.M., Wyborn, C., Klenk, N.L., Ryan, M., Serban, A., Bennett, N.J., Brennan, R., Charli-Joseph, L., Fernández-Giménez, M.E., Galvin, K.A., Goldstein, B.E., Haller, T., Hill, R., Munera, C., Nel, J.L., Österblom, H., Reid, R.S., Riechers, M., Spierenburg, M., Tengö, M., Bennett, E., Brandeis, A., Chatterton, P., Cockburn, J.J., Cvitanovic, C., Dumrongrojwatthana, P., Paz Durán, A., Gerber, J.-D., Green, J.M.H., Gruby, R., Guerrero, A.M., Horcea-Milcu, A.-I., Montana, J., Steyaert, P., Zaehringer, J.G., Bednarek, A.T., Curran, K., Fada, S.J., Hutton, J., Leimona, B., Pickering, T., Rondeau, R., 2022. Co-productive agility and four collaborative pathways to sustainability transformations. Glob. Environ. Chang. 72, 102422. https://doi.org/10.1016/j.gloenvcha.2021.102422

Feb 16 **Political Ecology: Power, Politics, and Access**

Ribot, J.C., Peluso, N.L., 2003. A Theory of Access*. Rural Sociol. 68, 153–181. https://doi.org/10.1111/j.1549-0831.2003.tb00133.x

Avelino, F., Rotmans, J., 2009. Power in Transition: An Interdisciplinary Framework to Study Power in Relation to Structural Change. Eur. J. Soc. Theory 12, 543–569. https://doi.org/10.1177/1368431009349830

Liverman, D., 2015. Reading climate change and climate governance as political ecologies. Routledge Handb. Polit. Ecol. 303–319.

Robbins, P., 2000. The rotten institution: Corruption in natural resource management. Polit. Geogr. 19, 423–443. https://doi.org/10.1016/S0962-6298(99)00087-6

Galaz, V., Crona, B., Dauriach, A., Jouffray, J., Österblom, H., Fichtner, J., 2018. Tax havens and global environmental degradation 14–16. https://doi.org/10.1038/s41559-018-0497-3

Feb 23 **Institutions, Robustness, and Coupled Infrastructure Systems**

Anderies, J.M., Janssen, M., 2016. Institutions and the performance of Coupled Infrastructure Systems. Int. J. Commons Special Is, 1–10. https://doi.org/http://doi.org/10.18352/ijc.651

Tellman, B., Bausch, J.C., Eakin, H., Anderies, J.M., Mazari-Hiriart, M., Manuel-Navarrete, D., Redman, C.L., 2018. Adaptive pathways and coupled infrastructure: seven centuries of adaptation to water risk and the production of vulnerability in Mexico City. Ecol. Soc. 23, art1. https://doi.org/10.5751/ES-09712-230101

Anderies, J.M., 2015. Managing variance: Key policy challenges for the Anthropocene. Proc. Natl. Acad. Sci. 112, 14402–14403. https://doi.org/10.1073/pnas.1519071112

Carpenter, S.R., Brock, W.A., Folke, C., van Nes, E.H., Scheffer, M., 2015. Allowing variance may enlarge the safe operating space for exploited ecosystems. Proc. Natl. Acad. Sci. 201511804. https://doi.org/10.1073/pnas.1511804112

Optional:

Janssen, M.A., Anderies, J.M., Baeza, A., Breetz, H.L., Jasinski, T., Shin, H.C., Vallury, S., 2019. Highways as coupled infrastructure systems: an integrated approach to address sustainability challenges. Sustain. Resilient Infrastruct. 00, 1–12. https://doi.org/10.1080/23789689.2019.1708181

Mar 2- no class AAG

Mar 9 spring break

March 16
IPCC Working group 2: Vulnerability, Adaptation, and Impacts of Climate Change and The Earth Commission: Safe/Just Corridors
Guest lecture- Diana Liverman

Working Group II Executive Summary for Policy Makers (Forthcoming, available February 25).*

*Note I may assign individual chapters to students so we can split the material amongst the class.

