Designing Sustainable Systems

BioP 404/504: Special Topic, Spring 2012 (Tentative Syllabus)

A new transdisciplinary 3-credit course focused on a functional "wide-scope" understanding of sustainability in a time of global challenge. Where most traditional courses focus on the "learning of facts", this course embraces the larger context where facts begin to make sense, and where the real-life complexity of our globalized world is viewed from a unified systems perspective. As a student in class, you will engage in a creative, integrative, and open-ended exploration of the historical, philosophical, cultural, scientific, and economic dimensions of the sustainability crisis and its potential solutions – including changes in awareness, creative design, and innovative planning. Instead of memorizing for tests or writing traditional papers, you will participate in extensive interactive lectures and discussions, grounded in weekly readings from a wide range of sources, and work together with other students in a studio setting to design a strategy for sustainable change applied to an issue of global or regional scope. Throughout this comprehensive design project, you will learn and apply a new practical methodology for effective problem resolution, negotiation, organizational change, and functional, systemic and sustainable solutions in design, planning, policy-making, and management. This new, highly practical methodology, designed for this course, is grounded in fields as diverse as participatory action research, Spinoza's non-reductionist philosophy, systems theory, the cognitive psychology of Jean Piaget, the philosophy of cross-disciplinary science, complexity theory, global ecology/Gaia theory, and ecological design. This course facilitates an integrative understanding of how the individual "parts" of your previous studies and experience come together in a larger, functional "whole". By hands-on application grounded in this "Big Picture", the course prepares students from a wide range of disciplines for professional challenges or graduate-level research.

Instructor: Daniel Hansson, Department of Bioregional Planning & Community Design
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Start date: January 12, 2012
Lecture & discussion: Tuesdays & Thursdays 9:30 – 10:45 AM (Location: TLC 022)
Design & planning studio: Thursdays 11:30 AM – 1:20 PM (Location: Engineering Physics 209)

Major Topics

- The history and philosophy of science and education relevant for cross-disciplinary and culture-transcending sustainable solutions; with special focus on Spinoza's alternative to the Baconian-Cartesian philosophy of reductionism

- From perception and cognition to worldviews, communication and creativity – how do we see the world and how does our view of the relationship between 'parts' and 'wholes' translate into action – for good or for bad?

- A non-reductionist systems approach to sustainability

- The ethical and environmental challenges of globalization, technology, and consumerism

- Social, environmental, and economic justice from a systems perspective

- The aesthetic dimension of sustainability, especially in system design; including the concept of biomimicry – innovation inspired by function and process in natural systems

- Climate change, the Gaia theory, and forecasting of system disruptions

- Thinking ahead of the curve – the precautionary principle and risk assessment in relation to sustainable development

- Finding leverage points for lasting system change

- Understanding feedback processes, complexity, wicked problems and messes

- System mapping, design process, and teamwork grounded in Spinoza's *Ethics*

Reading List

No required textbook; readings will be provided in class, online, or by e-mail on a weekly basis. The list is not sequential but organized under topics that will be recurring themes throughout the course. Note that many of the texts in excerpt are short, and that the reading list is subject to change throughout the semester.

Philosophy, perception & the creative process

- Baruch Spinoza (1665), Letter 32, and *Ethics* (1677) (excerpt)
- António Damásio (2003), *Looking for Spinoza: Joy Sorrow and the Feeling Brain* (excerpt)
- Burton Watson (trans.) (1996), *Chuang Tzu: Basic Writings* (excerpt)
- Jason McLennan (2004), *The Philosophy of Sustainable Design* (excerpt)
- Jean Piaget (1927), *The Child's Conception of Physical Causality* (excerpt)
- Fritjof Capra (2007), *The Science of Leonardo: Inside the Mind of the Great Genius of the Renaissance* (excerpt)

Cross-disciplinary problem solving

- David Orr (1996), "What is Education For?"
- Erich Jantsch (1980), "Interdisciplinarity: Dreams and Reality", *Prospects: Quarterly Review of Education*, *10*(3), 304-12
- Marion Brady (1995), "'Interdisciplinary' Isn't the Answer", *NAASP Bulletin*, March 1995, pp. 111-115
- Basarab Nicolescu (2008), *Manifesto of Transdisciplinarity* (excerpt)

Design & systems

- David Orr (2002), *The Nature of Design: Ecology, Culture, and Human Intention* (excerpt)
- Sim van Der Ryn & Stuart Cowan (1996), *Ecological Design* (excerpt)
- Janine Benyus (1997), *Biomimicry: Innovation Inspired by Nature* (excerpt)
- Jay Forrester (1998), "Designing the Future"
- Michael Goldberg (1989), *On Systemic Balance: Flexibility and Stability in Social, Economic, and Environmental Systems* (excerpt)
- Donella Meadows (2008), *Thinking in Systems: A Primer* (excerpt)
- Donella Meadows (1999), "Leverage Points: Places to Intervene in a System"
- Peter Checkland (1981), *Systems Thinking, Systems Practice* and other texts (in excerpt)
- James Lovelock, various texts on the Gaia theory (in excerpt)

Sustainability

- Anthony Clayton & Nicholas Radcliffe (1996), *Sustainability: A Systems Approach* (excerpt)
- Gro Harlem Brundtland, et al. (1987), *Our Common Future: World Commission on Environment and Development* (the "Brundtland Commission Report"; excerpt)
- Simon Bell & Stephen Morse (2008), *Sustainability Indicators: Measuring the Immeasurable?* (excerpt)
- Simon Bell & Stephen Morse (2003), *Measuring Sustainability: Learning from Doing* (excerpt)
- John Gowdy (1994), "Progress and Environmental Sustainability", *Environmental Ethics* 1994; 16: pp. 41-55
- Peter Hardi and Terrence Zdan (Eds.) (1997), *Assessing Sustainable Development: Principles in Practice* (the "Bellagio Report"; excerpt; available at: http://www.iisd.org/pdf/bellagio.pdf)
- Edward Stead and Jean Stead (1994), "Can Humankind Change the Economic Myth? Paradigm Shifts Necessary for Ecologically Sustainable Business", *Journal of Organizational Change Management;* 1994; 7, 4; ABI/INFORM Global, p. 15ff

Course Objectives

A. To deliver a boost of creativity, new courage to take on complex problems, and a deeper sense of empowerment as a citizen, student, and professional making way for a sustainable future on the Earth.

