



ERS 680 Sustainability Foundations Fall 2020

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Course organization

- 12 sessions (weekly except for Reading Week)
- this syllabus for the detailed information and a course guide for a quick overview and for navigating the course LEARN site
- lectures posted on the ERS 680 course website (in LEARN under the “content” tab) early Monday for each week there is a course session (not Reading Week); lectures will be in relatively short pieces: typically, an introductory screen capture video with the instructor’s talking head, and following parts as narrated powerpoints)
- readings for each session also posted on LEARN (also under the “content” tab)
- online discussion meetings 11:30am-12:50pm (Waterloo time) on Wednesdays (except Reading Week) for questions, exchange of ideas, and individual contributions on key issues and illustrative applications (we also have an available slot 11:30-12:50 on Mondays, which we may choose to use as well)
- dropboxes for assignments
- online course Discussion Forum (in LEARN under the “connect” tab) for posting contributions for each session
- course Q&A Forum (also in LEARN as a “discussion” under the “connect” tab) all term for questions, and responses to questions, of potentially general interest about the course that are not addressed in the discussion sessions
- course Recommendations Forum (also a “discussion”) all term for suggested course adjustments and proposed other readings, videos, websites
- weekly online announcements, reminders, etc.
- email access to the instructor(s) for individual issues and questions

Purpose

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 SERS masters program, 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 in which specific research is undertaken; and
- build a basic conceptual foundation for designing and carrying out research (and participating in other initiatives and activities) in this broad context.

The course will explore how far we can go in specifying the main objectives and key considerations of sustainability efforts in a complex and uncertain world as basic guides for decisions and decision-making processes for very different issues and contexts. This 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.

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

- sustainability, understood as attractive long-term viability and wellbeing, 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 (historically, currently and desirably in the future) are interactions of and in complex socio-ecological systems that are diverse, multi-scalar, nested and intersecting, dynamic and surprise-filled;
- because we face many key trends towards deeper unsustainability globally (as well as locally in most places) and also value many existing positive but vulnerable contributions to wellbeing, moving towards a desirable future entails considerable transformation as well as strengthening of what we wish to maintain;
- in sustainability issues, deliberations 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 single proper framework to be taught or accepted. Critical exploration 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 anticipated MES research in its larger context.

Assembling this framework will require development of

- a critical grasp of the assumptions and institutional structures and practices that now prevail (your critique);

- a reasonably coherent view of the basic characteristics of alternative assumptions and institutions – or alternative combinations of assumptions and institutions – that are more in keeping with sustainability objectives in a complex world (your vision); and
- a set of working propositions about the most desirable means of making the transformation (your conclusions about the appropriate strategies and tactics applying various tools, techniques, etc.).

Accordingly, ERS 680 examines why sustainability and complex systems thinking have arisen as related critiques of and alternatives to prevailing ideas, institutions and behaviour, what their essential foundations are, what different forms progress towards a sustainable society might take and what main considerations guide development of appropriate strategies. The course also addresses central implementation considerations, especially respect for complexity and uncertainty, the main theories of change and the range of possible applications. It reviews actions that can be taken to help meet essential requirements for sustainability in initiatives for positive change locally and globally, with attention to the problems, barriers and opportunities involved.

Readings

The weekly information below provides great long lists of readings from which to choose. And the lists are likely to be refreshed as we go.

Usually the weekly readings are in two categories – core “readings” and supplementary “additional readings” – but even the core readings are typically more numerous than you will be able to read. The pile of readings is offered here as a resource from which you can select items that suit your needs and preferences. The participants in this class have a grand diversity of backgrounds (areas of existing knowledge and unfamiliarity) and research interests (priorities for exploration) and consequently different foundations to supplement or begin building.

The core weekly readings have been listed in a rough and debatable order of potential importance, which you are free to ignore. Particular interests may lead you to look also in the additional readings. These readings will be supplemented as appropriate throughout the course. Further suggestions are welcome.

All of the core readings are available electronically on the course LEARN website. Login at <http://learn.uwaterloo.ca/> using your WatIAM/Quest username and password. In the session readings lists below, any readings that are not on the course website are identified as [not on the course website].

Also, you should maintain a reading journal for the course. There is an assignment related to that. See below, concerning “Your best two reading journal entries,” page 7.

Online discussion meetings for each session

The course has been assigned two time slots for group online discussion meetings: 11:30-12:50 on Mondays and Wednesdays (except Reading Week). We will begin with

meetings using the Wednesday slot, so that participants will have had an opportunity before the meeting to view/hear the lectures and check out the readings. The meetings will be held using the “virtual classroom” in LEARN (under the “connect” tab).

The discussion meetings are for exchanges of perspectives and comments about the weekly topics, and the ideas, issues, options, alternatives, applications and implications involved. There will also be openings for general questions and suggestions about the course. For discussion purposes, we may choose to focus for a session or a series of sessions on applications and implications for one or more particular issue area, region and/or sector (e.g., transitions required for climate change mitigation, responses to stresses on urban ecosystems and waterways, food and agricultural system alternatives, means of enhancing biodiversity and social justice at the same time). Selection of among discussion options will be guided by the interests and research areas of the participants as well as the broader objectives of the course. Participation in the discussion sessions is not mandatory and will not be graded but should contribute to course learning and community. The sessions will be recorded and posted for those unable to attend.

Assignments

The formally graded assignments, set out in detail below, are

- three reasonably short papers integrating your understandings from the readings and course lectures/discussions and considering implications for your own area of interest, with the third paper also offering a final integration in the form of a broad framework for locating and pursuing work in your research area in light of the big picture of seeking sustainability and respecting complexity in this world;
- your perspective/discussion contribution for each of the 12 sessions; and
- your best reading journal entry from each of the first two parts of the course (sessions 1-5 and sessions 6-9)

An ungraded preliminary assignment about your own research is also included.

Preliminary assignment about your intended area of research

Prepare and submit a concise description of your intended area of research. A paragraph or a set of bullet points will do. No grading is involved. What you can describe now may not be what you end up doing, but having a working topic will give you something to use when considering applications of the ideas presented in the course throughout the term. And as part of the final commentary paper, you will be expected to use your chosen research area (which may be somewhat different by the end of term) as a basis for discussing the implications of material from the course lectures, readings and discussions. Please post the initial version research area description in the “preliminary assignment” dropbox on the course LEARN site by midnight on Friday, Sept 11, but be prepared to discuss it in the discussion for session 1 (September 9).

Three papers integrating your understandings from the readings and course lectures/discussions

The main purpose of the assignment is to encourage a combination of reading and synthesis that will round out and deepen your general understanding of issues concerning sustainability and complexity, clarify the links among these issues and point to important

implications. This is meant in part simply to strengthen your foundations for understanding and acting. But it is useful also to anticipate application in your research area.

The substance of the three papers will be tied to the three main sections of the course:

- sessions 1 to 5 on the introductory basics of sustainability and complexity (the challenges);
- sessions 6 to 9 on major areas for attention in solutions; and
- sessions 10 to 12 on applications including the broad implications for linking big picture understanding with your own specific research and its possible impacts.

Each of the papers should

- present your selection and integration of the key points raised in the lectures, discussions and readings for the sessions involved, and
- offer reasoned insights into the implications broadly, and for work in your research area.

Each paper should cover at least two readings from each of the relevant sessions.

Incorporating ideas from sources outside the course is also a good idea.

Participants' selection of major points to recognize and key implications to identify are expected to vary, given the variety of backgrounds and research fields represented. But all papers should be concerned about building an integrated understanding (not merely listing key points) and link the big picture to matters of more specific personal interest, including especially your area of anticipated focus for the masters thesis or research paper. All papers should reveal growing familiarity (though not necessarily agreement) with the key points raised in the lectures and readings and offer insights into the implications. The papers may also draw from the session discussions.

The first paper nominally covers more session topics than the others. However, the second paper should build on the first and the reveal growing understanding of how all of the considerations in the course so far come together (and to some extent conflict). The third paper provides your summary integration of the key points and implications from the final three sessions with your understandings from the earlier sessions as well as consideration of implications for your anticipated research. The third paper can also be thought of as your conclusions from the course.

The third paper should end with presentation and discussion of what you consider to be the essentials of a defensible ethical/analytical framework for addressing issues and making decisions (including on research agendas) in your area, seeking to contribute to sustainability and recognizing complexity. It should discuss

- what (if any) principles should be applied generally in assessing past experience, in identifying and choosing among potential options for action, and in designing and applying processes for deliberation and decision making; and
- how more specific principles or guides should be developed for application in your research area, perhaps with an illustrative focus on a more or less particular case and/or context

- You are free to challenge any of the underlying premises here, so long as the challenge is supported by good argument.