Liverman et al. IPCC and Gender (Forthcoming in Nature- available in February)

Rockström, J., Gupta, J., Lenton, T.M., Qin, D., Lade, S.J., Abrams, J.F., Jacobson, L., Rocha, J.C., Zimm, C., Bai, X., Bala, G., Bringezu, S., Broadgate, W., Bunn, S.E., DeClerck, F., Ebi, K.L., Gong, P., Gordon, C., Kanie, N., Liverman, D.M., Nakicenovic, N., Obura, D., Ramanathan, V., Verburg, P.H., van Vuuren, D.P., Winkelmann, R., 2021. Identifying a Safe and Just Corridor for People and the Planet. Earth's Futur. 9, 1–7. https://doi.org/10.1029/2020EF001866

March 23 **Land Systems Science**

Tellman, B., Magliocca, N.R., Turner, B.L., Verburg, P.H., 2019. Understanding the role of illicit transactions in land-change dynamics. Nat. Sustain. https://doi.org/10.1038/s41893-019-0457-1

Meyfroidt, P., Roy Chowdhury, R., de Bremond, A., Ellis, E.C., Erb, K.H., Filatova, T., Garrett, R.D., Grove, J.M., Heinimann, A., Kuemmerle, T., Kull, C.A., Lambin, E.F., Landon, Y., le Polain de Waroux, Y., Messerli, P., Müller, D., Nielsen, J., Peterson, G.D., Rodriguez García, V., Schlüter, M., Turner, B.L., Verburg, P.H., 2018.

Middle-range theories of land system change. Glob. Environ. Chang. 53, 52–67. https://doi.org/10.1016/j.gloenvcha.2018.08.006

Turner II, B.L., Lambin, E.F., Reenberg, A., 2007. The emergence of land change science for global environmental change and sustainability 103, 13070–13075.

McSweeney, K., Coomes, O.T., 2020. Who owns the Earth? A challenge for the land system science community. J. Land Use Sci. 00, 1–7. https://doi.org/10.1080/1747423X.2020.1765428

Pick one of the following:

Murillo-Sandoval, P.J., Gjerdseth, E., Correa-Ayram, C., Wrathall, D., Van Den Hoek, J., Dávalos, L.M., Kennedy, R., 2021. No peace for the forest: Rapid, widespread land changes in the Andes-Amazon region following the Colombian civil war. Glob. Environ. Chang. 69, 102283. https://doi.org/10.1016/j.gloenvcha.2021.102283

Seto, K.C., Reenberg, A., Boone, C.G., Fragkias, M., Haase, D., Langanke, T., Marcotullio, P., Munroe, D.K., Olah, B., Simon, D., 2012. Urban land teleconnections and sustainability. Proc. Natl. Acad. Sci. U. S. A. 109, 7687–92. https://doi.org/10.1073/pnas.1117622109

Optional:

Chen, T.K., Seto, K.C., Chen, T.K., 2022. Gender and authorship patterns in urban land science. J. Land Use Sci. 00, 1–17. https://doi.org/10.1080/1747423X.2021.2018515

March 30 **Debate I: Limits to Adaptation: Managed Retreat, Climate Insurance, and Loss and Damage:**

Resolved: Governments should pay for the costs of climate change

Reading:

Surminski, S., Bouwer, L.M., Linnerooth-Bayer, J., 2016. How insurance can support climate resilience. Nat. Clim. Chang. 6, 333.

Mechler, R., Singh, C., Ebi, K., Djalante, R., Thomas, A., James, R., Tschakert, P., Wewerinke-Singh, M., Schinko, T., Ley, D., Nalau, J., Bouwer, L.M., Huggel, C., Huq, S., Linnerooth-Bayer, J., Surminski, S., Pinho, P., Jones, R., Boyd, E., Revi, A., 2020. Loss and Damage and limits to adaptation: recent IPCC insights and implications for climate science and policy. Sustain. Sci. 15, 1245–1251. https://doi.org/10.1007/s11625-020-00807-9

Haasnoot, M., Lawrence, J., Magnan, A.K., 2021. Pathways to coastal retreat. Science (80-.). 372, 1287–1290. https://doi.org/10.1126/science.abi6594

Debate II: Net Zero: Geoengineering, carbon capture, and offsets

Resolved: Net Zero carbon emissions will be achieved with geoengineering, carbon capture, offsets, and other technologies, and necessary to significantly reduce dangerous impacts of climate change.

