Sustainability and Globalization

Module Length: 6 hours

Overview

The depletion of natural resources that accompanies globalization brings the issue of sustainability to the forefront as countries try to balance the protection of the environment with economic growth. Policymakers must balance the needs to provide opportunities for employment and upward mobility in the present, while not destroying the natural resources that are necessary precondition for the human well-being in the future. The United Nations defines sustainability as the ability to "meet the needs of the present without compromising the ability of future generations to meet their own needs."

The Sustainability module introduces students to the impact of present and future population trends, the concept of natural capital, the causes and effects of global warming, the different types of alternative energy, and potential solutions to creating a sustainable environment, society, and economy. Students will critically examine these issues through multiple lenses and will gain an understanding of how key thinkers and organizations are approaching these controversial topics.

Learning Objectives

Through the completion of this module, participants will be able to:

1. Connect concepts from a variety of disciplines within the framework of sustainability.
2. Make informed decisions about controversial issues involving sustainability.
3. Evaluate the validity of a news report related to the environment and sustainability OR prepare a scientifically sound argument on a local environmental issue to present at a town forum or in a town newspaper
4. Recognize the role separate countries play in the environmental issues that affect sustainability.

Glossary

Carrying Capacity: the maximum population of a species that a particular habitat can sustain with being degraded

Climate: The long term average weather for an area: Months, years, centuries.

Ecological footprint: the amount of biologically productive land/sea area needed to support the lifestyle of humans

Exponential Growth: The rate of growth for a population if it has a constant birth rate over time and is never limited by other factors

Ecosystem: the physical factors (i.e. water, soil, air) and biological entities (plants, animals) that interact within a habitat

Geothermal energy: the utilization of high temperatures within the earth to heat water to either heat buildings or generate electricity

Linear Growth: "when something grows the same exact amount in each time frame" (Retrieved from: http://answers.ask.com/Science/Other/what_is_linear_growth)

Natural Capital: The natural resources and services that keep life on Earth alive and support our economy.

Natural resources: materials and energy found in nature that we use: examples include solar energy, coal, oil, soil, water, air, trees, fish, copper, aluminum, etc.

Nitrogen Fixation: As N2, Nitrogen is inert, and most organisms can't use it to build proteins. The N2 has to be converted into usable molecules by separating the two Nitrogen atoms and adding Hydrogen to them in varying amounts to create ammonia and other Nitrogen compounds. Biodiversity: variety of the species on the Earth

Nonrenewable resources: resources that are not replaced as fast as they are used. Examples: coal, oil, fish, copper, aluminum, etc.

Population Growth Rate: is the increase in a country's population during a period of time, usually one year, expressed as a percentage of the population at the start of that period. (Retrieved from: http://www.worldbank.org/depweb/english/modules/social/pgr/index.html)

Population momentum: Reaching replacement level fertility rate does not immediately stop population growth, because the current children will grow up and also give birth to 2.1 children, putting off the stop in population growth by a generation. This delay in leveling of the population is called population momentum.

Renewable resources: resources that are replaced at a rate equal to or greater than the rate at which they are used. Examples: solar, soil, water, air, trees

Sustainability: "meet the needs of the present without compromising the ability of future generations to meet their own needs" -from the United Nations General Assembly (1987) Report of the World Commission on Environment and Development: Our Common Future.

Total fertility rate: Average number of children born to women during their reproductive years. Replacement level fertility rate: The number of children a couple must give birth to replace themselves

Weather: the state of atmospheric conditions over a short period of time: Hours or days.

Lesson Plans

Lesson 1 Population and Sustainability

Overview

In the first lesson, students will compare and contrast different definitions of sustainability and will examine the relationship between population trends and sustainability. Concepts such as the ecological footprint and population dynamics will be discussed.

Relevant Learning Outcomes

1. Connect concepts from a variety of disciplines within the framework of sustainability.
2. Make informed decisions about controversial issues involving sustainability.

Procedure

Pre-Class Assignments

- Students read the Bartlett or Diamond readings before class. If the class is longer than one hour, students can read parts of the reading in class for discussion. For the Bartlett reading, students should also skim the biographical and publications information available on his website (see "Resources" below).

Possible Classroom Activities

- Hook/Introduction.
  (Time: 5-7 minutes) (Skills: Holistic Thinking) (Objective 1) (Related Resource: PowerPoint)

  Task for students: In your own words, define "sustainability" or at least some of its key elements.
  If there is time, 1) ask students to compare with 2-3 neighbors and develop a common definition; and/or share/discuss as a class.

