ERS 701:
Sustainability in Complex Systems

School of Environment, Resources and Sustainability
University of Waterloo
Fall 2020
Fridays: 11:30 a.m. – 1:00 p.m.

Instructor Information

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Special organizational notes:

- The lecture materials are created jointly for both ERS 701 and ERS 680, the core introductory course for SERS master's students. Each week, lecture material explaining and exploring key concepts will be made available that will provide context for the readings.
- We will have a live discussion every Friday where we can elaborate on threads in the discussion boards, debate key ideas, and answer questions about the readings, course assignments, lectures, etc. Attendance is not mandatory; sessions will be recorded and posted for those unable to attend.

Course Description

The course is about how best to move towards a sustainable society in a world of complex socio-ecological systems and interactions. As a core offering in the ERS doctoral programme, this course is intended to help participants with different backgrounds and research interests to:

- See how insights from a variety of different fields can contribute to the pursuit of a sustainable society in a complex world;
- Expand their understanding of the nature and implications of the broad sustainability-in-complexity context;
- Build a basic conceptual foundation for designing and carrying out research in this context; and
- Begin to situate their doctoral research project within the context of sustainability-in-complexity.

The course will also involve considering how to deal with the various big apparent tensions – between global and local, immediate and long term, socio-economic and ecological, carefully

planned and designed for surprise, highly complex and practically manageable, generally applicable and context specific, etc.

CORE CONCEPTS

The approach here rests on a set of basic propositions. Five main ones are as follows:

- Sustainability, understood as attractive long-term viability, involves the interactions among ecological (biophysical) and human (physical, social, psychological, cultural, political, economic, institutional, etc.) factors over time and at many linked scales;
- The relationships involved are interactions of and in complex socio-ecological systems that are diverse, multi-scalar, nested and intersecting, dynamic and surprise-filled;
- Because many key trends globally and locally are towards deeper unsustainability, moving towards a desirable future entails considerable transformation as well as strengthening of what we wish to maintain;
- In all sustainability issues and decisions, the specifics of the case and context are always crucial; and
- What we choose to do in pursuit of sustainability is ultimately a matter of ethics as well as understanding, and an appreciation of the relations among ethics, understanding and uncertainty is likely to be helpful.

These propositions are open to challenge. And beyond these propositions, there is no proper framework to be taught or accepted. Critical exploration in the doctoral course will lead different individuals to different conclusions, and subsequent study will provide new enlightenment and perhaps very different perspectives. At the same time, each participant will be encouraged to assemble and be able to defend with evidence and logic his or her own working framework for understanding and applying the concepts of sustainability in complexity, most immediately for setting an agenda for their own anticipated research.

Course Goals and Objectives

A. Describe prevailing assumptions, institutional structures, and practices about systems, sustainability, and governance thereof.

   - Understand predominant narratives about society and ecology.
   - Advance critiques of assumptions and practices that contribute to unsustainability.

B. Articulate a coherent view of the basic characteristics of alternative assumptions and institutions that may contribute to sustainability objectives.

   - Synthesize alternative assumptions into a vision for sustainability.
   - Explain this vision through written work, with reference to your own research interests.

C. Develop a set of working propositions about the most desirable means creating transformation; for instance, your conclusions about appropriate strategies and tactics, applying various analytic tools and techniques, etc.

- Describe the kinds of research and analysis that might be used to create sustainable transitions/transformations.

What to Expect Each Week:

- Intro and Lecture Materials on Mondays (approx. 30-60 min.). Watch on your own schedule.
- Required readings (approx. 4-5 articles) and online discussions
  - You must post first before seeing other threads. Prompts are typically about the readings.
- Live discussion on Fridays (approx. 60-80 minutes)
  - I will start each session with reminders and any questions I have received or seen in the discussion board.
  - We will take discussion deeper in person, answer lingering questions, chat about the program, etc.
  - Discussion boards will remain open afterwards if you have additional thoughts or were not able to attend the live session.

Readings

Each week, everyone is expected to read ***at least*** the required readings specified below before participating in the online discussions. The required readings are established to ensure that we all have a base of common reference upon which we can build our discussions. You are encouraged to read these selections critically, with reference to both the lecture materials provided and your own expertise.

All of the core readings are available electronically via LEARN, either as a PDF or a link to the article in question (per copyright rules).

Suggested Texts:
For those wishing to delve a little more deeply into complex systems and sustainability, the following books are recommended, but not required:

Robert B. Gibson, *Sustainability Assessment: Criteria and Processes* (London: Earthscan, 2005)

Brian Walker and David Salt, *Resilience Practice: Building capacity to absorb disturbance and maintain function* (Washington: Island, 2012).

David Waltner-Toews, James J. Kay and Nina-Marie E. Lister, editors, *The Ecosystem Approach: complexity, uncertainty and managing for sustainability* (New York: Columbia University Press, 2008).

There are also long lists of suggested readings on Learn from which you may also read, particularly where titles or subjects pique your curiosity and relate to your own research project(s).