Reading:

Lawrence, M.G., Schäfer, S., Muri, H., Scott, V., Oschlies, A., Vaughan, N.E., Boucher, O., Schmidt, H., Haywood, J., Scheffran, J., 2018. Evaluating climate geoengineering proposals in the context of the Paris Agreement temperature goals. Nat. Commun. 9. https://doi.org/10.1038/s41467-018-05938-3

Harding, A.R., Ricke, K., Heyen, D., MacMartin, D.G., Moreno-Cruz, J., 2020. Climate econometric models indicate solar geoengineering would reduce inter-country income inequality. Nat. Commun. 11, 1–9. https://doi.org/10.1038/s41467-019-13957-x

Keith, D.W., 2021. Toward constructive disagreement about geoengineering. Science (80-.). 374, 812–818. https://doi.org/10.1126/science.abj1587

David Keith NYtimes essay:
https://www.nytimes.com/2021/10/01/opinion/climate-change-geoengineering.html

* podcast from the Economist, August 2021, first 10 mins:
https://www.economist.com/podcasts/2021/08/17/why-is-the-idea-of-solar-geoengineering-so-controversial

Klein, Naomi, 2014. Chapter 8: Dimming the Sun. In: *This Changes Everything : Capitalism vs. the Climate.*

April 6

Debate III: AI/Big Data and Climate Tech for Sustainable Development and Climate Mitigation/Adaptation

Resolved: AI and Climate Tech are essential to meeting the Sustainable Development Goals

-maybe Lauren Gifford speak?

Reading:

Jean, N., Burke, M., Xie, M., Davis, W.M., Lobell, D.B., Ermon, S., 2016. Combining satellite imagery and machine learning to predict poverty. Science (80-.). 353, 790–794. https://doi.org/10.1126/science.aaf7894

see: www.atlasai.co

Jain, M., Balwinder-Singh, Rao, P., Srivastava, A.K., Poonia, S., Blesh, J., Azzari, G., McDonald, A.J., Lobell, D.B., 2019. The impact of agricultural interventions can be doubled by using satellite data. Nat. Sustain. 2, 931–934. https://doi.org/10.1038/s41893-019-0396-x

Fiedler, Tanya, Andy J. Pitman, Kate Mackenzie, Nick Wood, Christian Jakob, and Sarah E. Perkins-Kirkpatrick. "Business Risk and the Emergence of Climate Analytics." *Nature Climate Change*, February 8, 2021. https://doi.org/10.1038/s41558-020-00984-6.

Lower Carbon Capital Blogs:
https://lowercarboncapital.com/act2/
https://lowercarboncapital.com/2021/03/14/forbes-chris-sacca-unretired/

Giridharadas, Anand. Chapter 3: Rebel-Kings in Worrisome Berets. In: *Winners Take All : The Elite Charade of Changing the World*. First ed. New York: Alfred A. Knopf, 2018. Print. pp 60-88

April 13

Debate IV: Half Earth and Space for Nature
Resolved: Half Earth should be implemented

Reading:

Dinerstein, E., Olson, D., Joshi, A., Vynne, C., Burgess, N.D., Wikramanayake, E., Hahn, N., Palminteri, S., Hedao, P., Noss, R., Hansen, M., Locke, H., Ellis, E.C., Jones, B., Barber, C.V., Hayes, R., Kormos, C., Martin, V., Crist, E., Sechrest, W., Price, L., Baillie, J.E.M., Weeden, D., Suckling, K., Davis, C., Sizer, N., Moore, R., Thau, D., Birch, T., Potapov, P., Turubanova, S., Tyukavina, A., De Souza, N., Pintea, L., Brito, J.C., Llewellyn, O.A., Miller, A.G., Patzelt, A., Ghazanfar, S.A., Timberlake, J., Klöser, H., Shennan-Farpón, Y., Kindt, R., Lillesø, J.P.B., Van Breugel, P., Graudal, L., Voge, M., Al-Shammari, K.F., Saleem, M., 2017. An Ecoregion-Based Approach to Protecting Half the Terrestrial Realm. Bioscience 67, 534–545. https://doi.org/10.1093/biosci/bix014

Ellis, E.C., Mehrabi, Z., 2019. Half Earth: promises, pitfalls, and prospects of dedicating Half of Earth's land to conservation. Curr. Opin. Environ. Sustain. 38, 22–30. https://doi.org/10.1016/j.cosust.2019.04.008

Debate V: TBD- class will define together

April 27

Debate VI: TBD- class will define together

Debate VII: TBD- class will define together

May 4: Final Project Presentations ~10 min each