B. To impart a deeper understanding of reductionism and Spinoza's philosophical alternative, and of how these approaches to the priority and organization of 'parts' and 'wholes' are relevant to our present sustainability crisis; including the ethical, economic, social, and cultural/traditional dimensions involved.

C. To impart understanding of how 'sustainability' differs from traditional 'environmentalism', and how the concept of sustainability relates to the self-regulation, flexibility, long-term viability, and evolution of natural, designed, and social systems.

D. To impart understanding of the systems approach to sustainability and climate change, and how it differs from superficial versions of "sustainability" which disregard the multi-scalar, cross-disciplinary, and synergistic (non-linear) properties of complex systems that are nested interdependently within the total Earth system ("Gaia") and limited by its constraints.

E. To facilitate a deeper, systemic "Big-Picture" understanding of complexity, wicked problems and messes; including a basic understanding of how systems regulate themselves by feedback, and how lasting system change can be effected by using leverage points.

F. To impart the ability to practically use various conceptual system-mapping strategies for effective structuring of multi-scalar wicked problems and messes relevant to sustainability planning, design and decision-making processes.

G. To enable practical experience of group communication and hands-on problem solving in a teamwork studio setting.

Course Grade

1. **Design-studio project** **50%**

   A. **Overall quality of teamwork, studio-project presentations, and written report**
   (30 of total 50% for design project)

   Same for all members of a given design team; based on overall effectiveness of teamwork, quality of peer feedback given (within team and of other teams), team presentations, and final written team report

   B. **Individual effort and creative contribution to teamwork and project report**
   (20 of total 50% for design project)

   Including individual design-project responsibilities, and personal contribution to effective team communication, project organization, and problem solving documented through individual project-log entries; for graduate-level credit in the course (i.e. for students in section 504), a greater degree of teamwork responsibility is expected

2. **Take-home and in-class assignments** **35%**

   The total number of take-home assignments and their due dates will be decided on an ongoing basis throughout the course; for graduate-level credit (i.e. for students in section 504), completion of an extra set of graduate-level assignments is required in addition to the other assignments

3. **Discussion and in-class activity participation** **15%**

   Including lecture and studio attendance and discussion contributions supported by weekly readings

100% - 90% = A
89% - 82% = B
81% - 72% = C
71% - 62% = D
Below 62% = F

Student-team Project: Designing a Process for Sustainable Change

- The goal of the project is to be **a tangible experience of real-world complex-problem solving**

- The student teams will analyze, model, and redesign a complex problem situation of global-, international-, national-, or regional scope related to the three (basic) dimensions of sustainability. Topics can be professional interests related to fields of future work, or other issues that are of special interest to students

- Each team will design a systemic strategy/process (in steps) for long-term sustainability in the system/complex problem situation under consideration

- To get there, each team will consider BOTH the long-term resilience/viability/balance of the system/situation itself, AND the local-, regional-, and global sustainability impacts *of* the system/situation – especially climate impacts, resource depletion, and waste

- Both reductions in greenhouse-gas emissions AND reductions of systemic vulnerability to climate-change related disruptions are essential to any realistic sustainability strategy. For this reason, each team will consider sustainability impacts and systemic vulnerability on scales of short-term (< 50 years) and long-term (> 50 years)

- Each team will design models of relevant systems/"partial messes" to map out the larger problem situation and to support analysis as well as to explain and motivate the strategy/process

    • Students in the course will learn several techniques for this purpose – including Sustainability Assessment Mapping (SAM) and Soft Systems Methodology (SSM)

    • This design process will proceed in a cyclical manner where each team explores the "layers" of the system/situation from various angles (e.g. stocks and flows, and human activities)

    • Models will be created to clarify the situation – and they will be valuable ONLY insofar as they make the mess *easier* to deal with!

- The final strategy designed by each team will provide appropriate *general* guidelines for decision makers, the public, or whoever will need to change their behavior/choices. Each strategy will address:

    A. Scales of implementation – what needs to be done when, and at what level of scale?
    B. Feasibility – how will the team take into account politics, money, and value conflicts?
    C. Resource allocation for implementation – by what means will it happen?

- **The teamwork will be repeatedly discussed and presented in class** throughout the semester. The entire class will evaluate each plan from the standpoints of:

    A. Environmental sustainability
    B. Socio-economic equity/justice
    C. Economic sustainability
    D. Feasibility of implementation (culturally, economically, practically)
    E. Time-scale feasibility

- Each team will also create **a final sustainability report or information brochure**. The goal of this "publication" is to clearly communicate the team's stepwise plan for sustainability, supported by well-explained systems models incorporating the concepts of feedback and leverage points

Project Dates

- In-class presentation of project topics – **Thursday, March 8**
- In-class briefing of progress – **Thursday, April 12**
- Final in-class presentation – **Thursday, May 3**
- Final sustainability report or information brochure – due on **Thursday, May 10**

Cellphone and Laptop Policy

No cellphones, laptops, or tablet computers are allowed to be used in the classroom, with the exception that laptops may be used in the design studio during group-project sessions