  Ask students to compare to the UN definition (PowerPoint slide 1)

- Lecture/Discussion.
  (Time: 30 - 60 minutes) (Skills: Holistic Thinking) (Objective 1) (Related Resources: Sustainability1.ppt, and Appendix A)

  Using lecture outline and PowerPoint slides, introduce students to the concepts of sustainability, globalization and population. Make the lecture interactive through

questioning and analysis. Appendix A contains the lecture notes and discussion questions.

- Reading Discussion.
  (Time: 30 minutes) (Skills: Holistic Thinking) (Objectives 1 and 2) (Related Resources: Bartlett reading and Appendix B)

  One could shorten the lecture and use class time for a discussion of the main reading (Barlett, 1998). Please note that the Barlett article is rather long. A variety of discussion models could be employed (see "Notes" for module) or the instructor can use classroom management software for outside-of-class-discussions. Appendix B contains relevant discussion questions.

- Conclusion.
  (Time: 5-7 minutes) (Skills: Holistic Thinking) (Objectives 1 and 2) (Related Resources: Sustainability1 PowerPoint, Bartlett reading, Diamond reading)

  How could one elaborate on the 1987 UN Commission's definition of sustainability? What elements would you add to reflect the diverse issues and interpretations revolving around this topic?

Resources

- Appendix A Lecture Outline for Lesson 1
- Appendix B Lesson 1 Reading Discussion Questions
- Bartlett, A.A. (1998). Reflection on sustainability, population growth, and the environment – Revisited. *Renewable Resources Journal*, v. 15, n. 4, pp. 6-23. Available online at http://www.albartlett.org/articles/art_reflections_part_1.html
- "About Professor Emeritus Albert A. Bartlett." (n.d.). Retrieved from: http://www.albartlett.org/about_al_bartlett/about_al_bartlett.html
- Diamond, Jared. (2005). Chapter 2, "Twilight at Easter" in: *Collapse: How societies choose to fail or succeed*. Viking-Penguin Group, Inc., New York, pp. 79-119.
- "Selected Articles by Al Bartlett." (n.d.). Retrieved from: http://www.albartlett.org/articles/articles_by_al_bartlett.html
- Sustainability1.ppt. Retrieved from: http://www.global-workforce.globalization101.org/wp-content/uploads/2012/08/Sustainability1.ppt

Optional Resources

- International Data Center. (n.d.). Retrieved from: http://www.guttmacher.org/idc/servlet/DoMap

- Black, Richard. (2006, November 2). Only 50 Years Left for Sea Fish. BBC News. Retrieved from: http://news.bbc.co.uk/2/hi/6108414.stm
- Fish stock collapse (n.d.). [data file]. Retrieved from: http://images.wri.org/chart_wr9899_rrfg11.gif
- Collapse: End of Global Fish Stock by 2050?. (2006, December 7). Globalization101. Retrieved from: http://www.globalization101.org/collapse-end-of-global-fish-stock-by-2050-2/
- Ecological footprint quiz. Global Footprint Network. (n.d.). Retrieved from: http://www.footprintnetwork.org/en/index.php/GFN/page/personal_footprint
- Ecological footprint by nation. Global Footprint Network. (n.d.). Retrieved from: http://www.footprintnetwork.org/en/index.php/GFN/page/footprint_for_nations/
- Tierney, John. (2011, March 7). When Energy Efficiency Sullies the Environment. *New York Times*. Retrieved from: http://www.nytimes.com/2011/03/08/science/08tier.html?ref=earth
- Environmental History Timeline. (n.d.) Retrieved from: http://www.radford.edu/~wkovarik/envhist/

Lessons 2 and 3: Natural Capital

Overview

In the second and third lessons, students will learn about the economic, social and environmental elements of sustainability and examine the primacy of a healthy environment, as taking precedence over the economic and social well-being. Students will debate the importance of natural capital and give presentations on the nitrogen cycle, the water cycle, biodiversity, and mineral extraction and consumption.

Relevant Learning Objectives

1. Connect concepts from a variety of disciplines within the framework of sustainability.
2. Make informed decisions about controversial issues involving sustainability.