The considerations noted above will be incorporated in the following rubric for grading the papers, recognizing that the three rubric categories and components in them overlap and interact:

- familiarity with (or mastery of) the concepts and sources, ideas and implications covered by the course (40%);
- coherence (or brilliance) of argument, including insightful understanding, logical flow, emphasis on most significant points, effective use of evidence (with appreciation of its limitations), integration of ideas (recognizing conflicts and tensions), attention to implications, and appropriate credit to sources (40%); and
- clarity (and elegance) 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%).

Each paper should be properly referenced and not more than 2500 words (not including the bibliography). While this is not obligatory, you are likely to find it useful to illustrate your key points and their implications with examples or applications in your anticipated thesis or research paper topic area.

You must use proper grammar but may include bullet point lists. Proper referencing (any recognized style) is mandatory. The submitted product should be comprehensible to a broadly informed but not specialized reader. More importantly, it should also make sense to you in a year or two.

As is the case with all writing assignments, participants are expected to be familiar with the rules against plagiarism and aware of the penalties for offences. See the note on academic offences, below. In all submissions, and in your own notes, it is particularly important to identify clearly when you are quoting from a reading or other source and when you are paraphrasing in your own words. You will not remember later when you come to use your 680 papers in a future manuscript for submission or publication.

- Paper one, covering sessions 1 to 5, is due on Monday, October 19.
- Paper two, covering sessions 6 to 9, is due on Monday, November 16.
- Paper three, covering sessions 10 to 12, is due on Friday, December 11.

Electronic submissions should be placed in the relevant dropbox in the 680 LEARN website before 11:59 on the due date.

Twelve perspective/discussion contributions – one for each session

Each of the twelve sessions will include questions and/or exercises of some sort. See the information on each of the sessions, below. Many of the questions/exercises will be centred on how the issues and ideas raised in the lectures and readings may affect work in your field and perhaps your own research and related activities.

For each session after session one (for which a biography posting is required) you are to prepare a brief perspective as a discussion contribution for sharing with your colleagues.

The contributions will be informally for presentation in the Wednesday discussion meeting for each session and will be formally posted for all in the relevant section “topic” in the Discussion Forum (under the “Connect” tab on the course Learn site), where you can also exchange comments.

Each contribution should be short enough to be presented orally in 2 minutes. That translates to about 400 words, unless you are a professional auctioneer. The posted versions of the contributions can and should also include references to your sources (the references are not included in the 400-word limit, and that limit will not be enforced fiercely).

The substance of the contributions will vary depending on the topic/questions. However, the core objective is to clarify the nature and significance of the issues involved and their implications for application.

Each contribution should be posted on the Discussion Forum in the file for the relevant session after the discussion meeting. Once yours is posted you will be able to see those of your colleagues.

The contributions will be graded in two packages – one for sessions 1-6, and one for sessions 7-12. For grading purposes, please put the relevant contributions into a single document for each package and submit that document to the relevant dropbox on the course LEARN site (under the “Submit” tab). The package for sessions 1-6 is due before midnight on Friday, October 23. The package for sessions 7-12 is due before midnight on Friday, December 4.

Your best two reading journal entries

Quite aside from the immediate purposes of the 680 papers assignment, you should be keeping for future reference a journal of some sort (perhaps centred on an annotated bibliography) where you record new ideas, issues and response options, data, connections, overview framings, arguments and other useful findings from your readings, as well as from lectures and discussions, and other sources. Many reading journal formats work, but normally a journal entry would include

- proper bibliographic references to all written materials and information from other media;
- brief summaries of the main contents, main relevant points made, and issues/questions raised in or by the readings covered;
- relevant points from the class lectures (and discussions if you wish);
- considered comments on the significance and implications of these points or issues/questions, including implications for your understanding of the big picture; and
- attention to connections or conflicts among the ideas considered.

You may also wish to consider implications for your own research, since that will be useful when you get to the final part of paper three (and you will usually be doing that anyway for the discussion contributions for each session).

The formal course assignment is limited to submission of two reading journal entries – covering material for one session in each of first two parts of the course (sessions 1-5 and sessions 6-9). If you do prepare reading journals for all sessions, you can choose your best two.

- Best journal entry one, covering one of sessions 1 to 5, is due on Monday, October 19 in the relevant dropbox on the course LEARN site (under the “submit” tab).
- Best journal entry two, covering one of sessions 6 to 9, is due on Monday, November 16, also in the relevant dropbox.

The grading considerations and rubric for the papers apply generally to the journal entries, but with adjustments to accept a variety of formats and less focus on building an argument:

- familiarity with (or mastery of) the concepts and sources, ideas and implications covered in the session (40%);
- coherence (or brilliance) of selection of key insights, judgment of significance, identification of implications, integration and/or contrast of ideas, critical appreciation of evidence and its limitations, and appropriate credit to sources (40%); and
- clarity of writing, organization of thoughts and evaluations, effective linking of broad ideas to special illustrations or examples, proper grammar and syntax (allowing for suitable use of bullet points and other means of efficient recording and communication), concise presentation, and ease of understanding (20%).

Evaluation

paper 1, sessions 1 to 5	20%
paper 2, sessions 6 to 9	20%
paper 3, sessions 10 to 12 and final framework	30%
discussion contributions, sessions 1-6	10%
discussion contributions, sessions 7-12	10%
best reading journal entries (2 @ 5% each)	10%

Lateness: In the interests of equity, penalties will be assessed for late submission of written assignments. The grade given for a written submission will be reduced by .5 for each day late – a paper assigned 25/30, if received on time, will get 24.5/30 if one day late, and 24/30 if two days late (and so on) except in cases of documented illness or other extraordinary inability.

Schedule of discussion sessions

1. September 9 Introduction

Part 1: Sustainability and complexity challenges

2. September 16 Goals, limits and indicators of better and worse
3. September 23 What sustainability means and entails
4. September 30 Complex socio-ecological systems
5. October 7 Sustainability in complex socio-ecological systems

October 14 No class [Thanksgiving holiday and reading week]

Part 2: Sustainability and complexity solutions

6. October 21 Socio-ecological system integrity, resilience and transformation
7. October 28 Efficiency
8. November 4 Equity, sufficiency, opportunity, civility and democracy
9. November 11 Integration (ethics, requirements, contexts and trade-offs)

Part 3 Sustainability and complexity applications

10. November 18 Limits versus growth
11. November 25 New frameworks for understanding and analysis
12. December 2 Strategies for navigating change

Important UW policies and services on key course-related topics

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

Disabilities: AccessAbility Services (<https://uwaterloo.ca/accessability-services/>), located in Needles Hall, Room 1401, 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 AccessAbility Services at the beginning of each academic term.

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. Please

review the material provided by the university's Academic Integrity office specifically for students: <http://uwaterloo.ca/academicintegrity/Students/index.html>. 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 <https://uwaterloo.ca/library/get-assignment-and-research-help/academic-integrity/academic-integrity-tutorial>, 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: <https://uwaterloo.ca/secretariat-general-counsel/policies-procedures-guidelines/policy-71>.

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: Students who believe that they have been wrongfully or unjustly penalized have the right to grieve; refer to Policy 70, Student Grievance: <https://uwaterloo.ca/secretariat-general-counsel/policies-procedures-guidelines/policy-70>.

Appeals: A decision made or penalty imposed under Policy 70 (Student Petitions and Grievances) on matters 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.

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.

Communications with the Instructor: All communication with students must be through either the student's University of Waterloo email account or via Learn. Any student who emails the instructor from a personal account will be requested to resend the email using a personal University of Waterloo email account.

Intellectual Property: Students should be aware that this course contains the intellectual property of their instructor, and/or the University of Waterloo. Intellectual property includes items such as: lecture content, spoken and written (and any audio/video recording thereof); lecture handouts, presentations, and other materials prepared for the course (e.g., PowerPoint slides); questions or solution sets from various types of assessments (e.g., assignments); and work protected by copyright (e.g., any work authored by the instructor or used by the instructor with permission of the copyright owner).

Course materials and the intellectual property contained therein, are used to enhance a student's educational experience. However, sharing this intellectual property without the intellectual property owner's permission is a violation of intellectual property rights. For this reason, it is necessary to ask the instructor, and/or the University of Waterloo for permission before uploading and sharing the intellectual property of others online (e.g., to an online repository).

Permission from an instructor, or the University is also necessary before sharing the intellectual property of others from completed courses with students taking the

same/similar courses in subsequent terms/years. In many cases, instructors might be happy to allow distribution of certain materials. However, doing so without expressed permission is considered a violation of intellectual property rights.

Please alert the instructor if you become aware of intellectual property belonging to others (past or present) circulating, either through the student body or online. The intellectual property rights owner deserves to know (and may have already given their consent).

Recording lecture: Use of recording devices during lectures is only allowed with explicit permission of the instructor of the course. Only audio recordings will be permitted. Posting of videos or links to the video to any website, including but not limited to social media sites such as: Facebook, Twitter, etc., is strictly prohibited.