Plagiarism

Plagiarism violates the University of Idaho code of academic conduct (regulation O-2). Standard university policies on plagiarism apply and will be enforced with no exceptions

Students with Disabilities

Reasonable accommodations are available for students with a documented disability. If you may require such accommodations for course participation, please notify the instructor and contact Disability Support Services (208-885-6307; dss@uidaho.edu)

Course Schedule

Thursday, Jan 12: **Introduction and course overview**

Assignment #1: "The Fukushima nuclear disaster – a system failure" (due in class Thursday, Jan 19)

Tuesday, Jan 17: **The mutilation of knowledge – reductionism & the conquest of nature**

- Historical beginnings – sustainability & the Baconian-Cartesian legacy
- The Cartesian conquest of nature & the dualism justifying it
- Our maps of knowledge – worldviews & onto-epistemic assumptions
- Machine- & organic analogies – is life a mechanical process?
- Reductionism, specialization, & increasing complexity
- Paralysis by analysis & the "Cartesian Curse"
- Cross-disciplinary mapping strategies & sustainability

Thursday, Jan 26: **To heal our understanding – Spinoza & the transdisciplinary vision (Part I)**

- Maps old & new – sea monsters galore!
- Leonardo da Vinci – "man of the universe"
- "Universal education" in the Renaissance
- The polymath or expert as ideal?
- The modern separation of arts & sciences
- Is "the environment" a Cartesian construct?
- Spinoza on "the order and connection of things"
- Man & Nature as a unified system
- Parts & wholes – Spinoza's worm-in-the-blood analogy
- Leonardo da Vinci's science of perspective
- The usefulness & limitations of disciplinary approaches
- Transdisciplinarity – a unified vision

Group activity

- The Fukushima nuclear disaster – modeling a cascading system failure
- Are "systems" in the eye of the beholder?
- Communicating about a system failure

Tuesday, Jan 31: **To heal our understanding – Spinoza & the transdisciplinary vision (Part II)**

- Spinoza's seamless map of reality
- Why true understanding is systemic
- The well frog & the sea turtle – Chuang Tzu on "small" & "great"
- Aspect perception
- Spinoza on "confused and mutilated knowledge"
- Why functional understanding requires a wider scope
- The "uncarved block" & the value of the "useless" in nature

Thursday, Feb 2: **Nature as a unified system – applying Spinoza to sustainable change (Part I)**

- Spinoza on sustainability
- *Conatus* – the natural tendency to self-sustain
- The three basic dimensions of sustainability
- Why sustainability is a whole-system property, not a simple "effect" of certain "causes"
- The Bellagio Principles of sustainable development

Group activity

- Seeing is believing – an exercise in perception & communication
- Jean Piaget (1927) on the child's conception of the physical causality of bicycle riding

Tuesday, Feb 7: **The Great Exhale – understanding climate change from a systems perspective**

A guest lecture by Lee Vierling, Associate Professor of systems ecology

Thursday, Feb 9: **Spinoza meets Gaia – climate change & global self-regulation**

- Anatomy or physiology? – is the Earth a "living body"?
- The Gaia theory & geophysiology
- Spinoza's perspective-based view of Nature & its "modes" & Lovelock's "Gaia" perspective – the usefulness of an adjustable "systems lens"
- Atmospheric steady-state vs. full chemical equilibrium
- Temperature regulation through biotic feedback
- Homeostasis & homeorhesis
- A trip to Daisyworld

Forming of interdisciplinary student teams for the design-studio project

Tuesday, Feb 14: **Spinoza, Gaia & systems – feedback & global resilience**

- Gaia – a well-supported theory
- A global perspective on climate change in the context of evolution & homeostatic self-regulation
- Evidence from the global sulfur cycle & microbial cloud nucleation
- Anthropogenic climate change = disruption of the Earth's life-support system
- Greenhouse gases & the relevance of time scales
- Songs in the key of C – is "carbon management" becoming the tune of political discourse?
- Complexity & resilience defined
- Meta-stable states & ecological thresholds
- Are we approaching a tipping point?

Thursday, Feb 16: **Climate feedback – the checks & balances of global change**

- What is a dynamical system?
- Stocks & flows
- Sources & sinks
- Nested systems
- The feedback loop – an analogy from electrical engineering
- Self-reinforcing ("positive") & balancing ("negative") feedback

- A Gaia symphony in C major – carbon & the interdependence of biogeochemical systems
- Carbon sequestration & climate regulation through biogeochemical rock weathering
- Ice-albedo feedback

In-team group activity, peer feedback between teams, & whole-class discussion

Tuesday, Feb 21: **Nature as a unified system – applying Spinoza to sustainable change (Part II)**

- The interdependence of parts & wholes
- Spinoza's unified vision of Nature as "substance" & its "modes"
- Cartesian dualism – only parts, parts, PARTS!
- The "irreducibility" of systemic wholes – synergy & emergence
- Spatial & temporal scales
- Feedback as analogy for our perception of the world
- Can we model Nature-in-itself or only *our understanding* of it?