Grade Breakdown

Online Discussion Board Attendance	10% - Ongoing
Participation	10% - Ongoing
Draft Research Proposal	10% - Due Monday, Sept. 28 by 11:59 p.m.
Reading Response #1 (Weeks 1-5)	20% - Due Monday, Oct. 19 by 11:59 p.m.
Reading Response #2 (Weeks 6-9)	20% - Due Monday, Nov. 16 by 11:59 p.m.
Commentary Paper (Weeks 10-12)	30% - Due Monday, Dec. 7 by 11:59 p.m.

Online Discussion Board "Attendance" – 10%
Each week will include online and virtual synchronous discussions of the readings and lecture material. Participation in the online discussion boards will form the basis of the participation grade. Most weeks you will need to post at least one original comment/question before you can participate in the rest of the conversation. From there, you will be expected to engage with at least 2 other comments made by your classmates or by me. This means, at minimum, you will be making 3 posts per week (typically: 1 original + 2 responses) though you are encouraged to participate more than that and to engage in an open dialogue with your classmates.

You will earn one attendance point for doing the minimum number of posts (3) each week. Don't worry if you miss a week - there are 12 weeks where you can earn points, so you can participate in just 10 weeks and still earn a perfect "attendance" score. You will not be able to earn a score higher than 10/10 on attendance.

You are encouraged to post at least your first comment/question prior to the Friday live discussion. You will get much more out of the live discussion if you are actively participating in the discussion boards and keeping up with the readings. However, there is no penalty if you post after the live discussion. Do note, though, that simply re-creating someone else's ideas in your posts without adding your own ideas is likely to result in a lower overall participation grade (see below).

Participation Grade – 10%
In addition to the "attendance" in the discussion, I will also award a grade out of 10 on the overall quality of your participation at the end of the term. The quality of posts will be judged based on your engagement with the course lectures, readings and any other course materials as well as what other students and I are posting. This isn't to say that your posts need to be perfect articulations of every idea, but that the post(s) show that you are making a good effort, are engaged with the readings, demonstrating original thought, and meaningfully engaging with other students' posts and ideas as well. Posts that simply reiterate other students' ideas or briefly state agreement or disagreement without a meaningful engagement will not score well.

Do note that the online discussion forums are not anonymous. You should only write things that you would feel comfortable saying to someone else in person. UWaterloo's academic integrity policies also apply in the Forums, which means not only that you should provide credit for words and ideas that are not yours, but also that you should act ethically and appropriately. Refer to Policy 71 for the details.

Draft Research Proposal – 10%
During Week 3, everyone will submit a 400-600 word draft research proposal for their intended research program. The proposal should provide as detailed a description of your proposed doctoral research project as you can manage at this time. In line with Tri-Agency Requirements, try to be as specific as possible, provide background information to position your proposed research within your field, and state the significance of the proposed research to your field of interest. As appropriate for your research area, state the research question, objectives and/or hypothesis (if applicable), as well as the expected methods and procedures to be used. The proposal should be single-spaced, using 12-point font, with 1-inch margins. A separate page can be attached for your references – they will not count towards the word count.

You will receive feedback on your proposal which you may later use to apply for scholarships and awards; however, it is your responsibility to ensure that you are eligible for the awards for which you are applying and have completed all of the other application requirements. Beyond these basic requirements noted above, you are encouraged to format your proposal in line with the requirements of the award for which you are applying or may apply for in the future.

I want you to succeed in this course: Starting a PhD is daunting at the best of times. While I have tried to build the course with lots of flexibility to account for different timelines, locations, and research interests, as well as the changing dynamics of a global pandemic, this is still a challenging course. Please be in touch if you feel you need additional support due to illness, safety, or other personal concerns.

Reading Responses (2 x 20% each)

You are responsible for writing two 1800-2400-word reading responses throughout the term. The main purpose of these assignments is to help deepen your general understanding of issues concerning sustainability and complexity and clarify the links among these issues.

Each reading response should:

- Develop an idea or argument about the concepts/issues about which you have read.
- Include a short introduction that outlines this idea/argument.
- Demonstrate familiarity (though not necessarily agreement) with the key points raised in the lectures and/or readings.
- Use the remainder of the response to present evidence from the readings and outline your thinking about them.
- Address at least three readings from any of the relevant weeks of class.
    - As we move along, you will likely want to connect to concepts from earlier in the course, and I encourage you to do so. But be sure to address readings and concepts from the immediately preceding weeks.
    - You may address readings from one weekly topic or several, as you see fit.
    - You are encouraged to select additional readings that suit your interests and incorporate them into your responses as you see fit. These may be readings you are doing in support of your own research project.
- Use proper bibliographic citation and include one additional page for your references. Any citation style you prefer is fine, so long as you are consistent.

Questions to consider when writing:

- What is the significance and/or implications of these ideas with regard to the larger sustainability and complexity issues being covered in class?
- What connections or conflicts do you see across the readings?
- What information, ideas, or content do you find useful to your own thinking about sustainability and complexity?
- What information, ideas or content do you disagree with or find challenging? Why?