Procedure

Pre-Class Assignments

- Students read Chapters 1 and 2 of French

Possible Classroom Activities

- Hook/Introduction.
  (Time: 5-7 minutes) (Skills: Holistic Thinking) (Objective 1) (Related Resources: French reading; WTO website)

  Have students answer the following:
  - What was "The Battle in Seattle" that French described? How did she summarize the outcome of the 1999 WTO meetings there?
  - What "battles" occurs over globalization today?

  Please note that an alternate source for the "Battle in Seattle" is the introduction to the Globalization101.org Environment Issue in Depth: http://www.globalization101.org/category/issues-in-depth/environment/.

  *This activity can be preceded by a video clip, document, or image from the 1999 WTO meeting in Seattle. A growing set of materials will be available digitally at the University of Washington's WTO History Project http://depts.washington.edu/wtohist/index.htm

- Lecture/Discussion.
  (Time: 120 minutes – enough for two class lectures) (Skills: Holistic Thinking) (Objective 1) (Related Resources: Sustainability2-3.ppt, and Appendix C)

Using lecture outline and PowerPoint slides, introduce students to the concepts of natural capital, nutrient cycling, ecosystems, water cycles, biodiversity, and energy sources. Integrate questions and discussion to make it interactive and allow for formative assessment of students' thinking about the topics. Appendix C contains lectures notes and discussion questions.

*Option: Integrate a short group activity into the lecture after slide 13, for variety and greater student engagement.

- Group Activity: Human Effects on the Ecosystem and Sustainability.
(Time: 20-30 minutes) (Skills: Holistic Thinking) (Objective 1) (Related Resources: Sustainability2-3.ppt)

  Divide students into four groups with each group assigned one of the four examples in slide 15: 1) nitrogen cycle, 2) water cycle, 3) biodiversity, and 4) mineral extraction and consumption. Provide a sheet of poster-sized paper and markers.

  All students are provided with a handout on which the PowerPoint text for the 4 examples above (slides 13-51) has been consolidated into four sections—one for each topic. Instructions could be added at the top:

  "In your group, read and discuss the information about your aspect of the ecosystem. Create a simple poster that summarizes the information, including how human activities affect this aspect. Prepare to present briefly to the class (appr. 3 min.) You have {10-15} minutes for this task."

  After groups present, add any needed explanations. For class discussion:

  How do human activities affect sustainability?
  What contentious issues does this cycle raise?

- Reading Discussion.
(Time: 60 minutes, 30 minutes per class) (Skills: Holistic Thinking) (Objective 1)
(Related Resources: French reading)

  Optionally, the instructor could shorten the lecture and use class time for a discussion of the main reading. (French, 2000).

  <u>Discussion guide</u>

Chapter One

- How does French define "globalization" and what are some of the key, recent aspects?
- How are economics and the environment transnational issues?
- What are some obstacles to addressing global environmental problems?
- What could be some solutions?

Chapter Two

- Why, according to French, is "nature under siege"?
- What are some human activities that negatively impact the environment?
- What human activities might help?
- Did you find anything surprising and if so, what?

- Conclusion.
  (Time: 5 minutes) (Skills: Holistic Thinking) (Objectives 1 and 2)(Related Resources: n/a)

  For individual "quick write" and possible sharing:

  What are three ways your current habits or practices impact ecosystems?
  What might you do to improve your impact?

Resources

- Appendix C Lecture Outline for Lessons 2 and 3
- French, Hilary. (2000). *Vanishing Borders: Protecting the Planet in the Age of Globalization*. W.W. Norton & Co., New York, Chap 1 and 2. 257 pp.
- Sustainability2-3.ppt. Retrieved from: http://www.global-workforce.globalization101.org/wp-content/uploads/2012/08/Sustainability2-3.ppt

Optional Resources

- University of Washington's WTO History Project (n.d.). Retrieved from: http://depts.washington.edu/wtohist/index.htm)

Lesson 4: Global Climate Change and the Carbon Cycle

Overview

The lesson will examine how the earth's atmosphere plays a significant role in the regulation of climate. Students will examine how changes in the atmosphere's composition, resulting from the burning of fossil fuels, have severe ramifications regarding sustainability around the globe. Students will participate in a role-play panel discussion on the impacts of global warming.

Relevant Module Learning Objectives

2. Make informed decisions about controversial issues involving sustainability.

Procedure

Pre-Class Assignments

- Have students read Chap 6 of French
- If choosing the debate activity, assign characters to students beforehand and have them develop the required background (see Appendix E)

Possible Classroom Activities

- Hook/Introduction.
  (Time: 5-7 minutes) (Skills: Holistic Thinking) (Objective 1) (Related resources: Gapminder World website)

  Introduce students to Gapminder World. Briefly demonstrate how the graphs work, and in particular how the bubbles/colors identify different countries and regions.