Thursday, Feb 23: **Nature as a unified system – applying Spinoza to sustainable change (Part III)**

- Is the whole greater than the sum of the parts?
- Spinoza's philosophy of systems
- The ethics of homeostatic co-existence
- Envisioning a sustainable civilization

In-team group activity, peer feedback between teams, & whole-class discussion

Tuesday, Feb 28: **Making sense of complexity – systems thinking in action**

- Beware of crypto-reductionism in modern systems theory!
- The usefulness & limitation of computer simulation
- Model utility vs. the Cartesian quest for the "perfect model"
- The system boundary – a critical concept
- Open systems & closed
- Natural-, designed-, & human-activity systems
- Non-linear causation & human confusion

Thursday, March 1: **Defining an elusive target – sustainable development or just sustainability?**

- Can we even *define* sustainability?
- Competing views & definitions
- The Brundtland Commission definition
- Is sustainability a whole-system property?
- … or sustaining economic growth?
- *Can* development be sustainable?
- Discussion of sustainability definitions for student design projects

In-team group activity, peer feedback between teams, & whole-class discussion

Tuesday, March 6: **Dealing with messes – a systems approach for sustainable change (Part I)**

- Classical systems theory – only motivated by human utility?
- The Cartesian legacy of systems engineering
- Cybernetics – a science to "build & control"?
- General Systems Theory
- Conceptualizing "wicked problems" in the real world (Rittel & Webber, 1973)
- Defining "the mess" as a complex system of problems (Ackoff, 1974)
- Sustainable systems – towards a new (& ancient) science

Thursday, March 8: **Dealing with messes – a systems approach for sustainable change (Part II)**

- The engineering of social systems – a dismal failure leads to a new (& ancient) realization
- The "soft" systems view of Peter Checkland (& Spinoza)
- Systems as mental constructs with varying degree of model utility
- "Problem structuring" before problem solving!
- "Conflict accommodation" before conflict resolution – a move beyond the old deadlocks
- Soft Systems Methodology (SSM)
- The "subjective" interpretation of purposeful systems & the stakes of the resource game
- Brainstorming a "rich picture" of the situation – a tool for creative re-visioning
- Visualizing & modeling the system in the student design project

In-class briefing by student teams & peer feedback

• Project topics are introduced to the class
• General discussion of topics and the scope & approach of the projects
• Discussion of the overlap & contextual integration between the various projects (to identify missing pieces & to improve focus of contextual problem analysis)

March 12-16: **Spring recess**

Tuesday, March 20: **System mapping – seeing both the forest & the trees**

- Why systems methodology is no cookie-cutter "method"
- Mapping interconnections – the "order and connection of things"
- Drawing system diagrams – the Deepwater Horizon disaster revisited
- Locating logical dependencies & causal patterns
- Defining a system boundary based on model utility
- Identifying key processes, weak links, systemic constraints, internal conflicts, & leverage points
- Modeling feedback processes
- Playing with the options – the fine art of systems design

Thursday, March 22: **Sustainability Assessment Mapping – weighing impacts for decision-making**

Assignment #2: "Is the whole greater than the sum of the parts?" (due in class)

- Relating & comparing sustainability impacts
- Assessing impacts "as a whole"
- Drawing SAM diagrams to clarify the decision-making process (Clayton & Radcliffe, 1996)
- How to avoid reductionist trade-offs & "suboptimization"
- Moving decision making beyond the binary "Yes"/"No" of reductionist approaches

In-team group activity, peer feedback between teams, & whole-class discussion

Tuesday, March 27: **Globalization & sustainability – local solutions & the problem of scale (Part I)**

- The 1960s – "Earthrise" & globalization
- Cycles of economic change & stability of central governments
- A historical overview of imperialism & globalization
- From the Industrial Revolution to consumerism – subsistence gives way for growth-based economics
- Corporate imperialism, mass-production & the environment

Thursday, March 29: **Globalization & sustainability – local solutions & the problem of scale (Part II)**

- Globalization in the modern era – from protectionism to Neoliberal trade agreements
- Socio-economic stratification & the globalized economy
- Cultural homogenization
- Economic growth & its potential alternatives
- Carrying capacity on the scale of Gaia (the "whole-Earth" perspective of global ecology)
- Externalization of greenhouse gases & the Gaia-scale Tragedy of the Commons
- How do we move on beyond the failure of global climate agreements?
- The "Gaian"/Spinozan ethics of extended (i.e. "enlightened") self-interest (sustainable self-persistence of individuals & communities) versus traditional ethics

In-team group activity, peer feedback between teams, & whole-class discussion

Tuesday, April 3: **Human activity systems – designing a process for sustainable change**

Assignment #3: "The dynamics of sustainable systems" (due in class)

- A Soft Systems Methodology (SSM) primer
- Rich picture, root definition & CATWOE
- The SSM cycle
- Designing a human-activity system for sustainable change

Thursday, April 5: **Top-down, bottom-up, or consensus – how can sustainable solutions be negotiated?**

- The democratic process from a systems perspective
- "Top down", "bottom-up" & "consensus" from the standpoint of systemic homeostasis & change
- Idealized perceptions of status-quo & change
- The myths of progress & the ideal past, & the function of these myths in the public debate
- Mandate periods, decision-making & time scales

- Strategic delays, deadlocks by design, & lobbyism – understanding the political game
- Partisan division from a systems perspective
- State legislation & federal – can they function together sustainably?
- Identifying & communicating a common ground – a leap beyond watered-down political compromise
- "Me" & "you", "us" & "them" – how do we reach beyond the divide?

In-team group activity, peer feedback between teams, & whole-class discussion

Tuesday, April 10: **Owning the Earth – rights, needs, & social dilemmas**

- With stakes in the game – the multiplicity & conflict of stakeholder motivations
- Individual- & collective rights & needs – uncovering the root of social dilemmas
- Common-, public-, & private property – who "owns" Mother Earth?
- Sustainability in the Hebrew Bible
- For seven, or ten generations – ancient- (Homer's *Odyssey*) & Native American notions of sustainable land use
- "Negative externalization" & the Tragedy of the Commons
- The "free-rider" problem & sustainability
- A Swedish example – *Allemansrätten*, "Every Man's Right"
- Greed/economic "rationality"/profit making as the engine of economic "growth"
- Can Capitalism be sanitized? And should it be?