Commentary paper – 30% - Due Wednesday, Dec. 9 by 11:59 p.m.

In addition to responding to the same prompts above, this final paper will also include a discussion of what you consider to be the essentials of a defensible ethical/analytical framework for making decisions (including on research agendas) in your area, seeking to contribute to sustainability and/or recognizing complexity. It should address these questions:

- What principles of sustainability/complexity are important in a general sense?
- How should more specific principles or guidelines be developed for application in your research area (or another area of interest)?
    - You may find it useful to focus on a particular case and/or context based on your interests or expertise.

You are free to challenge any of the underlying premises/propositions in the course, so long as your challenge is supported by good, scholarly argumentation and a solid understanding of the course material.

As noted above, this can focus on your own research agenda and how any of the concepts in the course are relevant for how you expect to design research or how this research fits into the broader themes.

Grading Rubric:

- Familiarity with the concepts and sources, ideas and implications covered by the course (40%);
- Coherence of argument, including insightful understanding, logical flow, emphasis on most significant points, effective use of evidence, integration of ideas, attention to implications, and appropriate credit to sources (40%);
- Clarity of writing, taking into consideration the structure and organization of thoughts and argument, effective linking of broad ideas to special illustrations or examples, proper grammar and syntax, concise presentation, and ease of understanding (20%).

The paper should be properly referenced and 2400-3000 words in length. You will likely find it useful for your own purposes to illustrate your key points with examples or applications in your anticipated dissertation topic area, however this is not strictly required. Electronic submissions can be placed in the appropriate dropbox in the ERS 701 LEARN site.

Schedule

1. September 8	Introduction
Part 1: Sustainability and Complexity Challenges	
2. September 14	Goals, Limits and Indicators of better and worse
3. September 21	What Sustainability means and entails
4. September 28	Living in complex socio-ecological systems
5. October 5	Issue linkages and cross-scale feedbacks
October 12	No Class [Reading Week]
Part 2: Sustainability and complexity solutions	
6. October 19	Socio-ecological system integrity, resilience and transformation
7. October 26	Efficiency
8. November 2	Equity, sufficiency, opportunity, civility and democracy
9. November 9	Integration (ethics, requirements, contexts and trade-offs)
Part 3: Sustainability and complexity Applications	
10. November 16	Limits: boundaries and opportunities, growth and (de)growth
12. November 23	New frameworks for understanding and analysis
12. November 30	Strategies for navigating change

Email Policy: When emailing, anticipate hearing back from me within 1-2 business days (Monday-Friday, 9 a.m. – 5 p.m.) of sending your initial email. All emails regarding ERS 701 should include the course code in the subject line. I will not answer questions about written assignments within 24 hours of the due date, so please arrange to ask questions in advance.

Late Policy:
Grace Period: The three written assignment due dates each have a **3-day grace period** during which time no late penalty will apply. No documentation is required. You are encouraged to submit everything on time in order to keep up with the class, but given the current state of the world, do use these days as needed.

There is also a **2-day grace period for the discussion boards**. You will have a full week to participate plus 2 extra days before the discussion board will be locked. You can always review the discussion boards later on, but you will not be able to add new material.

Late Penalty: All written assignments submitted after the grace period will receive an **automatic penalty of 5 percentage points** (out of 100 points available on the assignment) per day, to a maximum 50% penalty. No assignments will be accepted after 14 days past the due date unless you have requested and received an extension.

Important UW policies and services on key course-related topics

Academic Integrity: In order to maintain a culture of academic integrity, members of the University of Waterloo community are expected to promote honesty, trust, fairness, respect and responsibility. See **http://www.uwaterloo.ca/academicintegrity/**. Every student is expected to know what constitutes academic integrity, to avoid committing academic offences, and to take responsibility for his or her actions. A student who is unsure whether an action constitutes an offence, or who needs help in learning how to avoid offences (e.g., plagiarism, cheating), should visit the on-line tutorial at **http://www.lib.uwaterloo.ca/ait/** and seek guidance from the course professor, academic advisor, or the Undergraduate Associate Dean.

When misconduct has been found to have occurred, disciplinary penalties will be imposed under Policy 71 – Student Discipline. For information on categories of offenses and types of penalties, students should refer to Policy 71 - Student Discipline, http://www.adm.uwaterloo.ca/infosec/Policies/policy71.htm

Within the Faculty of Environment, those committing academic offences (e.g. cheating, plagiarism) will be placed on disciplinary probation and will be subject to penalties that may include a grade of 0 on affected course elements, 0 on the course, suspension, and expulsion.

Grievances: A student who believes that a decision affecting some aspect of his/her university life has been unfair or unreasonable has the right to grieve. See Policy 70 – Student Petitions

and Grievances, www.adm.uwaterloo.ca/infosec/Policies/policy70.htm. When in doubt please contact your Graduate Advisor for details.

