UNST 124g fall 2011
details, details, details

1 introduction

Rockström *et al.* (2009) define nine planetary boundaries that define a "safe operating space" for humanity. Their analysis indicates we are beyond safe thresholds for some but not all of the boundaries. While we should pay attention to all of the boundaries, a case could be made for urgency to be focussed where they conclude that we are close to or beyond a threshold now. We will examine four of these in some detail:

- climate change/carbon emissions/energy
- freshwater
- Nitrogen/Phosphorous cycles and agriculture
- biodiversity/ecosystems

2 assignment

A reading on each topic is assigned in the syllabus. In addition to readings and reflections on those, you are asked to work in study groups to develop and give classroom presentations and lead a discussion that treats each topic area in more detail than is available in the primary readings. The presentations should explain why this topic is relevant to sustainability (or resiliency, or sustainable development) and address two themes:

- What are the challenges?
- What are some actions that can be taken (or are now being taken) to meet those challenges?

Use the article we have all read (listed here and in the syllabus) as the starting point for the class discussion but grow from there, using your study of additional resources. The study group presentations should be, factual, engaging, and well integrated. Please do not prepare a series of monologues.

Some additional sources are recommended here but you should think of these as a starting point, not the only materials you need. The sources listed here are all available via the

accompanying URL or online subscriptions held my Millar Library. Please do not hesitate to ask your professor for additional suggestions.

2.1 climate/carbon/energy

Confronting global warming and climate change requires action at many scales, from personal to global. Because global warming is caused by carbon emissions and fossil carbon is currently the world's dominant energy source, climate action requires fundamental changes to the world's energy plan. Because fossil fuels are non-renewable on human time scales, sustainability action also requires changes to the world's energy plan. The primary reading (for everybody) on this topic is on electronic reserve:

Socolow, R., and S. Pacala. (2006). A plan to keep carbon in check. *Scientific American*.

Additional readings for this study group include:
Dothwaite, R. (2010). The International Response to Climate Change, In *The Post-Carbon Reader*. Watershed Media. `http://www.postcarbon.org/reader/toc`

Jacobson, M. and M. Delucchi. (2009). A plan to power 100 percent of the planet with renewables. *Scientific American*. November.

Roberts, D. (2010). Local power: Tapping distributed energy in 21st-century cities. *Scientific American*. June.

2.2 water

Access to freshwater is a fundamental human need, for drinking and agriculture, sanitation, and the production of goods. Water can also be a hazard. For example, when more rain falls (or snow melts) than can be accommodated by surface water systems, the resulting floods have adverse health and infrastructure effects. Freshwater resources, storm events, and drought are all changing due to population growth and global warming. The primary reading (for everybody) on this topic is available online:

Postel, S. (2010). Water: adapting to a new normal, In *The Post-Carbon Reader*. Watershed Media. `http://www.postcarbon.org/reader/toc`

Additional readings for this study group include:
Oelkers, E, J. Hering, and C. Zhu. (2011). Water: Is there a global crisis? *Elements*, 7, 157-162.

Schwartz, F. and M. Ibaraki. (2010). Groundwater: A resource in decline. *Elements*, 7, 175-179.

Drought research at Lamont-Doherty Earth Observatory
http://www.ldeo.columbia.edu/res/div/ocp/drought/

2.3 agriculture

Food production connects with many other issues on the climate and sustainability agenda. Water resources, global biogeochemical cycles, and fossil fuels are all on the plate when we sit down to a meal. The primary reading (for everybody) on this topic is available online: Bomford, M. (2010). Getting fossil fuels off the plate, In *The Post-Carbon Reader*. Watershed Media. `http://www.postcarbon.org/reader/toc`

Additional readings for this study group include:
Science special online collection: Food Security. (2010). `http://www.sciencemag.org/site/special/foodsecurity/`.

Allen, E. Growing Community Food Systems, In *The Post-Carbon Reader*. Watershed Media. `http://www.postcarbon.org/reader/toc`

Foley, J.A., C. Monfreda, N. Ramankutty and D. Zaks. (2007). Our share of the planetary pie. *PNAS*, 104 (31), 12585-12586.

Tilman, D., K.G. Cassman, P.M. Matson, R. Naylor, and S. Polasky. (2002). Agricultural sustainability and intensive production practice. *Nature*, 418, 671-677.

2.4 biodiversity

The word *biodiversity* and the ways of thinking about ecosystems it implies are relatively new. The word was first used b y biologist E.O. Wilson in the mid 1980s as he expressed concern about loss of this quality in global ecosystems. From their start, biodiversity studies have been intertwined with philosophical questions. Biologists and ecosystem ecologists are measuring systems that are in most places changing, sometimes at rapid rates, due to the global actions of one species. From a purely anthropocentric perspective, we may care about biodiversity loss because it affects the ecosystems in which we live and on which we rely for services. Other value systems are also possible, of course. Ecosystem stewardship is a framework for understanding and acting on issues centered around biodiversity loss and environmental change.

The primary reading (for everybody) on this topic is available in the electronic reserve for this class: Chapin, S. and 16 others. (2009). Ecosystem stewardship: sustainability strategies for a rapidly changing planet. *Cell*, 25 (4), 241-249.

Additional readings for this study group include:
Chapin, S. and 11 others. (2000). Consequences of changing biodiversity. *Nature* (405), 234-242.

Daily, G.C, and 8 others ((2009). Ecosystem services in decision making: time to deliver. *Frontiers in Ecology and the Environment*, 7 (1), 21-28.

Tilman, D. (2000). Causes, consequences and ethics of biodiversity. *Nature*, (405), 208-211.

3 references

Rockström, J., and 29 others. (2009). A safe operating space for humanity. *Nature*, 461, 472-475.