Weekly agenda and readings

1. September 8-11 Introduction to the course

Agenda

- Introductions, backgrounds, areas of interest
- The essentials of the SERS grad programs, links between core courses and particular thesis research
- Sustainability as the objective: integrating concept across areas of expertise and concern (socio-economic, ecological/biophysical, cultural, political, etc.) and across responses (critique, vision, strategy, tactics)
- Complexity as the context: implications for resilience and transition/transformation
- Fundamentals of an ethical framework
- Plans for session 2 and subsequent sessions.

Discussion topic and discussion contribution assignment

Weekly discussion contributions are a formal requirement of the course (see above). The online discussion meetings are intended to enhance the course experience, but participation is not obligatory and only the submitted discussion contributions will be graded. The meetings are meant to provide an opportunity to share and discuss the contributions and to address questions arising from the lecture and readings and surrounding issues. However, the uses of the meeting time (and the potential use of the available slot on Mondays as well as the one on Wednesdays) are open to collective choice and experimentation with different options. See for example the option below on “focal topics.”

The first discussion contribution – for submission to the Discussion Forum on LEARN as well as for presentation in the Wednesday discussion meeting – is to introduce yourself. The formal posting requirement is for each participant to introduce her/himself by posting on Discussion Forum’s “topic” for week 1, a brief biography with

- your name
- current location

- area of particular research interest in the SERS program and brief specifics about you intended research project if you know what that is now (or you can note an illustrative option or two)
- some other information of your choosing to indicate what you know/care about especially and/or makes you unique and intriguing

Please post the bio before midnight on Wednesday, Sept 9. Once you have posted your bio you will be able to see those your colleagues have posted.

The first discussion meeting will begin with mutual introductions, questions about the course and the program, and issues raised by the online lecture and other materials. We will also pick topics for session 2.

Discussion meeting option: focal topics

For meeting discussions of implications and applications, the initial approach centred on considering implications for individual research areas may serve well enough. However, in future sessions we may wish to identify some cross-cutting topic areas of shared interest for collective consideration and deliberation – perhaps for several sessions. The topic areas may involve any of the big *sustainability-in-complexity* concerns and opportunities. Topics chosen in past years include climate change and sustainable food and agricultural systems and potential for viable urban socio-ecological systems. These topics all involve sustainability and complexity, and address matters undeniably important for lasting wellbeing at all scales from the global to the local. Chosen topics for discussions should be rich venues for questions, controversies and innovative possibilities that involve matters of sustainability and complexity and require insights from all the areas of expertise represented by participants in the class. We can choose to pursue a limited range of standard topics throughout the course, or for several successive sessions, or chose different topics for each session.

Any chosen topic areas should

- be useful for addressing each of the weekly topics starting with week 3;
- involve interconnected ecological, socio-economic and other factors with long term implications;
- require both protection of valued existing aspects, and transition from or transformation of problematic conditions, structures and practices;
- benefit from attention to local, regional and global scale considerations;
- be well enough known to permit reasonably informed engagement by all participants;
- be usefully informed by course participant expertise and research agendas; and
- be intriguing enough to merit discussion stretching over many sessions (though we can switch to new ones if the first set wears out).

Readings

1. Kate Raworth, “Want to get into the doughnut? Tackle inequality,” Exploring doughnut economics (2014), <http://www.kateraworth.com/2014/10/16/doughnut-inequality/> also see Kate Raworth, “Why it’s time for Doughnut Economics,” *Progressive Review* 24:3 (Winter 2017), pp.217-222 [readings for week 12]

2. Thomas Sterner et al., “Policy design for the Anthropocene,” *Nature Sustainability* 2 (January 2019), pp.14-21.
3. Richard B. Norgaard, “Finding hope in the Millennium Ecosystem Assessment,” *Conservation Biology* 22:4 (2008) pp.862-869.
4. F. Wickson, A.L. Carew and A.W. Russell, “Transdisciplinary research: characteristics, quandaries and quality,” *Futures* 38 (2006), pp.1046-1059.
5. Elinor Ostrom, “A general framework for analyzing sustainability of social-ecological systems,” *Science* 325 (24 July 2009), pp.419-422 [also for week 11].
6. Moti Nissani, “Ten cheers for interdisciplinarity,” *The Social Science Journal* 32:2 (1997), pp.201-216;
<http://www.is.wayne.edu/mnissani/pagepub/10cheers.htm>
7. 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 [also listed as one of the climate change discussion readings]

2. September 14-18 Challenges: goals, limits and indicators of better and worse

Agenda

- Evident problems and deeper problems: indicators and roots, critiques and basic assumptions
- What the indicators tell us: states and trends
- Indicator issues: selective evidence, problems of measurement, problems of interpretation, links between trends and drivers
- Responses to the indications: visions of alternatives (competing options, utopias and dystopias, scenarios and backcasting, shades of green)

Discussion topic and discussion contribution assignment

Each participant

- i. picks one major topic of concern that is relevant to sustainability and about which formal indicators have been identified and tracked. Topics addressed in the Sustainable Development Goals (SDGs) are recommended, but attention to others that are likely to be crucial is also encouraged. Topics 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.);
- ii. finds one recent, credible report on the topic; and
- iii. reports, briefly (2 minutes/), to the group – on the Discussion Forum topic in LEARN for session 2, and if possible in the Wednesday class meeting – on what is revealed by the report. Please pay particular attention to

- a. what indicators (and associated criteria) are considered important and which ones are overlooked;
- b. what indicators (and associated explanations) do well in illuminating the contributing factors; and
- c. what you can find about what works (where progress towards sustainability is being made), rather than only what trends are negative (or even positive).

Bonus: For further diversity and insight, each participant also finds 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. Extra glory for items that are surprising and/or comical as well as profoundly revealing.

Readings

1. Your chosen credible report.
2. United Nations Sustainable Development Goals Knowledge Platform, *Sustainable Development Goals*, on-line, multi-layer site, <https://sustainabledevelopment.un.org/?menu=1300> [not on the course Learn site]
3. United Nations, *The Sustainable Development Goals Report 2019* (UN: New York, 2019), <https://unstats.un.org/sdgs/report/2019/The-Sustainable-Development-Goals-Report-2019.pdf>.
4. Daniel O’Neill, “Is it possible for everyone to live a good life within our planet’s limits?” *The Conversation* (7 February 2018), <https://theconversation.com/is-it-possible-for-everyone-to-live-a-good-life-within-our-planets-limits-91421> and the full paper: Daniel W. O’Neill, Andrew L. Fanning, William F. Lamb and Julia K. Steinberger, “A good life for all within planetary boundaries,” *Nature Sustainability*, 2018, Vol.1 (2), p.88-95, DOI: 10.1038/s41893-018-0021-4
5. S.L. Wood and F. DeClerck, “Ecosystems and human well-being in the Sustainable Development Goals,” *Frontiers in Ecology and the Environment*, 13 (2015), p.123. [about linking ecosystem protection and human wellbeing]
6. ICSU, ISSC, *Review of the Sustainable Development Goals: The Science Perspective* (Paris: International Council for Science (ICSU), 2015), <https://council.science/cms/2017/05/SDG-Report.pdf> [science-based critique of the adequacy of the SDG goals/targets]
7. Tomáš Hák, Svatava Janoušková, Bedřich Moldan, “Sustainable Development Goals: A need for relevant indicators,” *Ecological Indicators* 60, January 2016, pp.565-573.
8. Donella Meadows, “Indicators and Information Systems for Sustainable Development,” (Hartland, Vermont: The Sustainability Institute, 1998), esp. pp. viii-xii; http://www.iisd.org/pdf/s_ind_2.pdf
9. 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 [This reading is not on the course website but the

book is now available through the UW library at
<https://ebookcentral.proquest.com/lib/Waterloo/detail.action?docID=5820915>]

Key indicator areas

10. WWF et al., *Living Planet Report 2018: Aiming Higher*, esp. pp.22-25 (but scan the rest),
https://wwf.panda.org/knowledge_hub/all_publications/living_planet_report_2018/
11. Facundo Alvaredo, Lucas Chancel, Thomas Piketty, Emmanuel Saez and Gabriel Zucman, eds., *World Inequality Report 2018, Executive Summary* (Berlin: World Inequality Lab, 2018), <https://wir2018.wid.world/files/download/wir2018-summary-english.pdf>
12. Stockholm Resilience Centre, “The nine planetary boundaries,” [accessed 2019] <https://www.stockholmresilience.org/research/planetary-boundaries/planetary-boundaries/about-the-research/the-nine-planetary-boundaries.html> [not on the course Learn site], and/or
Thomas Sterner et al., “Policy design for the Anthropocene,” *Nature Sustainability* 2 (January 2019), pp.14-21.