Appeals: A decision made or penalty imposed under Policy 70 – Student Petitions and Grievances (other than a petition) or Policy 71 – Student Discipline may be appealed if there is a ground. A student who believes he or she has a ground for an appeal should refer to Policy 72 – Student Appeals, www.adm.uwaterloo.ca/infosec/Policies/policy72.htm.

Disabilities: The AccessAbility Office, located in Needles Hall, Room 1132, collaborates with all academic departments to arrange appropriate accommodations for students with disabilities without compromising the academic integrity of the curriculum. If you require academic accommodations to lessen the impact of your disability, please register with the AccessAbility Office at the beginning of each academic term.

Mental Health: The University of Waterloo, the Faculty of Environment and our Departments consider students' well-being to be extremely important. We recognize that throughout the term students may face health challenges – physical and/or emotional. Mental health is a serious issue for everyone and can affect your ability to do your best work. ***Help is available.*** Counselling Services (http://www.uwaterloo.ca/counselling-services) is an inclusive, non-judgmental, and confidential space for anyone to seek support. They offer confidential counselling for a variety of areas including anxiety, stress management, depression, grief, substance use, sexuality, relationship issues, and much more.

Religious observances: A student needs to inform the instructor at the beginning of term if special accommodation needs to be made for religious observances that are not otherwise accounted for in the scheduling of classes and assignments.

Unclaimed assignments: Assignments that are not picked up by students will be retained for four months after the course grades become official in Quest. After that time, they will be destroyed in compliance with UW's procedures for confidential shredding: https://uwaterloo.ca/central-stores/confidential-shredding.

Weekly agenda and readings

1. September 8: Introduction to the course

Required readings:

- Kate Raworth, "Want to get into the doughnut? Tackle inequality," Exploring doughnut economics (2014), http://www.kateraworth.com/2014/10/16/doughnut-inequality/

- Thomas Sterner et al., "Policy design for the Anthropocene," *Nature Sustainability* 2 (January 2019), pp.14-21. https://www-nature-com.proxy.lib.uwaterloo.ca/articles/s41893-018-0194-x

- Giovanna Di Chiro, "Environmental Justice and the Anthropocene Meme," in *The Oxford Handbook of Environmental Political Theory*, Edited by Teena Gabrielson, Cheryl Hall, John M. Meyer, and David Schlosberg (2016). https://www-oxfordhandbooks-com.proxy.lib.uwaterloo.ca/view/10.1093/oxfordhb/9780199685271.001.0001/oxfordhb-9780199685271-e-18

- Will Steffen et al., "Trajectories of the Earth System in the Anthropocene," PNAS 155:33 (August 14, 2018), [about climate feedbacks and hothouse earth], www.pnas.org/cgi/doi/10.1073/pnas.1810141115

Suggested Readings:

- Richard B. Norgaard, "Finding hope in the Millennium Ecosystem Assessment," Conservation Biology 22:4 (2008) pp.862-869.

- Moti Nissani, "Ten cheers for interdisciplinarity," The Social Science Journal 32:2 (1997), pp.201-216;

- F. Wickson, A.L. Carew and A.W. Russell, "Transdisciplinary research: characteristics, quandaries and quality," Futures 38 (2006), pp.1046-1059. https://www-sciencedirect-com.proxy.lib.uwaterloo.ca/science/article/pii/S0016328706000553?via%3Dihub

2. September 14: From indicators to actions: critiques, visions, strategies, tactics

Discussion Group exercise:

Task #1:

a. CHOOSE one major topic of concern that is relevant to sustainability and about which formal indicators have been identified and tracked. You may it easiest to choose something related to the SDGS or you may choose something related to your own research. Some ideas include: global or other scales of armed conflict, biodiversity, child health, climate change, competitiveness, consumption, contaminant emissions, corporate responsibility, cultural diversity, democracy, development, ecological footprint, ecological integrity, fisheries, food production, food security, GDP, green performance, happiness, health, human rights, inequity, international trade, investment, major "natural" disasters, population, poverty, progress, security, water quality, water supply, weapons, wellbeing/quality of life, and various combinations (ecosystem and human wellbeing, health and equity, footprints and biodiversity, etc.)

b. FIND one recent, credible report on the topic (see the list of sources on indicators on the ERS 701 D2L site);
c. DESCRIBE to the group on what is revealed by the report in your initial post.

In your post, please pay particular attention to:

- What indicators are considered important (and whether it seems some are overlooked);
- What indicators do well in illuminating the contributing factors; and
- What you can find about what works (where progress towards sustainability is being made), rather than only what trends are negative

Task #2:
Find one additional indicator, quantitative or qualitative, on any factor that might in its small way reveal something larger – from any perspective, at any scale from the microscopic to the planetary – to report on, very briefly, to the group.

Required readings:

- Your chosen *credible* report, as described above. See the list of reports on LEARN.