  Play "CO2 emissions Since 1820" to demonstrate increased global emissions over time and the USA's move to the lead:

  Quick write for students: Write a quick response to this demonstration, making a link to at least one issue covered in a previous lesson.

  The teacher may discuss briefly, or weave discussion of probable responses into the interactive lecture. Some important themes:
  - dramatic growth in emissions over time
  - concerns for long-term sustainability
  - initial growth in Europe, then USA; seen later for other regions
  - How are consumption patterns part of this – and how may they vary within countries?
  - What is being done? Can be done?

- Lecture/Discussion.
  (Time: 30-60 minutes) (Skills: Holistic Thinking) (Objective 2) (Related Resources: Sustainability4.ppt, and Appendix D)

  Using lecture outline and PowerPoint slides, introduce students to the concepts of global warming. Integrate questions and discussion to make it interactive and allow for formative assessment of students' thinking about the topics.

- Reading Discussion.
  (Time: 30 minutes) (Skills: Holistic Thinking) (Objective 2) (Related Resources: French reading)

  Optionally, one could shorten the lecture and use class time for a discussion of the main reading. (French, 2000).

  Discussion questions for reading:
  - What are some aspects of the "ecology of globalization" in "Sharing the Air"?
  - Explains some of the major forces in and forms of globalization and their environmental impacts?
  - How does French portray the threats to the global environment?
  - How does she describe possible solutions?
  - What might be the consequences of inaction? Of the actions she describes?
  - Relate French's article to current debates about "protecting the air"

- Panel Debate on Global Warming.
  (Time: 90 minutes) (Skills: Cross-cultural Communications and Holistic Thinking) (Objective 2) (Related Resources: Appendix E)

  The panel debate is an additional option and it could be combined with the panel conclusion.

- Conclusion to Panel Discussion.
  (Time: 5-7 minutes) (Skills: Cross-cultural Communications and Holistic Thinking) (Objective 2) (Related Resources: Appendix E)

  Briefly compare and contrast the points made by two panelists with different views. [Can be done individually, in pairs or small groups, or as a class. Prepares students for the post-debate writing assignment.]

- Conclusion.
  (Time: 5-7 minutes) (Skills: Holistic Thinking) (Objective 2)(Related Resources: n/a)

This is an alternate concluding activity for the class.

Summarize what you have learned in the past four lessons by drafting a 1-3 sentence statement or creating a mind map that includes the following terms: globalization, ecological footprint, carbon cycle

Resources

- Appendix D Lecture Outline for Lesson 4
- Appendix E Panel Debate
- French, Hilary. (2000). "Sharing the Air". *Vanishing Borders: Protecting the Planet in the Age of Globalization*. W.W. Norton & Co., New York, Chap 6. 257 pp.
- Gapminder World, "Yearly CO2 emission rates vs. income rates" (n.d.). [data set]. Retrieved from: http://www.gapminder.org/world/#$majorMode=chart$is;shi=t;ly=2003;lb=f;il=t;fs=11;al=30;stl=t;st=t;nsl=t;se=t$wst;tts=C$ts;sp=5.59290322580644;ti=1821$zpv;v=0$inc_x;mmid=XCOORDS;iid=phAwcNAVuyj1jiMAkmq1iMg;by=ind$inc_y;mmid=YCOORDS;iid=phAwcNAVuyj1NHPC9MyZ9SQ;by=ind$inc_s;uniValue=8.21;iid=phAwcNAVuyj0XOoBL_n5tAQ;by=ind$inc_c;uniValue=255;gid=CATID0;by=grp$map_x;scale=log;dataMin=194;dataMax=96846$map_y;scale=lin;dataMin=0;dataMax=6103493000$map_s;sma=50;smi=2$cd;bd=0$inds=

- Sustainability4.ppt. Retrieved from: http://www.global-workforce.globalization101.org/wp-content/uploads/2012/08/Sustainability4.ppt

Optional Resources

- Brown, Donald A. (2010, December 24). Cancun Climate Negotiations Outcome. *Climate Ethics*. Retrieved from: http://rockblogs.psu.edu/climate/2010/12/an-ethical-analysis-of-the-cancun-climate-negotiations-outcome.html
- Global and European temperature. (June 2010). European Environment Agency. Retrieved from: http://www.eea.europa.eu/data-and-maps/indicators/global-and-european-temperature/global-and-european-temperature-assessment-3
- Global Warming. (n.d.). Globalization101. Retrieved from: http://www.globalization101.org/global-warming/ [can also use video]

Lesson 5: Energy

Overview

In this lesson students will learn about energy saving technologies used in transportation as well in providing electricity. Students will give presentations on six different types of alternative energy: hydroelectric (dams, turbines, tidal, ocean currents, etc.), stored energy, nuclear energy, wind energy, solar (multiple sources), and biomass/algae.