Thursday, April 12: **In-class briefing by student teams**

10-15 minute presentation/discussion per team; **NO statistics or background info from your previous topic research in this briefing!** (save that for the final presentation & report/information brochure). Focus of the briefing:

1. Share with the class what your **approach & project definition** is & has been (if changed during the semester)
2. **What has worked & what hasn't** (e.g. methodology, system boundaries, & scope issues)
3. **How you model the mess/messes/systems** in your project, especially feedback loops
4. Any **recommendations** you may have to help the other teams

Tuesday and Thursday, April 17 & 19: **Designing a strategy for sustainable change**

Tuesday, April 24: **Sustainable development, risk & precaution (Part I)**

- How much risk is too much risk?
- The Deepwater Horizon & Fukushima disasters – what have we learned about risk management?
- Probabilistic risk assessment vs. functional whole-system approaches
- Determining risk in complex systems – a "wicked" problem!
- The dilemma of induction & utilitarian "cost-benefit" analysis
- Nuclear power & seismic-risk assessment
- The precautionary principle
- Precautionary buffers in natural-resource management
- The precautionary principle & Gaia-scale Tragedy-of-the-Commons situations (e.g. climate change)

Thursday, April 26: **Natural hazards, climate change & sustainable development**

A guest lecture by Tim Frazier, Assistant Professor of natural-hazard vulnerability & climate change

In-team group activity, peer feedback between teams, & whole-class discussion

Tuesday, May 1: **Sustainable development, risk & precaution (Part II)**

- Assessing the vulnerability of systems
- The Silent Spring of our time? – a worst-case scenario of consumer electronics
- Why we need to include risk management & disaster preparedness in sustainable development
- Invulnerable development
- Integrating risk & precaution in ecological design
- Science, engineering, economics, & ethics – "Where did we go wrong, & where do we need to go from here?"

Thursday, May 3: **The Beauty of Enough – reflections on the aesthetics of sustainable design**

- We preserve the beautiful
- Plato on beauty & the eye of the beholder
- Caspar David Friedrich – the landscape as unified vision
- The sense of awe, fulfillment & wholeness – functional design for socio-economic sustainability
- The beauty of proportion – the relation between "big" & "small"
- Ratio & harmony in the Renaissance
- Leonardo da Vinci's integration of visual art & the science of systems
- From isolated events to *relational wholes*
- From isolated parts to *pattern & process*
- From "things" to *functional relations*
- From quantities to *proportions*
- "Dance in your blood" – Rumi on the limits of organization & computation

Final in-class student presentations

- 20 minutes per team
- Systems, problems, and strategy for sustainable change are presented
- What have you learned from using the systems approach?
- Did the team communication, organization, and leadership function properly?
- How did the strategies of various student teams in the class integrate/overlap?
- In what sense has systems methodology been helpful in assessing the sustainability of your system/problem situation?
- Has the wide-scope methodology behind this project led you to solutions that you wouldn't have found with a traditional, narrowly conceived approach?
- What have you learned from seeking leverage points?
- If you advised someone about how to most effectively undertake a system-wide, comprehensive analysis for sustainable change – what would that advice be?
- **Can your recommendations actually be implemented outside the classroom? If so, where should you go/how can you proceed?**
- Feedback from invited guests

Thursday, May 10: **Final team-design project reports are due**

In-class Course Evaluation (April 16)

BioP 404/504: Designing Sustainable Systems, Daniel Hansson, Spring 2012

All responses were anonymous (*n* = 15)

A. Daniel Hansson as an instructor

1. Daniel's mastery as an instructor of the subject matter of this course (A = highest grade; D = lowest)

Grade	4	3	2	1	Mean
Respondents	12				**4.0 (100%)**

Student comments:

"VERY well-read and KNOWLEDGEABLE about many things, disciplines, and the concept of sustainability." (504 student)

"Can always explain the information in simple terms and is quick to correct student misconceptions" (504 student)

"Whenever someone brought up a topic related to the lecture but not within the scope, he was able to provide insight and information demonstrating an ability to think on his feet and a deep knowledge of the subject matter." (404 student)

"Very well-informed and well-read." (404 student)

"He knows the subject well and his passion for it shows and translates into passion for the students." (504 student)

"Very knowledgeable." (504 student)

"He obviously studies a great deal and is versed in topics ranging from philosophy, religion, nature and technology." (504 student)

"Daniel is very knowledgeable in the subject of Spinoza and sustainable systems thinking. He's very helpful and gives advice for whatever the problem may be." (504 student)

"!!!!" (504 student)

2. As an instructor, Daniel is inspiring and passionate about the design of sustainable systems (A = highest grade; D = lowest)

Grade	4	3	2	1	Mean
Respondents	12				**4.0 (100%)**

Student comments:

"[Daniel's] passion is addicting. Knowing my instructor feels so strongly about the subject he is teaching makes me want to learn more." (504 student)

"Fascinating lecturer. (…) passionate and extremely knowledgeable about these topics." (504 student)

"… very dynamic" (404 student)

"A+ (…) his passion and depth of knowledge is motivational. He is also open to debate and allows for a wide variety of ideas. He shows a creative and critical side which inspires the same in myself." (504 student)

"Daniel is a passionate instructor, genuinely concerned with doing a good job and making coursework meaningful." (404 student)

"Daniel's passion and interest in the sustainability topic inspired me to become a better advocate for it myself. The knowledge that he bestowed on me will help me to make better arguments for change in the future. The loss of him as a professor will be a detriment to our department and college." (504 student)

"!!!!" (504 student)

3. Daniel's ability to make the course material interesting and meaningful (A = highest grade; D = lowest)

Grade	4	3	2	1	Mean
Respondents	11	1			**3.9 (98%)**

Student comments:

"I recognize him as my best teacher ever." (504 student)

"Daniel Hansson is passionate about his work and it shows." (504 student)

"I love attending lectures for this course." (404 student)

"… explained the concepts being taught in an insightful, thoughtful and innovative way, while keeping me engaged and interested." (504 student)