- Paul Ekins and Arkaitz Usubiaga, "Brundtland+30: the continuing need for an indicator of environmental sustainability," in James Meadowcroft, et al., What Next for Sustainable Development? Our Common Future at Thirty (Cheltenham: Edward Elgar, 2019), pp.96-118. Chapter can be downloaded from the library: https://ebookcentral.proquest.com/lib/waterloo/reader.action?docID=5820915&ppg=112

- Tomáš Hák, Svatava Janoušková, Bedřich Moldan, "Sustainable Development Goals: A need for relevant indicators," *Ecological Indicators* 60, January 2016, pp.565-573. https://www-sciencedirect-com.proxy.lib.uwaterloo.ca/science/article/pii/S1470160X15004240?via%3Dihub

- Donella Meadows, "Indicators and Information Systems for Sustainable Development," (Hartland, Vermont: The Sustainability Institute, 1998), http://donellameadows.org/wp-content/userfiles/IndicatorsInformation.pdf. **Read *at least:* pp. viii-xii; Ch. 1.** More, as you prefer.

- Sylvia L. Wood, and Fabrice DeClerck, "Ecosystems and human well-being in the Sustainable Development Goals," Frontiers in Ecology and the Environment, 13 (2015), p.123. Download: https://esajournals-onlinelibrary-wiley-com.proxy.lib.uwaterloo.ca/doi/full/10.1890/1540-9295-13.3.123?sid=vendor%3Adatabase

3. September 21: What does sustainability mean? What does it entail?

Required readings

- Robert B. Gibson, "Sustainability," in Gibson, ed., *Sustainability Assessment: Applications and Opportunities* (London: Routledge/Earthscan, 2017), chap.1;

- R.B. Gibson, et al., *Sustainability Assessment: Criteria and Processes* (London: Earthscan 2005), chap. 5, esp. pp.95-114. [About requirements for sustainability]

- Joan Martinez-Allier, Unai Pascual, Frank-Dominique Vivien, Edwin Zaccai, "Sustainable de-growth: mapping the context, criticisms and future prospects of an emerging paradigm," *Ecological Economics* 69 (2010), pp. 1741-1747.

- Tensie Whelan and Carly Fink, "The comprehensive business case for sustainability," *Harvard Business Review* (October 2016), https://hbr.org/2016/10/the-comprehensive-business-case-for-sustainability

Suggested Reading:

- James Meadowcroft, David Banister, Erling Holden, Oluf Langhelle, Kristin Linnerud, Geoffrey Gilpin, "Introduction," *What Next for Sustainable Development? Our Common Future at Thirty* (Cheltenham: Edward Elgar, 2019), pp.2-8. The book is now available through the UW library at https://ebookcentral.proquest.com/lib/Waterloo/detail.action?docID=5820915]

- World Commission on Environment and Development, Gro Harlem Brundtland, chair, "From One Earth to One World: An Overview," from *Our Common Future* (Oxford/New York: Oxford University Press, 1987), pp.1-23.

4. September 28 - Challenges: Living (and Researching) in Complex Socio-Ecological Systems

Required Readings:

- Cinner, Joshua, 2018. How behavioral science can help conservation. *Science*, 362(6417), pp.889-890.

- Cote, Muriel, and Andrea J. Nightingale. "Resilience Thinking Meets Social Theory: Situating Social Change in Socio-Ecological Systems (SES) Research." *Progress in Human Geography* 36, no. 4 (August 2012): 475–89. doi:10.1177/0309132511425708.

- Holling, C.S. "Understanding the complexity of economic, ecological and social systems," Ecosystems 4:5 (2001), pp.390-405.

- Jianguo Liu, et al. [Liu , J., T. Dietz, S. R. Carpenter, M. Alberti, C. Folke, E. Moran, A. N. Pell, P. Deadman, T. Kratz, J. Lubchenco, E. Ostrom, Z. Ouyang, W. Provencher, C. L. Redman, S. H. Schneider, and W. W. Taylor], "Complexity of Coupled Human and Natural Systems," Science 317 (14 September 2007), pp.1513-1516. https://science-sciencemag-org.proxy.lib.uwaterloo.ca/content/317/5844/1513

- Brian Walker and David Salt, "Preparing for practice: the essence of resilience thinking," *Resilience Practice,* chap 1 (Washington: Island, 2012)*,* pp.1-25.

Suggested Readings:

- James J. Kay and Eric Schneider, "Embracing complexity: the challenge of the ecosystem approach," *Alternatives* 20:3 (1994), pp.32-39.

- James J. Kay, Henry A. Regier, Michelle Boyle and George Francis, "An ecosystem approach for sustainability: addressing the challenge of complexity," *Futures* 31 (1999) pp.721-742.

- Holling, C. S., and G. K. Meffe. 1996. Command and Control and the Pathology of Natural Resource Management. *Conservation Biology* 10:328-337.