Relevant Learning Objectives

1. Connect concepts from a variety of disciplines within the framework of sustainability.
3. Evaluate the validity of a news report related to the environment and sustainability OR prepare a scientifically sound argument on a local environmental issue to present at a town forum or in a town newspaper
4. Recognize the role separate countries play in the environmental issues that affect sustainability.

Procedure

Pre-Class Assignments

- Students read Osnos reading.

Possible Classroom Activities

- Hook/Introduction.
  (Time: 7-10 minutes) (Skills: Holistic Thinking) (Objective 1) (Related Resources: Buckminster Fuller video clip and About Bucky article):

  Introduce R. Buckminster "Bucky" Fuller, a renowned 20th century inventor and visionary born in Milton, Massachusetts in 1895.

  Play the video on Buckminster Fuller's Dymaxion car, house, and views:
  http://www.youtube.com/watch?v=hLkluGwyRv8

  Questions for students:
  Were you surprised to learn how long ago Fuller invented his Dymaxion car and house?
  What factors may have shaped their future production?
  What factors may shape invention and production of energy-saving technologies?

- Lecture/Discussion.
  (Time: 30-60 minutes) (Skills: n/a) (Objectives 1 and 4) (Related Resources: Sustainability5-Part1.ppt, Sustainability5-Part2.ppt, Sustainability5-Part3.ppt, Sustainability5-Part4.ppt and Appendix F)

  Using lecture outline and PowerPoint slides, introduce students to the concepts of energy resources.

- Jigsaw Activity.
  (Time: 30 minutes) (Skills: n/a) (Objectives 1 and 4) (Related Resources: Sustainability5-Part2.ppt, Sustainability5-Part3.ppt, Sustainability5-Part4.ppt and Appendix F)

  Jigsaw Activity can replace latter part of lecture: Divide students into 6 groups with each group assigned one of the forms of alternative energy:
  - Hydroelectric (dams, turbines, tidal, ocean currents, etc.) (Sustainability5-part2)
  - Stored Energy (Sustainability5-part2)
  - Nuclear Energy (Sustainability5-Part3.ppt)
  - Wind Energy (Sustainability5-Part3.ppt)
  - Solar (multiple sources) (Sustainability5-Part4.ppt)
  - Biomass/Algae (Sustainability5-Part4.ppt)

  Provide each group with a sheet of poster-sized paper and markers. All students are provided with a handout on which the PowerPoint text for the 6 examples above. Instructions could be added at the top:

  In your group, read and discuss the information about your aspect of the ecosystem. Create a simple poster that
  - explains the energy source
  - summarizes the advantages and disadvantages

  Prepare to present briefly to the class (appr. 3 min.) You have {10-15} minutes for this task.

  After groups present, add any needed explanations. For class discussion:

  What seem to be the major obstacles to alternative energy development? Have we discussed all the possibilities?

- Reading Discussion.
  (Time: 30 minutes) (Skills: Holistic Thinking) (Objectives 1, 3 and 4) (Related Resources: Osnos reading)

  Optionally, one could shorten the lecture and use class time for a discussion of the main reading.

Osnos Reading Discussion Questions:

1. According to Osnos's *The New Yorker* article on China and energy, what are some of China's motives for "going green" with regards to energy production? How do these motives compare to those of the US?
2. How does China's investment of government funds into energy research compare to that of the US?
3. What is FutureGen? And how did politics influence its funding?
4. What were some Chinese government actions that affected the use of coal?
5. How might China enhance the use of clean energy technology in other countries?
6. What are the strengths of China and the strengths of the US in developing and manufacturing clean energy technology? What are some differences? Multiple forms of differences incl. political and economic systems
7. What is "carbon capture and storage"?
8. Do you think electric bikes like the "Turtle King" will catch on in the US? How would you improve it?
9. How did Osnos's depiction of "the Green Giant" illustrate global connections in energy technologies?
10. What is Osno's main argument, and is it convincing? Why or why not?