3. September 21-25 Challenges: what sustainability means and entails

Agenda

- Why, from what roots and in what different forms the sustainability idea arose
- Underlying critiques of prevailing approaches to society, economy and nature
- Links between sustainability and complexity
- Implications for change: adjustment and accommodation or significant transition or both?
- Sustainability agenda to support existing power (e.g., as a new civilizing mission) or to challenge and redistribute power
- Different approaches to sustainability (e.g., local vs global, individual vs institutional, economic vs cultural, anticipatory vs adaptive, authoritative vs participative, balance vs integration); associated alternative assumptions, values and objectives
- Sustainability and growth (or de-growth)
- Sustainability in context: specifying key issues, objectives, criteria

Discussion topic and discussion contribution assignment

Each participant will

- i. identify three significant sustainability-related problems and/or opportunities addressed or potentially affected by work in her or his research field and/or particular topic area that merit careful attention (the focus of attention could be at any level or combination of levels from global to local);
- ii. consider whether, and if so how, the three problems and/or opportunities and potentially successful efforts to address them are or should be linked.

Readings

1. See the planetary boundaries and doughnut economics readings from sessions 1 and 2.
2. Robert B. Gibson, ed., *Sustainability Assessment: Applications and Opportunities* (London: Routledge/Earthscan, 2017), chap.1; for details on the requirements for progress towards sustainability, see R.B. Gibson, et al., *Sustainability Assessment: Criteria and Processes* (2005), chap. 5, esp. pp.95-114).
3. 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. 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.
5. 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>
6. 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. Many chapters of this book – e.g., chapters by Dalby; Linnerud, esp. pp.29-35;) are relevant to this week and later ones; the book is now available through the UW library at <https://ebookcentral.proquest.com/lib/Waterloo/detail.action?docID=5820915>
7. Chris Sneddon, Richard B. Howarth and Richard B. Norgaard, "Sustainable development in a post-Brundtland world," *Ecological Economics* (May 2006), 57 (2), pp. 253-268.
8. Scott Losee, "Sustainability lite? has business lost touch with the "true meaning of sustainability?" *Sustainability in business*," national conference proceedings, Brisbane, March 2017, pp.61-77.
9. Serge Latouche, "How do we learn to want less? The globe downshifted," *Le Monde Diplomatique* 13 January 2006; <http://mondediplo.com/2006/01/13degrowth>.
10. Libby Robin, "The big here and the long now: agendas for history and sustainability," presentation to the conference on *History and Sustainability*, University of Cambridge, 7 September 2007 [longer version is Libby Robin and Will Steffen, "History for the Anthropocene," *History Compass*, 5:5 (August 2007), pp.1694-1719].

Additional resources on the historical background of sustainability

1. J.R. McNeill and William H. McNeill, *The Human Web: a bird's-eye view of world history*, excerpt (New York: Norton, 2003), pp.3-8.
2. Robert Constanza, Lisa J. Graumlich and Will Steffen, "Sustainability or collapse: lessons from integrating the history of humans and the rest of nature," in Robert Constanza, Lisa J. Graumlich, and Will Steffen, eds., *Sustainability or Collapse: An integrated history and future of people on Earth* (Cambridge, MIT Press, 2007), pp.3-17.

3. Jacobus A. Du Pisani, "Sustainable development: historical roots of the concept," *Environmental Sciences* 3:2 (2006), pp.83-96.
4. Gifford Pinchot, "The fight for conservation," from D. Worster, ed., *American Environmentalism* (NY: Wiley, 1973/originally published 1910), pp. 84-95
5. Wolfgang Sachs, "The archaeology of the development idea," *Planet Dialectics: explorations in environment and development* (London: Zed, 1999), pp. 3-23.
6. Aldo Leopold, "The land ethic"; http://www.luminary.us/leopold/land_ethic.html
7. Melissa Leach, "Earth Mother Myths and Other Ecofeminist Fables: How a Strategic Notion Rose and Fell." *Development and Change* 38:1 (2007), pp.67-85.

4. September 28-October 2 Challenges: complex socio-ecological systems

Agenda

- Sustainability in the context of complex socio-ecological systems
- Key concepts including connections across boundaries, dynamics including flips, and the roles of humans, including making choices

Discussion topic and discussion contribution assignment

Each participant will

- i. begin with the major sustainability-related problems and/or opportunities she or he discussed in session 3,
- ii. identify a complex socio-ecological system that is affected, involved and/or illustrative of the issues and implications: that system will serve as the "focal system" for the purposes of discussion, recognizing that the focal system will be interacting with many others at the same scale and at larger and smaller scales;
- iii. identify very briefly one of the focal system's most desirable characteristics, threats to that characteristic and possible ways to reduce the stresses and build system resilience to maintain the characteristic;
- iv. identify one of the focal system's undesirable characteristics, the nature (including evident resilience) of the institutions and other factors the perpetuate that characteristic, and possible ways to encourage a transition (overcome undesirable resilience).
- v. an example of desirable links between actions identified in (iii) and (iv).

This will be very hard to do in two minutes, but try to be as concise as possible.

Readings

1. C.S. Holling, "Understanding the complexity of economic, ecological and social systems," *Ecosystems* 4:5 (2001), pp.390-405.
2. 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.
3. Brian Walker and David Salt, "The essence of resilience thinking," in *Resilience Practice* (2012), chapter 1.

4. Brian Walker and David Salt, "Thresholds," in *Resilience Thinking* (2006), pp.53-63.
5. James Kay and Eric Schneider, "Embracing complexity," *Alternatives* 20:3 (1994), pp.32-39.
6. Cinner, J., 2018. How behavioral science can help conservation. *Science*, 362(6417), pp.889-890.
7. 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.
8. Ramcilovic-Suominen, S., and G. Epstein. 2012. Towards an Analytical Framework for Forest Law Compliance. *International Forestry Review* 14:326-336.
9. Silvio Funtowicz and Jerome Ravetz, "Post-normal science," in International Society for Ecological Economics, *Internet Encyclopaedia of Ecological Economics* (Feb 2003).
10. Peter Dizikes, "When the butterfly effect took flight," *Technology Review* (22 February 2011), <http://www.technologyreview.com/article/422809/when-the-butterfly-effect-took-flight/>

5. October 5-9 Challenges: sustainability in complex socio-ecological systems

Agenda

- The key characteristics of sustainability-in-complexity problems
- Social-ecological systems as complex interconnected systems
- Strengths and limitations of conventional approaches, especially in environmental/resource management in comparison with approaches giving more attention to interactions
- Implications of approaches recognizing the complexities of socio-ecological systems

Discussion topic and discussion contribution assignment

Returning to the research-related, illustrative topic areas examined in session 4, each participant will

- i. choose one or more examples of complex system phenomena (multiple interacting stressors, cross-scale feedbacks, issue linkages, etc.) that are involved in your field and/or more specific research area;
- ii. discuss how the identified phenomenon/phenomena might be addressed in an approach that applies an appreciation of complexities to research design and/or management deliberations and decision making.

Readings

1. 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>
2. Millennium Ecosystem Assessment, *Ecosystems and Human Well-being: Synthesis* (Washington: Island Press, 2005), preface pp.v-ix. [the full report is available at <https://www.millenniumassessment.org/documents/document.356.aspx.pdf>]
 3. Bodin, Ö., B. Crona, M. Thyresson, A.-L. Golz, and M. Tengö. 2014. Conservation Success as a Function of Good Alignment of Social and Ecological Structures and Processes. *Conservation Biology* 28:1371-1379.
 4. Folke, C., Pritchard Jr, L., Berkes, F., Colding, J. and Svedin, U., 2007. The problem of fit between ecosystems and institutions: ten years later. *Ecology and Society*, 12(1).
 5. 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.
 6. Birkeland, C., and P. K. Dayton. 2005. The importance in fishery management of leaving the big ones. *Trends in Ecology & Evolution* 20:356-358.
 7. Holling, C. S., and G. K. Meffe. 1996. Command and Control and the Pathology of Natural Resource Management. *Conservation Biology* 10:328-337.
 8. Pikitch, E.K., Santora, C., Babcock, E.A., Bakun, A., Bonfil, R., Conover, D.O., Dayton, P., Doukakis, P., Fluharty, D., Heneman, B. and Houde, E.D., 2004. Ecosystem-based fishery management. *Science* 305: 346-347.
 9. Meyfroidt, P., Lambin, E.F., Erb, K.H. and Hertel, T.W., 2013. Globalization of land use: distant drivers of land change and geographic displacement of land use. *Current Opinion in Environmental Sustainability* 5(5), pp.438-444.
 10. Smajgl, A., Ward, J. and Pluschke, L., 2016. The water–food–energy nexus: realising a new paradigm. *Journal of Hydrology*, 533, pp.533-540.
 11. Cumming, G.S., Allen, C.R., Ban, N.C., Biggs, D., Biggs, H.C., Cumming, D.H., De Vos, A., Epstein, G., Etienne, M., Maciejewski, K. and Mathevet, R., 2015. Understanding protected area resilience: a multi-scale, social-ecological approach. *Ecological Applications*, 25(2), pp.299-319.