- Carpenter, S.R., Ludwig, D. and Brock, W.A., 1999. Management of eutrophication for lakes subject to potentially irreversible change. *Ecological Applications*, 9(3), pp.751-771

5. October 5: Challenges: Issue linkages and cross-scale feedbacks

Required Readings:

- Elinor Ostrom, "A Diagnostic Approach for Going Beyond Panaceas," *Proceedings of the National Academy of Sciences of the United States of America* Vol. 104, No. 39 (2007), pp. 15181-15187. https://login.proxy.lib.uwaterloo.ca/login?qurl=https://www-jstor-org.proxy.lib.uwaterloo.ca/stable/25449110

- Örjan Bodin, Beatrice Crona, Matilda Thyresson, Anna-Lea Golz, and Maria Tengö. 2014. Conservation Success as a Function of Good Alignment of Social and Ecological Structures and Processes. *Conservation Biology* 28:1371-1379.

- Folke, Carl, Pritchard Jr, L., Berkes, Firket, Colding, J. and Svedin, U., 2007. The problem of fit between ecosystems and institutions: ten years later. *Ecology and Society*, 12(1).

- Epstein, G., J. Pittman, S. M. Alexander, S. Berdej, T. Dyck, U. Kreitmair, K. J. Rathwell, S. Villamayor-Tomas, J. Vogt, and D. Armitage. 2015. Institutional fit and the sustainability of social–ecological systems. *Current Opinion in Environmental Sustainability* 14:34-40.

[October 12 – 16 is Fall Reading Week – No Classes]

6. October 19 - Solutions: Socio-ecological System Integrity, Resilience and Transformation

Required Readings:

- Melissa Leach, et al., "Transforming innovation for sustainability," *Ecology and Society* 17:2 (2012):11, 6pp.; http://www.ecologyandsociety.org/vol17/iss2/

- Lennart Olsson, Anne Jerneck, Henrik Thoren, Johannes Persson and David O'Bryne, 2015. "Why resilience is unappealing to social science: theoretical and empirical investigations of the scientific use of resilience," *Science Advances* 1:4 (2015), 22 May 2015, e1400217, ppp.1-11.

- Richard J Hobbs, Eric Higgs, Carol M Hall, Peter Bridgewater, F Stuart Chapin III, et al., 2014. "Managing the whole landscape: historical, hybrid, and novel ecosystems." *Frontiers in Ecology and the Environment* 12 (2014), pp.557–564. http://dx.doi.org/10.1890/130300

- Laura Zanotti, L., Z. Ma, J. L. Johnson, D. R. Johnson, D. J. Yu, M. Burnham, and C. Carothers. 2020. Sustainability, resilience, adaptation, and transformation: tensions and plural approaches. *Ecology and Society* 25(3):4. https://doi.org/10.5751/ES-11642-250304

Suggested Readings:

- B. Walker, C.S. Holling, S.R. Carpenter and A. Kinzig, "Resilience, adaptability and transformability in socio-ecological systems," *Ecology and Society* 9:2 (2004), article 5, http://www.ecologyandsociety.org/vol9/iss2/art5/.

7. October 26 - Solutions: Efficiency

Required readings:

- Tima Bansai, "Growth is in the DNA of business," Network for Business Sustainability (May 2019). https://www.nbs.net/articles/from-timas-desk-what-is-business-sustainability

- Tim Jackson, "The myth of de-coupling," in *Prosperity without Growth: economics for a Finite Planet* (London: Earthscan, 2009), pp.67-86.

- Patrizia Ghisellini, Catia Cialani, Sergio Ulgiati, "A review on circular economy: the expected transition to a balanced interplay of environmental and economic systems," *Journal of Cleaner Production*, Vol. 114, 2016, Pages 11-32, https://doi.org/10.1016/j.jclepro.2015.09.007

- Joachim H. Spangenberg, Alastair Fuad-Luke and Karen Blincoe, "Design for Sustainability: the interface of sustainable production and consumption," Journal of Cleaner Production 18 (2010), pp.1483-1491.

- Tengö, Maria, Eduardo S. Brondizio, Thomas Elmqvist, Pernilla Malmer, and Marja Spierenburg. 2014. Connecting diverse knowledge systems for enhanced ecosystem governance: The multiple evidence base approach. *Ambio* 43, (5) (09): 579-91, http://search.proquest.com.proxy.lib.uwaterloo.ca/docview/1553055279?accountid=14906

8. November 2 - Solutions: equity, sufficiency, opportunity, civility and democracy

Required readings:

- Bina Agarwal. 2000. "Conceptualising Environmental Collective Action: Why Gender Matters." *Cambridge Journal of Economics* 24 (3): 283–310. https://academic-oup-com.proxy.lib.uwaterloo.ca/cje/article/24/3/283/1716832

- Kate Baker, Eichhorn, Markus P., and Griffiths, Mark. Decolonizing field ecology. *Biotropica*. 2019; 51: 288– 292. https://doi-org.proxy.lib.uwaterloo.ca/10.1111/btp.12663

- Mary Menton, Carlos Larrea, Sara Latorre et al. Environmental justice and the SDGs: from synergies to gaps and contradictions. *Sustainability Science* (2020). https://doi-org.proxy.lib.uwaterloo.ca/10.1007/s11625-020-00789-8