- Conclusion.
  (Time: 5-7 minutes) (Skills: Cross-cultural Communications, Holistic Thinking) (Objective 1)

  Ask student to respond to the following task (write, pair-share, etc)

  Explain to Prof. Yao Qiang the varied political and cultural attitudes in the US that would shape responses to his statement:

  Yao Qiang, a professor of thermal engineering at Beijing's Tsinghua University, quoted by Evan Osnos:
  "If the government does nothing, the technology is doomed to fail."

Resources

- About Bucky (n.d.). Retrieved from: http://bfi.org/about-bucky
- Appendix F Lecture Outline for Lesson 5
- Osnos, Evan. (2009). Letter from China: Green Giant – Beijing's crash program for clean energy. *The New Yorker*, Dec. 21 & 28, 2009. pp. 54-69. Available online at http://www.newyorker.com/reporting/2009/12/21/091221fa_fact_osnos
- Sustainability5-Part1.ppt. Retrieved from: http://www.global-workforce.globalization101.org/wp-content/uploads/2012/08/Sustainability5-Part1.ppt

- Sustainability5-Part2.ppt. Retrieved from: http://www.global-workforce.globalization101.org/wp-content/uploads/2012/08/Sustainability5-Part2.ppt
- Sustainability5-Part3.ppt. Retrieved from: http://www.global-workforce.globalization101.org/wp-content/uploads/2012/08/Sustainability5-Part3.ppt
- Sustainability5-Part4.ppt. Retrieved from: http://www.global-workforce.globalization101.org/wp-content/uploads/2012/08/Sustainability5-Part4.ppt
- Buckminster Fuller Dymaxion Home, Car, and Geodesic dome (2011, September 7). Retrieved from: http://www.youtube.com/watch?v=hLkluGwyRv8
- National Geographic "Green Energy" (n.d.). Retrieved from: http://greenliving.nationalgeographic.com/green-energy/ (See additional resources on "The Environment"): http://environment.nationalgeographic.com/environment/?source=NavEnvHome

Optional Resources

- 2010 Survey of Energy Resources (Executive Summary). (2010). World Energy Council. Retrieved from: http://www.worldenergy.org/documents/ser2010exsumsept8.pdf [would probably need to combine data for PowerPoint slides]
- America's Quest for Alternative Energy. (2010, August 15). CBS News. Retrieved from: http://www.cbsnews.com/video/watch/?id=6774753n (9 min 48 sec)
- Buckminster Fuller Institute. Retrieved from: http://bfi.org/
- How does carbon trading work and critique. (2008, January 27). Youtube. Retrieved from: http://www.youtube.com/watch?v=oKQ8GW6iblQ (6 min 53 sec)
- Weinstein, Bernard. (2011, February 22). Rethinking America's Energy Security. *The Hill*. Retrieved from: http://thehill.com/blogs/congress-blog/energy-a-environment/145459-rethinking-americas-energy-security [could help stir a debate based on comments, positions]

Lesson 6: Potential Solutions: How the Experts Think It Can Be Done

Overview

In this lesson, students will be introduced to a brief history of United Nations involvement in sustainability issues and treaties to protect the environment. Also, students will develop an action plan to address and international environmental problem.

Relevant Learning Objectives

1. Students shall be able to connect concepts from a variety of disciplines within the framework of sustainability.
2. Make informed decisions about controversial issues involving sustainability.
4. Recognize the role separate countries play in the environmental issues that affect sustainability

Procedure

Pre-Class Assignments

- Students read French chapters and Millennium Ecosystem Assessment
- Students calculate and record figures for their annual energy usage using the National Geographic [If computers are available this can be done in class as part of the hook.]. They need to bring results to class, including the country chosen for comparison.

NOTE: The instructor could assign countries in advance to ensure geographic distribution and other diversity among the countries compared.

Possible Classroom Activities

- Hook/Introduction.
  (Time: 10 minutes) (Skills: Cross-cultural Communications, Holistic Thinking) (Objectives 1 and 4) (Related Resource: National Geographic "Personal Energy Meter" webpage)

  Place students in pairs or groups. Have them compare and discuss the results of their Personal Energy Meter evaluations.

  As a class: On the board (or map) chart some of the countries compared and share some of the results.

  Individual quick response: Briefly explain to your "citizen for comparison" from another country why your energy usage compares to theirs as it does.