Case examples of interactive effects

1. Alberto Ansuategi, et al., *The Impact of Climate Change on the Achievement of the Post-2015 Sustainable Development Goals* (CDKN, May 2015), esp. pp.1-4, <http://cdkn.org/wp-content/uploads/2015/05/Impact-of-climate-on-SDGs-technical-report-CDKN.pdf>.
2. Floris d’Udine and Alec Crawford, “Migration and conservation in the Lake Albert ecosystem: policy brief,” (Winnipeg: IISD August 2015), <http://www.iisd.org/publications/migration-and-conservation-lake-albert-ecosystem-policy-brief>. [the full report is available at <http://www.iisd.org/publications/migration-and-conservation-lake-albert-ecosystem>]

3. Geeta Vaidyanathan, "In Gandhi's Footsteps: two unusual development organizations foster sustainable livelihoods in the villages of India," *Alternatives Journal* 28:2 (spring 2002), pp.32-37.
4. Dean Bavington and James Kay, "Ecosystem-based insights on the Northwest Atlantic fisheries in an age of globalization," manuscript (ERS, 2004).
5. Hilaire Avril, "Fisheries: fishy practices threaten environment," (IPS, 6Aug 2009).
6. Metcalf Foundation, "Food connects us all," (Toronto: Metcalf Fdn, February 2008).

October 12-16 Thanksgiving holiday and reading week [NO CLASS]

6. October 19-23 Solutions: socio-ecological system integrity, resilience and transformation

Agenda

- Building sustainability in the context of complex socio-ecological systems
- Quick review of the nature of complex ecological and socio-ecological systems
- General implications for action on sustainability (non-linear problem solving, scenario building, multi-perspective participation, precaution, etc.) in managing human interactions with ecological systems (and resources and protected areas) and (re)designing and managing socio-ecological systems

Discussion topic and discussion contribution assignment

Each participant

- i. depicts a place/case as a complex system with sustainability issues (can be the research area case used in the previous sessions);
- ii. as background summarizes very briefly
 - a. the focal system's desirable characteristics, threats to these characteristics, and possible ways to reduce the stresses and build system resilience to maintain these characteristics;
 - b. the focal system's undesirable characteristics, the nature (including evident resilience) of the institutions and other factors that perpetuate these characteristics; and
 - c. any evident new opportunities for overall improvements;
- iii. proposes possible ways to foster system transition and build positive system resilience that would address all three of the above considerations at the same time.

Readings

1. Brian Walker and David Salt, "A resilient world," in *Resilience Practice* (2012), chapter 6, pp.186-199.

2. Melissa Leach, et al., "Transforming innovation for sustainability," *Ecology and Society* 17:2 (2012):11, 6pp.; <http://www.ecologyandsociety.org/vol17/iss2/> [also for week 12]
3. Richard J Hobbs, Eric Higgs, Carol M Hall, Peter Bridgewater, F Stuart Chapin III, et al., "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>
4. 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>
5. Dan Barber, "The prairie," from *the Third Plate: field notes on the future of food* (New York: Penguin, 2014), pp.41-51 (also in readings for week 1).
6. 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. 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.
8. Paul Nadasdy, "Adaptive co-management and the gospel of resilience," in Derek Armitage, Fikret Berkes and Nancy Doubleday, eds., *Adaptive Co-management: collaboration, learning and multi-level governance* (Vancouver: UBC Press, 2008), pp.208-227.
9. Stephen Cork, "Resilience of ecosystems and social-ecological systems," in S. Cork, ed., *Brighter Prospects: enhancing the resilience of Australia* (Australia 21: 2009), pp.63-66.
10. Jan Sendzimir et al., "Assessing the resilience of a river management regime: informal learning in a shadow network in the Tisza River Basin," *Ecology and Society* 13:1 (2008): 11, <http://www.ecologyandsociety.org/vol13/iss1/art11/>.
11. Naresh Singh, "Community adaptation and sustainable livelihoods: basic issues and principles," (Winnipeg: IISD, March 1996), http://www.sustainable-livelihoods.com/pdf/SL_basic_issues_principles1.pdf.
12. Peter Montague, "The precautionary principle," *Rachel's Environment and Health Weekly*, 19 February 1998.
13. Fridolin Simon Brand and Kurt Jax, "Focusing the meanings(s) of resilience: resilience as a descriptive concept and a boundary object," *Ecology and Society* 12:1:23 (2007), www.ecologyandsociety.org/vol12/iss1/art23/.
14. Melissa Leach, ed., "Re-framing resilience: a symposium report," (Brighton: STEPS Centre, 2008), 22pp.; <https://opendocs.ids.ac.uk/opendocs/handle/20.500.12413/2315>
15. Nathaniel B. Morse, et al., "Novel ecosystems in the Anthropocene: a revision of the novel ecosystem concept for pragmatic applications," *Ecology and Society* 19:2 (2014), article 12, <http://dx.doi.org/10.5751/ES-06192-190212>
16. Millennium Ecosystem Assessment project, various reports; <http://www.millenniumassessment.org/en/index.aspx> *

7. October 26-30 Solutions: efficiency

Agenda

- Efficiencies for maintenance of ecological functions and protection of resource base, maintenance of socio-ecological systems, freeing capacity for ensure sufficiency for all
- Doing more with less (factor 4 and factor 10)
- Economic, technological, social, political and ecological aspects
- Sustainability efficiencies vs market efficiencies
- Limitations: what gets done with the gains (e.g., the rebound effect)? how does efficiency fit or conflict with resilience (e.g., need for redundancy)?
- Implications for applications: alternative and complementary approaches, tools, levels of ambition

Discussion topic and discussion contribution assignment

Each participant identifies one area of evident need for greater material (includes biophysical resources and capacities) and/or energy efficiency related to socio-ecological systems in his or her field of study and considers

- i. the major approaches and tools that have been or could be taken to enhance material and/or energy efficiency;
- ii. the most promising approach considered from a sustainability-in-complexity perspective;
- iii. the main barriers to effective action and how they might be overcome;
- iv. the extent to which the most promising approach to efficiency might still be insufficient from a sustainability perspective (e.g., because of conflicts with resilience objectives, or inequitable effects, or ...) and what might be done about that.

Readings

1. Ernst von Weizsäcker, et al., *Factor Five: transforming the global economy through 80% improvements in resource productivity* (London: Earthscan, December 2009), pp.1-19 (Introduction).
2. UNEP, United Nations Environment Program, *Decoupling natural resource use and environmental impacts from economic growth* (2011), esp. summary pp.xiii-xvi, <https://www.resourcepanel.org/reports/decoupling-natural-resource-use-and-environmental-impacts-economic-growth>
3. Tim Jackson, "The myth of de-coupling," in *Prosperity without Growth: Economics for a Finite Planet* (London: Earthscan, 2009), pp.67-86.
4. 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>
5. Tengö, Maria, Eduardo S. Brondizio, Thomas Elmqvist, Pernilla Malmer, and Marja Spiereburg. 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>
6. Smart Prosperity, *New Thinking: Canada's Roadmap to Smart Prosperity Roadmap* (February 2016), esp. pp.1-8,
<https://www.smartprosperity.ca/thinking/newthinking>
 7. Sidney Ribaux, "Warming trend; Quebec community groups are helping low-income households save energy and cut home heating bills," *Alternatives Journal* 26:2 (2000), p.34.
 8. David B. Brooks, "Beyond greater efficiency: the concept of water soft paths," *Canadian Water Resources Journal* 30:1 (2005), pp.83-92;
<https://www.tandfonline.com/doi/pdf/10.4296/cwrj300183> and/or Oliver Brandes and David B. Brooks, "The soft path for water in a nutshell," (Ottawa and Victoria, Friends of the Earth Canada and POLIS project on Ecological Governance, 2005), poliswaterproject.org/publication/23.
 9. Alex Kenney, Stewart Elgie and Dave Sawyer, *Advancing the economics of ecosystems and biodiversity in Canada* (Ottawa: Sustainable Prosperity, 2011),
<https://institute.smartprosperity.ca/sites/default/files/publications/files/Advancing%20the%20Economics%20of%20Ecosystems%20and%20Biodiversity%20in%20Canada.pdf>.
 10. World Resources Forum, "WRF Declaration: Resource governance – our challenge, our opportunity," Davos, Switzerland, 16 September 2009.
 11. Brian Walker and David Salt, "Resilience and economics," in *Resilience Practice* (2012), pp.161-167.
 12. 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.
 13. David Dodge and Duncan Kinney, "The \$750 billion dollar opportunity in industrial and commercial energy efficiency," *Green Energy Futures* 106 (2015), <http://www.greenenergyfutures.ca/episode/industrial-energy-efficiency>; and "Cradle to cradle: recycling's cooler younger brother," *Green Energy Futures* 109 (2015), <http://www.greenenergyfutures.ca/episode/cradle-cradle>
 14. Tima Bansai, "Growth is in the DNA of business," Network for Business Sustainability (May 2019).
 15. Alistair Sharp, "What you should know about the circular economy," *National Observer*, 17 June 2019,
<https://www.nationalobserver.com/2019/06/17/news/what-you-should-know-about-circular-economy>

Additional resources

1. J. Lundqvist, C. de Fraiture and D. Molden, *Saving Water from Field to Fork: curbing losses and wastage in the food chain* (Stockholm: Stockholm International Water Institute, 2008)
http://www.siwi.org/documents/Resources/Policy_Briefs/PB_From_Field_to_Fork_2008.pdf.