"Always prepared and interesting." (504 student)

"Best class so far in BioP [Bioregional Planning & Community Design]." (504 student)

4. Daniel's ability as an instructor to convey an integrative "wide-scope" understanding of interrelations within and among systems (A = highest grade; D = lowest)

Grade	4	3	2	1	Mean
Respondents	9	2			**3.8 (95%)**

Student comments:

"He provided many different methods by which we can approach the final project [in the course]…. very applicable to my design degree [and] will help in dealing with clients and stakeholders" (404 student)

"I believe no matter what major a person is in, this class can benefit. It teaches systems, and everything is a system that functions properly (like nature) or improperly (like humanized systems). Very stimulating class!" (504 student)

5. Daniel as an instructor encourages critical thinking and creativity (A = highest grade; D = lowest)

Grade	4	3	2	1	Mean
Respondents	11	1			**3.9 (98%)**

Student comments:

"Very open and positive toward student growth and interests." (504 student)

"… open to other people's ideas while making sure [he] gets [his] point across." (504 student)

"This course and Daniel's passion for creativity has inspired me toward ideas that could change the world we live in. I have had some great project ideas through listening to lectures." (504 student)

"This course should be mandatory for all University of Idaho students. I have never been in a class that pushed my way of thinking and understanding so far and so fast. This class is fascinating and important especially as our world continues to understand the role systems thinking and sustainability play in fixing many of our biggest problems. Everything about this course is outstanding. The readings are stimulating and make you think, like, seriously *think* about the world and our place on it as human beings. I look forward to this class and the lab every week! Please keep this course alive!" (504 student)

6. Overall performance of Daniel as an instructor (A = highest grade; D = lowest)

Grade	4	3	2	1	Mean
Respondents	11				**4.0 (100%)**

Student comments:

"The best instructor I've ever had. In comparison, all the other classes I take feel unimportant and like a waste of time. Simply the best teacher there is. This class has been like Seeing the Light." (504 student)

"Absolutely one of the best professors I've had in my 4 years at the University of Idaho." (504 student)

"If there was a higher grade I would give it to him. He kept me interested in a subject I never considered interesting." (504 student)

"One of the best I have had." (504 student self-identifying as pursuing his second (BioP) Master's degree)

"I cannot express how impressed I've been with your class this semester. I have learned so many tools and methodologies for making sense of messes and applying systemic change through design. (…) You and your class are pushing my way of thinking and my abilities as a designer to create lasting, meaningful, sustainable place!" (504 student)

"… the only instructor who's really cared about the dynamics of group work." (404 student)

"… an extremely valuable instructor…. Daniel is a breath of fresh air. He is reasonable, polite, knowledgeable, and very willing to help." (404 student)

"Very pleased that I took this course – the best class I have taken during my tenure at the University of Idaho." (504 student)
"Daniel is one of the University of Idaho's best professors. I've attended school here for 4 years and have never met a professor so passionate about his students and the topics of systems thinking and sustainability. Daniel is always there to talk with if you have any confusion regarding the course work, or if you just find something fascinating and want to discuss the topics further (happens ALOT!) Keep this guy around, he is extremely knowledgeable, helpful, passionate and understanding." (504 student)

"This is what all classes should be like." (504 student)
"Daniel Hansson is the best instructor I've ever taken a class from. I would recommend this class to every student in the whole university; it is the most relevant class to reality that I've ever taken. I believe that Daniel will go on to be a very famous lecturer and scholar. He is very skilled at organizing a class and reaching his audience in meaningful ways. He helps the student perfectly fuse deep, far-reaching goals with detail-specific planning. I believe that this class has taught me more valuable techniques that will be relevant to my future profession than almost all my other classes combined. I will not miss school, but I will miss learning from Daniel. (…) His grading and review of assignments was detailed and thoughtful. I was able to have a few conversations with Daniel outside of class and as good as he is in lecture, he taught me an astounding amount in these short conversations. This class should be a required class in its discipline. Taking this class was the best time I've ever invested at the University." (504 student self-identified as finishing the last semester of a second Master's degree).

7. Likelihood you would recommend Daniel as an instructor to others (4 = "highly likely"; 1 = "highly unlikely")

Grade	4	3	2	1	Mean
Respondents	11	1			**3.9 (98%)**

Student comments:

"*5* [on a scale from 1 to 4]." (504 student)

"The class was more than I expected and was innovative, informative and visionary. I highly recommend the class to anyone wishing to be challenged and have their eyes opened to a whole new world. I wish I learned as much and had as much enjoyment in my other classes, past and current." (504 student)

"Daniel is passionate and devotes a great deal of time and personal attention to students. He is really concerned with students' progress and will take time to address any issues that may come up in a deep and understanding way. Very uncommon." (404 student)

"I think this is a great class that everyone should take as possible future leaders in our fields." (504 student)

"This should become a required course for all students." (504 student)

"I hope Daniel is able to stay an academic instructor at the U of I in BioP [Bioregional Planning & Community Design]. The program would be greatly enhanced by his teaching and student-mentoring." (504 student in BioP)

"Very helpful, knowledgeable, understanding of other views, and isn't one-sided on ideas." (504 student)

"This course has given me a new understanding of how Bioregional Planning should be taught. This course embodies the reason I wanted to be a planner in the first place. I would describe it as truly and profoundly interdisciplinary, to use an overused word. Even further than that, I believe it is transdisciplinary in the best possible sense: retaining rigorous analysis and understanding of a variety of disciplines, but at the same time transcending all of the disciplines and allowing all of them to be 'in play' and to offer the best of what each can, while privileging no one discipline above the others, but allowing each to 'speak' and contribute to the ongoing conversation of sustainability. I would say that this course offered the best explanation and understanding of sustainability that I have ever encountered. I understand sustainability in a deeper and more nuanced way than I did before. This course helped to crystallize my thoughts about sustainability and its potential to help solve many of our planet's problems, from climate change to deforestation to cultural homogenization to globalization and beyond. This course explained sustainability to me in a practical and profoundly relevant way that will help me in my future academic and professional career." (504 student self-identified as a BioP student pursuing his second Master's degree)