- Lecture/Discussion.
  (Time: 30-60 minutes) (Skills: n/a) (Objective 1) (Related Resources: Sustainability6.ppt, and Appendix G)

  Using lecture outline and PowerPoint slides, introduce students to a brief history of United Nations involvement in sustainability issues and treaties to protect the environment

- Reading Discussion.
  (Time: 30 minutes) (Skills: n/a) (Objectives 1) (Related Resources: French chapters and Millennium Ecosystem Assessment)

  Optionally, one could shorten the lecture and use class time for a discussion of the main reading.

- Group Activity.
  (Time: 30 minutes) (Skills: Holistic Thinking) (Objectives 1, 2, 4) (Related Resources: UN lecture, Millennium Ecosystem Assessment, previous lessons)

  Divide students into groups of 3-5 with each an assigned a role:
  - An international group of business leaders
  - An international group of officials from the UN's environmental agencies
  - An international group of members of environmentalist NGOs
  - An international group of governmental leaders
  - An international group of residents of "Spaceship Earth" who are not in one of the above groups

  In your group, discuss the following and develop an action plan that you could share with the class.
  - What are your group's major goals, and how do these intersect with environmental problems?
  - What factors motivate your group to engage in environmental protections? What are some of the obstacles, including possible differences within your group?
  - How could you overcome these?
  - How could you persuade members of the other groups to collaborate?

Resources

- Appendix G Lecture Outline for Lesson 6

- Ecosystems and human well-being: Opportunities and Challenges for Business and Industry a synthesis report of the Millennium Ecosystem Assessment. (2003). Retrieved from: http://www.maweb.org/documents/document.353.aspx.pdf
- French, Hilary. (2000). *Vanishing Borders: Protecting the Planet in the Age of Globalization*. W.W. Norton & Co., New York, Chap 9 and 10. 257 pp.
- National Geographic Society, "Personal Energy Meter" found midway down "The Great Energy Challenge" webpage (n.d.). Retrieved from: http://environment.nationalgeographic.com/environment/energy/great-energy-challenge/?source=NavEnvEnergy
- Sustainability6.ppt. Retrieved from: http://www.global-workforce.globalization101.org/wp-content/uploads/2012/08/Sustainability6.ppt

Optional Resources

- Environmental quiz. (n.d.). Globalization101. Retrieved from: http://www.globalization101.org/quiz-5/
- Is Sustainable Development the Way Forward?. (n.d.). Globalization101. Retrieved from: http://www.globalization101.org/is-sustainable-development-the-way-forward/
- Juniper, Tony. (2011, April 1). An Historic Move in the Battle to Save Tropical Rainforests. *The Guardian*. Retrieved from: http://www.guardian.co.uk/environment/2011/apr/01/historic-move-rainforests
- Power Surge. (2011, February 24). PBS. Retrieved from: http://www.pbs.org/wgbh/nova/tech/power-surge.html (53 min 7 sec)
- Rio + 20. (n.d.). Retrieved from: http://www.earthsummit2012.org/

Appendices

Appendix A: Lecture Outline for Lesson 1

Lecture Outline

I. Define sustainability (Slide 2)
   a. Definition from UN Gen Assembly:
      "meet the needs of the present without compromising the ability of future generations to meet their own needs."
      -from the United Nations General Assembly (1987) Report of the World Commission on Environment and Development: Our Common Future.
   b. Disciplines involved (Slide 3)
      i. Environment
      ii. Economics
      iii. Sociology
      iv. Politics

II. Why Global?
   a. Environment is global (Slides 4 and 5)
      i. If only one country tried to act sustainably, would Global Warming cease?
      ii. Would sea fish supplies replenish?
   b. Economy is global (Slide 6)
      i. Jobs go where work force is cheap
      ii. Environmental regulations are different in different countries.

III. Population as an environmental issue (Slides 7 and 8)
   a. In order to meet the needs of future generations…
   b. Why population applies to sustainability (Slide 9)
      i. Use of resources
      ii. Use of land
      iii. Generation of waste
   c. "Ecological footprint": the amount of biologically productive land/sea area needed to support the lifestyle of humans: (Slide 10)
      "The Ecological Footprint measures the amount of biologically productive land and water area required to produce the resources an individual, population or activity consumes and to absorb the waste they generate, given prevailing technology and resource management" from Ewing B., S. Goldfinger, A. Oursler, A. Reed, D. Moore, and M. Wackernagel. 2009. The Ecological Footprint Atlas 2009. Oakland: Global Footprint Network.
      i. On average: 2.6 global hectares per person. But Earth only has capacity for 1.8 hectares per person. (U.S. is 9 gha/person) Where one US acre is .405 hectares (also from the Global Footprint Network)

ii. See also: http://www.footprintnetwork.org/en/index.php/GFN/page/footprint_basics_overview/

Discussion/Activity: Concept: ecological footprint

Ask students to restate/summarize the definition in their own words.