2. Edgar G. Hertwich, "Consumption and the Rebound Effect: An industrial ecology perspective," *Journal of Industrial Ecology* 9:1-2 (Winter/Spring 2005) pp.85-98
<http://mitpress.mit.edu/JIE/consumption> [whole special issue on consumption:
<http://mitpress.mit.edu/catalog/item/default.asp?type=4&tid=32>].
3. Rocky Mountain Institute, "The 'rebound effect': a perennial controversy rises again," (Spring 2011),
<http://www.rmi.org/rmi/TheReboundEffectAPerennialControversyRisesAgain>.
4. Herman E. Daly, "Sustainable development: definitions, principles, policies," invited address, World Bank, Washington, 30 April 2002,
https://millenniumindicators.un.org/unsd/envAccounting/ceea/archive/Framework/Daly_SD_Def_Priciples_Policies.PDF
5. Raimund Bleischwitz, et al., "Eco-innovation – putting the EU on the path to a resource and energy efficient economy," Wuppertal Institute, March 2009,
<http://www.euroecolecon.org/pdf/WI-Eco-Inno-09.pdf>.
6. Amory B. Lovins, "Energy Strategy: the road not taken?" *Not Man Apart* 6:20 (1977), pp.5-16.

8. **November 2-6 Solutions: equity, sufficiency, opportunity, civility and democracy**

Agenda

- Sufficiency, satisfaction and progress
- Material equity (sufficiency, growth vs redistribution, security) and socio-political equity (individual vs collective rights, representation vs participation)
- Intergenerational equity
- Relations between opportunity and material growth
- Interdependence of community, security, and empowerment
- Social capital and socio-ecological capital
- Moral choice and customary behaviour
- Roles of learning (educational theory, participative/liberatory education), community building, and involvement in nature
- Key considerations for applications and selection and use of application tools:

Discussion topic and discussion contribution assignment

Each individual picks a particular area related to her or his research field, identifies what people in that area, individually and collectively, need for the essentials of lasting wellbeing (sufficiency, etc.), and considers

- i. what major deficiencies, vulnerabilities and opportunities seem most significant for those people in that place;
- ii. which of them appear to have been addressed in some way by recent or current initiatives;
- iii. what interests (present and future, human and non-human) have been influential in the relevant decision making and what interests have been neglected or suppressed;

- iv. what kinds of knowledge have been applied (scientific data, economic analysis, traditional understanding, political strategizing, etc.), and what kinds have been neglected or suppressed.
- v. what could be done to correct or reduce the deficiencies in your case (e.g., different decision-making processes, different legal or economic arrangements, different education and better data).

Readings

Equity, sufficiency and opportunity

1. Kate Raworth, “Want to get into the doughnut? Tackle inequality,” *Exploring doughnut economics* (2014), <http://www.kateraworth.com/2014/10/16/doughnut-inequality>, and Kate Raworth, *A safe and just space for humanity* (London: Oxfam, February 2012) [see also Kate Raworth, “Why it’s time for Doughnut Economics,” *Progressive Review* 24:3 (Winter 2017), pp.217-222, in readings for week 1]
2. 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>
3. Bina Agarwal, “Conceptualising environmental collective action: why gender matters,” *Cambridge Journal of Economics* 24:3 (2000), pp.283–310.
4. 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>
5. 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>
6. 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.
7. 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) [This reading is not on the course website but the book is available through the UW library at <https://ebookcentral.proquest.com/lib/Waterloo/detail.action?docID=5820915>]
8. Branko Milanovic, “Unequal world: inequality among citizens in the world,” in *The Haves and the Have Nots* (New York: Basic Books, 2011), pp.149-164.
9. Joan Martinez-Alier, “The Environmentalism of the Poor,” *Geoforum* 54 (2014), pp.239–41.
10. Adrian Treves, Kyle A. Artelle, Chris T. Darimont, William S. Lynn, Paul Paquet, Francisco J. Santiago-Ávila, Rance Shaw and Mary C. Woo, “Intergenerational

equity can help to prevent climate change and extinction,” *Nature Ecology and Evolution* 2 (February 2018) pp.204-207.

11. Oxfam, Reward work, not wealth (January 2018), esp.19-23 and 30-32, <https://www.oxfam.org/en/research/reward-work-not-wealth>
12. Deborah Hardoon, “An economy for the 99%,” summary of briefing paper (London: Oxfam, 2017), <http://policy-practice.oxfam.org.uk/publications/an-economy-for-the-99-its-time-to-build-a-human-economy-that-benefits-everyone-620170>.
13. Ramachandra Guha, “How much should a person consume?” *Vikalpa* 28:2 (2003), pp.1-11.
14. Vandana Shiva, “Two myths that keep the world poor,” *Ode* 28 (2005), www.odemagazine.com/article.php?aID=4192.
15. Branko Milanovic, “Why does global inequality matter and what to do about it?” in *Worlds Apart* (Princeton University Press, 2005), pp.149-162.
16. Faiza Shaheen, *Reducing economic inequality as a Sustainable Development Goal*, New Economic Fdn, July 2014, esp. pp.11-14 and 35-37, http://b.3cdn.net/nefoundation/226c9ea56ee0c9e510_gqm6b9zpz.pdf.

Civility and democracy

1. Ann Dale, “Social capital and sustainable community development: is there a relationship,” in Ann Dale and Jenny Onyx, eds., *A Dynamic Balance: social capital and sustainable community development* (Vancouver: UBC Press, 2005), pp.13-30.
2. Andy Dobson, “Citizens, citizenship and governance for sustainability,” in W. Neil Adger and Andrew Jordan, *Governing Sustainability* (Cambridge: Cambridge University Press, 2009), pp.125-141.
3. Margot Parkes and Ruth Panelli, (2001), “Integrating catchment ecosystems and community health: the value of participatory action research,” *Ecosystem Health*, 7 (2001), pp.85-106. doi:10.1046/j.1526-0992.2001.007002085.x
4. Charles Dobson, “Social movements: a summary of what works,” from *The Citizen’s Handbook: A guide to building community in Vancouver* (Aug 2001); <http://www.vcn.bc.ca/citizens-handbook>.

For your curiosity

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

9. November 9-13 Solutions: integration (ethics, sustainability requirements, contexts and trade-offs)

Agenda

- Basics of ethics: practical differences between an ecological ethics and an enlightened human-centred ethics

- Sustainability ethics and sustainability requirements: integrity, efficiency, sufficiency and opportunity, equity, democracy and civility, precaution and integration (or economic opportunity, social justice, ecological responsibility, learning and commitment, humility in the face of uncertainty) – all at the same time, mutually reinforcing (vs trade-offs)
- Situated ethics and specifying ethical issues, priorities and criteria for particular contexts
- Applications:
 - critical review of purposes, comparative evaluation of options, justification of trade-offs
 - appropriate indicators and other information
 - criteria, specified for the case and context
 - analyses (e.g., rigorous approaches to the critical review of purposes, comparative evaluation of options, and justification of trade-offs)
 - processes for deliberation, decision and implementation/action
 - relations between sustainability, resilience and transformation

Discussion topic and discussion contribution assignment

Any set of sustainability requirements (however they may be organized and expressed so long as they are reasonably comprehensive of the core requirements for progress towards sustainability in a complex world) can represent an ethical package of sorts. As a discussion contribution, each participant is to

- i. to draft a point form list of generic (applicable anywhere) requirements reflecting the considerations we have examined in the course so far,
- ii. to add any further generic requirements drawn from other writings or deliberations on sustainability-related ethics in general or from in particular fields of study and action – e.g., ecological restoration, wildlife management, development assistance, water management, community building, conflict management, energy policy, international trade, and so forth [be sure to consider whether your preferred version of the requirements is justifiable, comprehensive, suitably focused on key matters and flexible enough for broad application];
- iii. pick a specific application (perhaps related to your own anticipated research);
- iv. identify at least five considerations that are particular to your chosen case and context and suggest how they could be integrated with the items in your generic requirements list to help guide decision making on, for example, choosing among competing possible research agendas, methods and/or audiences/beneficiaries.