- Tim Holland, Garry D. Peterson and Andrew Gonzalez, "A cross-national analysis of how economic inequality predicts biodiversity loss," *Conservation Biology*, 23:5 (2009) pp.1304-1313. https://conbio-onlinelibrary-wiley-com.proxy.lib.uwaterloo.ca/doi/full/10.1111/j.1523-1739.2009.01207.x

Suggested Readings:

- Iris Borowy, "Sustainability and redistribution," pp.120-137, and Ian Gough, "Necessities and luxuries: how to combine redistribution with sustainable consumption," pp.138-

158, in James Meadowcroft, et al., *What Next for Sustainable Development? Our Common Future at Thirty* (Cheltenham: Edward Elgar, 2019) https://ebookcentral.proquest.com/lib/Waterloo/detail.action?docID=5820915]

- Graves, J.L. African Americans in evolutionary science: where we have been, and what's next. Evo Edu Outreach 12, 18 (2019). https://doi.org/10.1186/s12052-019-0110-5

- Martinez-Alier, Joan. 2014. "The Environmentalism of the Poor." *Geoforum* 54 239–41.

- Oxfam, Reward work, not wealth (January 2018), esp.19-23 and 30-32, https://www.oxfam.org/en/research/reward-work-not-wealth

- Parkes, M. and Panelli, R. (2001), Integrating Catchment Ecosystems and Community Health: The Value of Participatory Action Research. Ecosystem Health, 7: 85–106. doi:10.1046/j.1526-0992.2001.007002085.x

Video: Wealth inequality in America (2012), http://www.youtube.com/watch?v=QPKKQnijnsM&feature=player_embedded

9. November 9 - Solutions: integration (ethics, sustainability requirements, contexts and trade-offs)

Required Readings:

- H.S. Afeissa, "The transformative value of ecological pragmatism: an introduction to the work of Bryan G. Norton," *Sapiens: Surveys and Perspectives Integrating Environment and Society* 1:1 (2008), pp.51-57; http://www.surv-perspect-integr-environ-soc.net/1/51/2008/sapiens-1-51-2008.html.]

- R.B. Gibson, "Avoiding sustainability trade-offs in environmental assessment," *Impact Assessment and Project Appraisal* 31:1 (2013), pp.1-12.

- David Orr, "Shelf life," Conservation Biology, 23:2 (April 2009), pp. 248-251 https://doi-org.proxy.lib.uwaterloo.ca/10.1111/j.1523-1739.2009.01187.x

- John Robinson, George Francis, Russel Legge and Sally Lerner, "Defining a sustainable society: values, principles and definitions, *Alternatives* 17:2 (1990), pp.36-46.

Suggested readings:

- R.B. Gibson, ed., Sustainability Assessment: Applications and Opportunities (2017), Chap. 2 (on specification of sustainability criteria for case and context).

- Aldo Leopold, "The land ethic" in *The Sand County Almanac (1949).*

10. November 16 - Applications: Limits vs growth: opportunities, development and degrowth

Required Readings:

- Peter A. Victor, "The idea of economic growth," in P. Victor, Managing without Growth: Slower by Design, not Disaster, 2nd edn (Cheltenham: Elgar, 2019)

- Joseph R. Burger et al, "The macroecology of sustainability," *PLOS Biology* 10:6 (2012).

- Corinna Dengler, Lisa Marie Seebacher, "What About the Global South? Towards a Feminist Decolonial Degrowth Approach," *Ecological Economics*, Volume 157, 2019, Pages 246-252, https://www-sciencedirect-com.proxy.lib.uwaterloo.ca/science/article/pii/S0921800918301228?via%3Dihub

- Nicolas Kosoy, Peter G. Brown, Klaus Bosselmann, Anantha Duraiappah, Brendan Mackey, Joan Martinez-Alier, Deborah Rogers, Robert Thomson (2012), "Pillars for a flourishing Earth: planetary boundaries, economic growth delusion and green economy," *Current Opinion in Environmental Sustainability.* Volume 4 (2012), pp.74-79.

- Van den Bergh, J. "Environment versus growth: a criticism of 'degrowth' and a plea for 'a-growth'," Ecological Economics 70:5 (2011), pp.881-890.

Suggested Readings:

- Georgina M. Mace, "The limits to sustainability science: ecological constraints or endless innovation?" *PLOS Biology* 10:6 (2012).

- François Schneider, Giogos Kallis and Joan Martinez-Alier, "Crisis or opportunity? economic degrowth for social equity and ecological sustainability," *Journal of Cleaner Production* 18 (2010), pp.511-518.

- Peter A. Victor, "We've outgrown growth: we can have it all – full employment, no poverty, lower greenhouse gas emissions and fiscal balance without relying on growth," Alternatives 43:1 (2017), pp.17-20.

- Christa Wichterich. 2015. "Contesting Green Growth, Connecting Care, Commons and Enough." In *Practising Feminist Political Ecologies: Moving Beyond the 'Green Economy'*, edited by Wendy Harcourt, and Ingrid L. Nelson, 67–100. London: Zed Books.