"Daniel Hansson's unique knowledge, passion and philosophy should [be the central theme of the course]." (504 student)

B. Course topics and themes

1. The course's value in expanding the mind and enriching the worldview (A = highest grade; D = lowest)

Grade	4	3	2	1	Mean
Respondents	11				**4.0 (100%)**

Student comments:

"This class should be required for all majors early in a student's academic ventures…. Keep it going and expand its recruitment. Every student should take this class as an intro early on or a capstone before graduation." (504 student)

"… this course made me realize the importance of my actions given how they affect others and how they affect how others view me." (404 student)

"… the biggest thing I have learned in this course is the value of good critical thinking skills over exhaustive knowledge…. Provided tools for critical thinking…. I find myself carefully evaluating the scope of problems before I decide to apply or think about solutions…. Highly useful in the design process…." (404 student)

"Loved the philosophical aspects of the class." (404 student)

"I have learned that not all philosophy is useless, when it is actually put to use…. This class has broadened my scope as far as seeing other aspects of sustainability, in economics, industry, and life as we know it. I look at problems differently now…. seeing a problem as a whole with connected parts…." (504 student)

"I have learned a new way of looking at problems and of seeing the world. I did not realize how closed minded my learning had been until I started to see things in a non-reductionistic light. I have adopted this new understanding in my everyday life and in problem visualization. [I] can see downstream effects in my own life and the effect on a worldwide scope." (504 student)

"A+++ (…) This is the greatest strength of the class. It was not just about learning, it was about growing." (504 student)

"…very relevant... this should be a mandatory core class university wide." (404 student)

"[This course] helped me realize that sustainability is not at the core of my field although it should be. Daniel helped strengthen my view of my unique place in the world…. Daniel has changed my understanding of the urgency and depth of the sustainability crisis…." (504 student)

"Excellent class. One of the best I have had at the U of I." (504 student)

"… should be required for all majors." (504 student)

"… it would be a true shame and tragedy if this course is not offered in the future. truly a valuable course and a great instructor." (504 student)

"I have learned about myself, my learning style, and that often my assumptions about what I think are wrong. This is a good thing. Because in learning to slow down and dig deeper into systemic planet-size problems and connections, I can see relationships, interdependencies, and the complexity of real-world problems in a more profound… way. (…) I have learned that it will take all of us, working together, and with sustainability as our goal, to create a better future for everyone. This course has changed my view of the world in profound ways. I have a deeper appreciation for the earth as a home for all of life in its complexity and beauty. I also have a deeper awareness of the sensitive balance that must be maintained in order for life to flourish. I have a deeper and more profound knowledge of the ecosystems and the complex interactions and relationships between human actions and the earth's adaptation to those actions. Furthermore, this course has changed the way I view my role in the world. It has given me more of a passion for finding sustainable solutions to real-world problems facing human society and the planet. In a nutshell, I would say that this course was able to give me something unusual and profound: a paradoxical understanding of the vast complexity of the problems facing our world, *and at the same time*, a reason to hope and believe that I, that we, can make a difference. That is a rare gift in academia!" (504 student self-identifying as a BioP graduate student with a previous Master's degree)

2. This course imparts a deeper understanding of reductionism and Spinoza's philosophical alternative, and of how these approaches to the priority and organization of parts and wholes are relevant to our present sustainability crisis; including the ethical, economic, social, and cultural/traditional dimensions involved (4 = "strongly agree"; 1 = "strongly disagree")

Grade	4	3	2	1	Mean
Respondents	10	2			**3.8 (96%)**

Student comments:

"I think everyone in higher education, regardless of their field of study, should take a course like this to open their minds to different ways of thinking." (504 student)

3. This course imparts understanding of how the concept of sustainability relates to the self-regulation, flexibility/resilience, long-term viability, and evolution of natural-, designed-, and social systems (4 = "strongly agree"; 1 = "strongly disagree")

Grade	4	3	2	1	Mean
Respondents	12				**4.0 (100%)**

Student comments:

"This course does this very well, to the point where it should be a required course for all students prior to graduation. The topics in this course are relevant to all disciplines and could potentially change our understanding of our role as humans." (504 student)

"BEST understanding of sustainability I have received so far at the U of I (I'm on my second Master's!)." (504 student)

"The info on diversity and resilience is *invaluable*." (404 student)

"The interrelated and correlated nature of complex systems was never explained as eloquently as it has been in this class." (504 student)

"I understood the surface theories of these concepts but not as in depth as I have now learned." (504 student)

"My understanding of climate change was definitely enhanced by taking this course. Through the lab exercises, lectures, and team projects, the students were engaged in the topic and were invited into the complexity of climate change and how it is related to the overall health and habitability of the planet." (504 student)

4. The course's value in developing your ability to think through real-world issues, explore creative avenues of expression, solve problems, and make decisions. (A = highest grade; D = lowest)

Grade	4	3	2	1	Mean
Respondents	10				**4.0 (100%)**

5. The course's value in teaching useful, real-world problem-solving skills (A = highest grade; D = lowest)

Grade	4	3	2	1	Mean
Respondents	8	3			**3.7 (93%)**

Student comments:

"I learned the importance of stepping back, viewing all parts of a problem." (504 student)

"The course has changed me in how to combat design problems in the world…." (504 student)

"I'm currently using what I have learned." (504 student)