Readings

Requirements for sustainability (review)

1. R.B. Gibson, et al., *Sustainability Assessment: Criteria and Processes* (2005), chap. 5, esp. pp.95-114) [also in readings for week 3]

Ethics

1. 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>.]

2. Bryan G. Norton, "Ethics and sustainable development: an adaptive approach to environmental choice," in Giles Atkinson, Simon Dietz and Eric Neumayer, eds., *Handbook of Sustainable Development* (Cheltenham: Elgar, 2007), pp.27-44.
3. United Nations, "The Universal Declaration of Human Rights," (1948) <http://www.un.org/Overview/rights.html>.
4. Earthjustice, "Issue Paper: Human Rights and the Environment," in materials for the 60th session of the UN Commission on Human Rights, Geneva, March-April 2004.
5. Aldo Leopold, "The land ethic," from *the Sand County Almanac* (1949); http://www.luminary.us/leopold/land_ethic.html.
6. Henry Beston, "Other nations," from *The Outermost House* (1926), in *Lapham's Quarterly* 6:2 (spring 2013), pp.75-76.
7. John Robinson, George Francis, Russel Legge and Sally Lerner, "Defining a sustainable society: values, principles and definitions," *Alternatives* 17:2 (1990), pp.36-46 (also in readings for week 3).
8. Paul Hawken, "Preface," *The Ecology of Commerce* (New York: HarperCollins, 1993), pp. xi-xvi.
9. David Orr, "Shelf life," *Conservation Biology*, 23:2 (April 2009), pp. 248-251.

Specification for case and context

1. R.B. Gibson, ed., *Sustainability Assessment: Applications and Opportunities* (2017), chap.2 (on specification of sustainability criteria for case and context).
2. Corina McKendry and Nik Janos, "Greening the Industrial City: equity, environment, and economic growth in Seattle and Chicago," *International Environmental Agreements: Politics, Law and Economics* 15:1 (2015), pp.45-60.

Trade-offs

1. R.B. Gibson, et al., *Sustainability Assessment: Criteria and Processes*, chapter 6 (on trade-offs).
2. Tima Beuchelt, and Lone Badstue. "Gender, nutrition- and climate-smart food production: opportunities and trade-offs," *Food Security* 5 (2013), pp.709-721.
3. R.B. Gibson, "Avoiding sustainability trade-offs in environmental assessment," *Impact Assessment and Project Appraisal* 31:1 (2013), pp.1-12.
4. Peter Montague, "Nanotechnology and the Precautionary Principle," *Rachel's Environmental and Health News*, 28 April 2005.

10. November 16-20 Applications: Limits vs growth: opportunities, development and degrowth

Agenda

- Different versions of the idea of limits or boundaries
 - fully global limits versus cumulative local and regional limits
 - limits to ecological and biospheric capacities
 - limits to human capacities
 - moveable and immovable limits

- uncertainties and responses to them
- Different views on the implications for growth, green growth, sustainable development, steady state and/or degrowth
 - quality of life vs material expansion
 - growth of what, where, for whom
 - drivers for technological innovation
 - means of overcoming deprivation and inequity of opportunity
 - embeddedness of smaller systems in larger ones
- Means of fostering fair transition

Discussion topic and discussion contribution assignment

Each participant will consider

- (i) whether, what and how limits for any particular region (e.g., Waterloo Region or the larger Toronto-centred Greater Golden Horseshoe/Greenbelt region) should be defined and applied concerning such matters as population, food systems, systems providing ecological good and services, land allocated to housing and non-agricultural industry, overall material and energy use, the gap between rich and poor, the provision of (space to create) opportunities; and
- (ii) whether and how some form or forms of growth and/or degrowth should be pursued, recognizing embeddedness of smaller systems in larger systems, priorities, openings for change, potential areas for non-material gains, fair transition strategies, etc.

Readings, etc.

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-](http://www.cbc.ca/ideas/episodes/2013/12/10/the-degrowth-paradigm/#igImgId_83174)

[paradigm/#igImgId_83174](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>]

review

1. Johan Rockström, et al., “A safe operating space for humanity,” *Nature* 461 (24 September 2009), pp.472-475. [see also Johan Rockström, et al., “Planetary boundaries: addressing some key misconceptions,” at <http://www.stockholmresilience.org/21/research/research-news/7-2-2012-addressing-some-key-misconceptions.html>] or Stockholm Resilience Centre or Sterner et al. from week 2.

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

planetary boundaries and means of respecting them:

1. Peter A. Victor, “The idea of economic growth,” in P. Victor, *Managing without Growth: Slower by Design, not Disaster*, 2nd edn (Cheltenham: Elgar, 2019), and 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.
2. Joseph R. Burger et al, “The macroecology of sustainability, *PLOS Biology* 10:6 (2012).
3. Georgina M. Mace, “The limits to sustainability science: ecological constraints or endless innovation?” *PLOS Biology* 10:6 (2012).
4. 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>
5. Nicolas Kosoy, Peter G. Brown, Klaus Bosselmann, Anantha Duraiappah, Brendan Mackey, Joan Martinez-Alier, Deborah Rogers, Robert Thomson, “Pillars for a flourishing Earth: planetary boundaries, economic growth delusion and green economy,” *Current Opinion in Environmental Sustainability* 4 (2012), pp.74-79.
6. François Schneider, Giorgos 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.
7. Ted Nordhaus, Michael Shellenberger and Linus Blomqvist, *The Planetary Boundaries Hypothesis: a review of the evidence* (Breakthrough Institute, June 2012).
8. Anonymous, “Boundary Conditions,” *The Economist*, 16 June 2012, <http://www.economist.com/node/21556897>.
9. John H. Matthews and Frederick Boltz, “The shifting boundaries of sustainability sciences: are we doomed yet?” *PLOS Biology* 10:6 (2012).
10. Will Steffen, Johan Rockström and Robert Costanza, “How defining planetary boundaries can transform our approach to growth,” *Solutions: for a sustainable and desirable future* 2:3 (May 2011), <http://www.thesolutionsjournal.com/node/935>.
11. OECD, *Towards green growth: a summary for policy makers*, (Brussels: OECD, May 2011), <https://www.oecd.org/greengrowth/towards-green-growth-9789264111318-en.htm>; also the review of progress *Towards Green Growth?* (2015), https://www.oecd-ilibrary.org/environment/towards-green-growth_9789264234437-en
12. World Business Council for Sustainable Development, *Vision 2050: a new agenda for business* (Geneva: WBCSD, 2010), esp. pp.2-4 and 6-7, full report available at <https://www.wbcsd.org/Overview/About-us/Vision2050/Resources/Vision-2050-The-new-agenda-for-business>

13. Herman E. Daly, "Economics in a full world," *Scientific American* 293 (September 2005), pp.100-107; http://steadystate.org/wp-content/uploads/Daly_SciAmerican_FullWorldEconomics%281%29.pdf
14. Peter Victor, "Questioning economic growth," *Nature* 468 (2010), pp.370-371.*
15. 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.
16. Giorgos Kallis, "In defence of degrowth," *Ecological Economics* 70:5 (2011) pp.873-880.
17. Peter Victor, "Growth, degrowth and climate change: a scenario analysis," *Ecological Economics* 84 (2012), pp.206-212.
18. Stephen Quilley, "De-growth is not a liberal agenda: relocalisation and the limits to low energy cosmopolitanism," *Environmental Values* 22 (2013), pp.261-285.
19. Christa Wichterich, "Contesting green growth, connecting care, commons and enough," in Wendy Harcourt and Ingrid L. Nelson, eds., *Practising Feminist Political Ecologies: moving beyond the 'green economy'* (London: Zed Books, 2015), pp. 67-100.

11. November 23-27 Applications: new frameworks for understanding and analysis

Agenda

- The role of analytical frameworks in social-ecological systems research
 - variable-oriented vs. process-oriented frameworks
 - the advantages and limitations of frameworks
- Frameworks for different sustainability and complexity agendas
 - Millennium Ecosystem Assessment
 - Ostrom's general framework for social-ecological systems and resource management
 - Sustainability assessment framework
 - ...
- Major issues concerning framework design and application, for example,
 - integration of different approaches to knowledge and knowledge systems
 - contextualization
 - uncertainties and trade-offs
 - manageability

Discussion topic and discussion contribution assignment

Each participant will select an illustrative case of some sustainability-in-complexity challenge (small or large) for understanding and analysis and

- i. identify the key changes that seem most necessary and desirable,
- ii. identify the key factors that are likely to be influential in the case and its context,
- iii. suggest how such changes might best be encouraged (including particular steps that could be taken), and
- iv. identify the key areas of potential uncertainty about whether the proposed steps might be effective and how you might deal with them; and

- v. consider the implications for selecting or designing a suitable framework for analysis of current conditions and trajectories, and evaluating options for responding to evident needs for improvement/protection/transformation.