Introductory Videos:

Leah Temper and Claudia Medina, *Life Beyond Growth– Economics for Everyone* (2010) 25 minute film; http://vimeo.com/10871269

Tim Jackson*, An Economic Reality Check*, TED talk (July 2010) http://www.ted.com/talks/lang/en/tim_jackson_s_economic_reality_check.html

Podcast:

Richard Swift, "The degrowth paradigm," *Ideas* (CBC, 10 December 2013), http://www.cbc.ca/ideas/episodes/2013/12/10/the-degrowth-paradigm/#igImgId_83174 [more directly http://www.cbc.ca/ideas/popupaudio.html?clipIds=2423403950]

11. November 23 - Applications: new frameworks for understanding and analysis

Required Readings:

- Elinor Ostrom, "A general framework for analyzing sustainability of social-ecological systems," *Science* 325 (24 July 2009), pp.419-422. https://science-sciencemag-org.proxy.lib.uwaterloo.ca/content/325/5939/419

- Claudia Binder, Jochen Hinkel, Pieter W. G. Bots, and Claudia Pahl-Wostl. 2013. Comparison of Frameworks for Analyzing Social-ecological Systems. *Ecology and Society* 18. https://www.ecologyandsociety.org/vol18/iss4/art26/

- Robbert Biesbroek, Johann Dupuis, and Adam Wellstead, 2017. Explaining through causal mechanisms: resilience and governance of social–ecological systems. *Current Opinion in Environmental Sustainability*, 28, pp.64-70. https://www-sciencedirect-com.proxy.lib.uwaterloo.ca/science/article/pii/S1877343517300556?via%3Dihub

- Maria Tengö, Eduardo S. Brondizio, Thomas Elmqvist, Pernilla Malmer, and Marja Spierenburg. 2014. Connecting diverse knowledge systems for enhanced ecosystem governance: the multiple evidence base approach. *Ambio* 43:579-591. https://search-proquest-com.proxy.lib.uwaterloo.ca/docview/1553055279?rfr_id=info%3Axri%2Fsid%3Aprimo

Suggested Reading List for Future Research (i.e. take note for research design purposes as not all of these are available on LEARN and you will need to seek out on your own):

- Bollen, K. A. 1989. *Structural Equations with Latent Variables*. John Wiley and Sons, New York [not on course website].
- Brady, H. E. 2008. Causation and explanation in social science. Pages 217-270 in J. M. Box-Steffensmeier, H. E. Brady, and D. Collier, editors. *The Oxford handbook of political methodology*. Oxford University Press, New York [not on course website].

- Shadish, W. R., T. D. Cook, and D. T. Campbell. 2002. Experimental and quasi-experimental designs for generalized causal inference. Wadsworth Cengage learning [not on course website].
- Rubin, D. B. 2005. Causal Inference Using Potential Outcomes. *Journal of the American Statistical Association* 100:322-331.
- Ragin, C.C., 2000. Fuzzy-set social science. University of Chicago Press [not on course website].
- Bennett, A., and C. Elman. 2006. Qualitative Research: Recent Developments in Case Study Methods*. Annual Review of Political Science* 9:455-476.
- Janssen, M. A., R. Holahan, A. Lee, and E. Ostrom. 2010. Lab Experiments for the Study of Social-Ecological Systems. *Science* 328:613-617.
- Coleman, E. A., and F. D. Fleischman. 2012. Comparing Forest Decentralization and Local Institutional Change in Bolivia, Kenya, Mexico, and Uganda. *World Development* 40:836-849.

12. December 6 - Applications: strategies for navigating change

Required Readings:

- Kate Raworth, "Why it's time for Doughnut Economics," *Progressive Review* 24:3 (Winter 2017), pp.217-222.

- Andrew Stirling "Sustainability and the politics of transformations: from control to care in moving beyond modernity," pp.219-238, in James Meadowcroft, et al., What Next for Sustainable Development? Our Common Future at Thirty (Cheltenham: Edward Elgar, 2019) [Available at https://ebookcentral.proquest.com/lib/Waterloo/detail.action?docID=5820915]

- James Patterson, Karsten Schulz, Joost Vervoort, Sandra van der Hel, Oscar Widerberg, Carolina Adler, Margot Hurlbert, Karen Anderton, Mahendra Sethi, and Aliyu Barau, "Exploring the governance and politics of transformations towards sustainability," *Environmental Innovation and Societal Transitions* 24 (2017), pp.1-16. https://www-sciencedirect-com.proxy.lib.uwaterloo.ca/science/article/pii/S2210422416300843?via%3Dihub

- Rachael Beddoe et al., "Overcoming systemic roadblocks to sustainability: the evolutionary redesign of worldviews, institutions and technologies," *PNAS*, 106:8 (24 February 2009), pp. 2483-2489, www.pnas.org/content/106/8/2483.

- Frances Westley et al., "Tipping toward sustainability: emerging pathways of transformation," *Ambio* 40 (2011), pp.762-780.