"This course has (…) reaffirmed my field of study and my future role in the world. (Landscape Architecture) (…) The course has given me tools for establishing myself and [my] profession in the future world. This course made me *aware* of complex systems. Before, I had a very reductionistic way of looking at things 'fix this and your problem doesn't exist anymore'…. By fixing one problem you may have only put a plug in one hole…. This course has helped to grow my argument why landscape architecture is important in the development of our future. " (504 student)

"I will use it [Soft Systems Methodology] in my thesis to help explain more in-depth problems." (504 student)

"[I have learned] how to use a systems approach to design and ideate [and] how to argue correctly…." (504 student)

"I am able to explain more clearly to everyone I speak to about climate change. [I have learned] how leverage and tipping points can cause catastrophies on a global scale. [I am also] going to include this mapping strategy [taught in class] in my designs and portfolio." (504 student)

"This course has brought my perspective of landscape architecture designs to a whole new level…. biomimicry is my new favorite design enhancement." (504 student)

"Every student that goes through the University of Idaho should have to take this class to graduate, it would put the university in the forefront of the sustainability argument and educate students on how change can be made. (…) The Soft Systems Methodology and CATWOE's process that I learned will be used in every project that I do from here toward the future." (504 student)

6. The course's value in stimulating critical thinking (A = highest grade; D = lowest)

Grade	4	3	2	1	Mean
Respondents	9	3			**3.8 (94%)**

Student comments:

"Really enjoyed the critical-thinking sessions in this class." (404 student).

"I'm a student of philosophy (B.A., M.A.) and understand 'systemic thinking' and systems of thought fairly well. But this course went beyond a simple *explanation* of complexity and was able to get us students to actually *experience* complexity. This is far more important and useful to students and to professionals working in the fields of planning, design, architecture, environmental science, and virtually any discipline." (504 student)

"… this class is applicable to all fields of study. It also helped me to understand why people are so limited in their understanding of the consequences of their actions because they fail to see the connections between the small things which aggregate together to form one wicked mess." (404 student)

7. Value of the written/drawn assignments in the course for learning the course material (A = highest grade; D = lowest)

Grade	4	3	2	1	Mean
Respondents	10	1			**3.9 (98%)**

Student comments:

"Very innovative and informational" (504 student).

8. Usefulness of the student-team design project for learning practical systems modeling/mapping (A = highest grade; D = lowest)

Grade	4	3	2	1	Mean
Respondents	6	5			**3.5 (89%)**

Student comments:

"This is the most important project that I've ever done in school." (504 student that self-identified as finishing the final semester of his second (BioP) Master's degree)

"Lab sessions were extremely well designed and useful." (504 student)

"Daniel was effective in giving constructive feedback on details of presentation." (504 student)

9. The course's value in teaching how to communicate in a clear and relevant way about sustainable development (A = highest grade; D = lowest)

Grade	4	3	2	1	Mean
Respondents	7	4	1		**3.5 (88%)**

10. The course's value in developing cross-disciplinary/cross-cultural collaboration skills (A = highest grade; D = lowest)

Grade	4	3	2	1	Mean
Respondents	8	3			**3.7 (93%)**

Student comments:

"… one of the best, if not THE best, class I have had in the BIOP program, or any program for that matter. It is one of the best examples of combining practical and theoretical knowledge in an interdisciplinary structure. And of course, the explanation of the philosophical foundations (Spinoza, Descartes, etc.) for understanding complexity and systems thinking is of incredible value to me." (504 student self-identifying as pursuing a second Master's degree)

11. The course's value in imparting understanding of the environmental- and socio-economic impacts of globalization (A = highest grade; D = lowest)

Grade	4	3	2	1	Mean
Respondents	8	3	1		**3.6 (90%)**

12. The course's value in teaching awareness of societal problems (A = highest grade; D = lowest)

Grade	4	3	2	1	Mean
Respondents	10				**4.0 (100%)**

13. Do you find it appropriate and meaningful to teach Spinoza's philosophy of parts and wholes in a course about sustainable systems? (4 = "highly appropriate"; 1 = "not appropriate"; circle one)

Grade	4	3	2	1	Mean
Respondents	11	1			**3.9 (98%)**

Student comments:

"I fought this from the beginning but the way it was taught made a believer out of this skeptic." (504 student).

"Excellent exposition of a very complex philosopher, and [made] practical and understandable." (504 student in the BioP Master's program with previous Master's and Bachelor's degrees in Philosophy)

14. Do you find it appropriate and meaningful to present and contrast Baconian-Cartesian reductionism with Spinoza in a course about sustainable systems? (4 = "highly appropriate"; 1 = "not appropriate"; circle one)

Grade	4	3	2	1	Mean
Respondents	9	2	1		**3.7 (92%)**

15. Spinoza's view on the perspectival relativity of parts and wholes is useful to understand when analyzing and designing systems (4 = "strongly agree"; 1 = "strongly disagree"; circle one)

Grade	4	3	2	1	Mean
Respondents	10	2			**3.8 (96%)**

16. Do you find it appropriate to teach the Gaia theory in a course about sustainable systems? (4 = "highly appropriate"; 1 = "not appropriate"; circle one)

Grade	4	3	2	1	Mean
Respondents	10	2			**3.8 (96%)**

17. Do you find it appropriate to teach Soft Systems Methodology (SSM) in a course about sustainable systems? (4 = "highly appropriate"; 1 = "not appropriate"; circle one)

Grade	4	3	2	1	Mean
Respondents	11	1			**3.9 (98%)**

18. Usefulness of the "soft-systems" approach (i.e. the view that systems are conceptual constructs) for understanding and designing systems (A = highest grade; D = lowest)

Grade	4	3	2	1	Mean
Respondents	10	2			**3.8 (96%)**