Readings

1. Millennium Ecosystem Assessment, *Ecosystems and Human Well-being: Synthesis* (Washington: Island Press, 2005), preface pp.v-ix. [the full report is available at <https://www.millenniumassessment.org/documents/document.356.aspx.pdf>]
2. Elinor Ostrom, "A General Framework for Analyzing Sustainability of Social-Ecological Systems," *Science* 325 (2009), pp.419-422.
3. Claudia Binder, Jochen Hinkel, Pieter W. G. Bots, and Claudia Pahl-Wostl. Comparison of Frameworks for Analyzing Social-ecological Systems. *Ecology and Society* 18 (2013), <https://www.ecologyandsociety.org/vol18/iss4/art26/>
4. Robert B. Gibson, ed., *Sustainability Assessment: Applications and Opportunities* (London: Routledge/Earthscan, 2017), chap.1, "Foundations" on the sustainability assessment framework (with readings for week 3) and chap.2, "Applications" on specifying sustainability criteria for case and context (with readings for week 9).
5. Tengö, M., E. S. Brondizio, T. Elmqvist, P. Malmer, and M. Spierenburg. 2014. Connecting diverse knowledge systems for enhanced ecosystem governance: the multiple evidence base approach. *Ambio* 43:579-591.
6. Turner, B. L., R. E. Kasperson, P. A. Matson, J. J. McCarthy, R. W. Corell, L. Christensen, N. Eckley, J. X. Kasperson, A. Luers, M. L. Martello, C. Polsky, A. Pulsipher, and A. Schiller. 2003. A framework for vulnerability analysis in sustainability science. *Proceedings of the National Academy of Sciences* 100:8074-8079.
7. Cole, D.H., Epstein, G. and McGinnis, M.D., 2019. Combining the IAD and SES frameworks. *International Journal of the Commons*, 13(1), pp.244-275.
8. Cox, M., 2015. A basic guide for empirical environmental social science. *Ecology and Society*.
9. Epstein, G., J. M. Vogt, S. K. Mincey, M. Cox, and B. Fischer. 2013. Missing ecology: integrating ecological perspectives with the social-ecological system framework. *International Journal of the Commons* 7:432-453.

12. November 30-December 4 Applications: strategies for navigating change

Agenda

- Transformation and resilience
 - transforming (adjusting, re-conceiving, replacing) what is problematic
 - protecting and enhancing the resilience of what is valued
 - just transitions
 - forward planning with uncertainty and diversity
- Theories of change and roles of ideas, institutions, surprise, etc. (review)
- Roles for individual choices/behaviour and collective decision making

- Resources: customs, rules (law, policy), economic self-interest and market mechanisms, understanding/reason/science/other knowledge, love/respect
- Institutions (governments, corporations, media, NGOs and other civil society organizations, etc.) and tools
 - markets (ecological economics, green taxes, etc.)
 - regulatory tools (hard and soft law, policy, programmes, etc.) and non-regulatory approaches, drivers, players
 - participative processes, democracy and education, expertise and its limits, traditional knowledge
 - civil society
 - combinations and alliances
- Special tools for transformation
 - forecasting and backcasting
 - scenarios
- General principles and contextual significance, coherence and diversity, purity and pragmatism

Discussion topic and discussion contribution assignment

This week we focus one last time on the participants' own research areas/agendas. Each participant is to summarize answers to the following questions:

- i. very broadly, what will the general contents and possible areas of implications for your main findings?
- ii. who would be the ideal thesis/research paper readers?
- iii. what would you want them to do with what they learn from your work?
- iv. to what extent do the responses to i-iii address all of the major sustainability and complexity considerations covered in the preceding sessions of the course?
- v. what, if anything, is missing and might that gap/those gaps limit the value of your contribution to knowledge?

Readings

Transformation

1. Kate Raworth, "Why it's time for Doughnut Economics," *Progressive Review* 24:3 (Winter 2017), pp.217-222.
2. Melissa Leach, et al., "Transforming innovation for sustainability," *Ecology and Society* 17:2 (2012):11, 6pp.; <http://www.ecologyandsociety.org/vol17/iss2/>
3. Andrew Stirling, "Emancipating transformations: from controlling 'the transition' to culturing plural radical progress, (Sussex: STEPS Centre, 2014; or 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) [not on the course website but available at <https://ebookcentral.proquest.com/lib/Waterloo/detail.action?docID=5820915>]
4. Tim Jackson, "The transition to a sustainable economy," and "A lasting prosperity," in *Prosperity without Growth*, pp.171-204.

5. World Business Council on Sustainable Development, *Changing Pace: Public policy options to scale and accelerate business action towards Vision 2050* (2012), esp. pp.1-10, <https://www.greengrowthknowledge.org/resource/changing-pace-public-policy-options-scale-and-accelerate-business-action-towards-vision>
6. Maarten Hajer, Måns Nilsson, Kate Raworth, Peter Bakker, Frans Berkhout, Yvo de Boer, Johan Rockström, Kathrin Ludwig and Marcel Kok, “Beyond cockpitism: four insights to enhance the transformative potential of the Sustainable Development Goals,” *Sustainability* 7 (2015), pp.1651-1660
7. 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://doi.org/10.1016/j.eist.2016.09.001>
8. 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.
9. Frances Westley et al., “Tipping toward sustainability: emerging pathways of transformation,” *Ambio* 40 (2011), pp.762-780.
10. Herman E. Daly, "Five policy recommendations for a sustainable economy," Sophie Prize acceptance address (Oslo, 1999) <http://www.feasta.org/documents/feastareview/daly2.htm>.
11. David Banister, Erling Holden, Oluf Langhelle, Kristin Linnerud, James Meadowcroft and Geoffrey Gilpin, “What next for sustainable development,” pp.295-311 in James Meadowcroft, et al., *What Next for Sustainable Development? Our Common Future at Thirty* (Cheltenham: Edward Elgar, 2019) [This reading is not on the course website but available through the UW library at <https://ebookcentral.proquest.com/lib/Waterloo/detail.action?docID=5820915>]

Resources, institutions and tools for change

1. Shaun Loney, “Conclusion,” from *An Army of Problem Solvers* (<http://www.armyofproblemsolvers.com>, 2016), pp.143-147.
2. John S. Drysek and Hayley Stevenson, “Global democracy and earth system governance,” *Ecological Economics* 70 (2011), pp.1865-1874.
3. René Kemp, Saeed Parto and Robert B. Gibson, “Governance for sustainable development: moving from theory to practice,” *International Journal for Sustainable Development* 8:1/2 (2005), pp.12-30.
4. Donella Meadows, “Places to intervene in a system,” (originally in *Whole Earth*, winter 1997, 13pp., <https://nonprofitquarterly.org/2017/05/01/places-to-intervene-in-a-system/>)
5. Elinor Ostrom, “A general framework for analyzing sustainability of social-ecological systems,” *Science* 325 (24 July 2009), pp.419-422.
6. Peter Dauvergne and Jane Lister, “Big brand sustainability: governance prospects and environmental limits,” *Global Environmental Change* 22:1(2012), pp.36-45.
7. Darren Swanson, Livia Bizikova, Charles Thrift and Dimple Roy, “GovernAbilities: the nexus of sustainability, accountability and adaptability” (Winnipeg: IISD, May 2104),

- https://www.iisd.org/sites/default/files/publications/governabilities_sustainability_accountability_adaptability.pdf
8. Québec, “*Sustainable Development Act: a fundamental law for Québec*,” (2006).
 9. John B. Robinson, “Future subjunctive: backcasting as social learning,” *Futures* 35 (2003), pp.839-856. [on a different application of backcasting see <http://www.theoryofchange.org>]
 10. Adam Kahane, “An invention born of necessity,” in *Transformative Scenario Planning: Working Together to Change the Future* (San Francisco, Berrett-Koehler, 2012), pp.1-13.
 11. Garry D. Peterson, Graeme S. Cumming and Stephen R. Carpenter, “Scenario planning: a tool for conservation in an uncertain world,” *Conservation Biology* 17:2 (April 2003), pp.358-366.
 12. John Jackson, "Postscript from an organizer's notebook," in Sally Lerner, ed., *Environmental Stewardship: studies in active earthkeeping* (Waterloo: University of Waterloo Department of Geography Publications, 1993), pp.399-409.
 13. Doug McKenzie-Mohr, "Community-Based Social Marketing".
 14. Charles Dobson, “Social movements: a summary of what works,” from *The Citizen’s Handbook: A guide to building community in Vancouver* (Aug 2001); www.citizenshandbook.org.html