What global factors could affect the elements of this footprint? [e.g. varied consumption/waste-producing levels, trade in goods/resources, shipments of waste]

Ecological footprint and sustainability

Compare the current average requirement for an individual's ecological footprint in gha to the current availability on a global level. What does this comparison mean with respect to:

This average consumption vs. variations in consumption? [Since current average required gha exceeds availability, some consume less than the requirement]

Current consumption levels vs. long term sustainability?

What factors shape sustainability? [population and consumption]

IV. Population dynamics: what controls population

a. Exponential vs. Linear growth (Slides 15-18)

Slide 15: Expand/clarify explanation of exponential growth

Slide 16: What is "currency unit"? Discuss data on graph

How does annual population growth contribute to the exponential rate of growth? [more people who may potentially have more children]

What are the implications of exponential growth for population figures?
On the collective ecological footprint and sustainability?

Slide 17: Provide an example – perhaps clarifying data on graph?

b. Population Growth Rate (Slide 19 - 29)
   i. Factors: birth rate, death rate
   ii. Doubling time

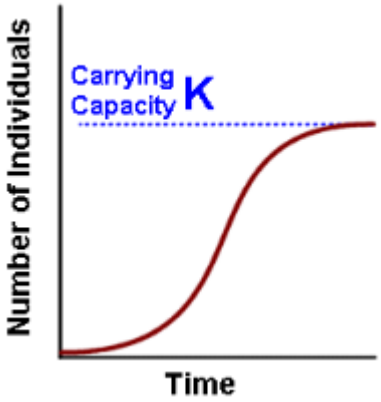
iii. Projected pop might not double- graph of Pop.
iv. Growth rate is decreasing

Doubling time

[Slide 22] What factors could affect the doubling time for a given country or population? [birth rate, death rate, life expectancy, family planning]

[Slide 24] What factors might change a population growth rate? [conflicts, natural disasters, public health, access to family planning, cultural practices…]

c. Fertility rates (Slide 30 - 40)
    i. Total fertility rate (TFR)
        1. Average number of children born to women during their reproductive years.
        2. In 2008: average global TFR was 2.6 (1.6 in developed countries; 2.8 in developing countries)
        3. What controls fertility rates?
            a. Education of women (plot is from: World Population Monitoring 2003, published by the United Nations in 2004, 189 pp.)
    ii. Replacement level fertility rate
        1. The number of children a couple must give birth to replace themselves
        2. 2.1 in developed countries, 2.5 in developing countries.
    iii. Population momentum
        1. Reaching replacement level fertility rate does not immediately stop population growth, because the current children will grow up and also give birth to 2.1 children, putting off the stop in population growth by a generation. This delay in leveling of the population is called population momentum.
d. Limits: resources (Slides 41 -42)
    i. In Nature: famine keeps population numbers in check
    ii. Logistic growth need graph



e. Carrying Capacity (Slides 43-47)
   i. Def: the maximum population of a species that a particular habitat can sustain with being degraded.
   ii. Do we know what it is for humans on Earth? No.
   iii. Ecological footprint: recall 2.6 global hectares per person
   One estimate has the total human ecological footprint at 1.4 times what the Earth can support. (Global Footprint Network)

   Others propose that with technology we will increase the carrying capacity.

Appendix B Lesson 1 Reading Discussion Questions.

The paper is somewhat opinionated and even strident, so the instructor should moderate the tone of the discussion. Possible questions:

- What is Albert Bartlett's academic background and specialties? What topics does he cover in articles written from the 1990s to the present, and how might his writings be controversial?
  [Bartlett is a physicist by training and his writings and talks on population have been controversial. That should at least be discussed. An interesting letter he wrote in 1997 http://www.albartlett.org/articles/art1997oct.html]
- What tone and vocabulary does the author use? Do these stylistic features help or hinder in making his point?
- How well does Bartlett provide evidence and cited sources for his assertions and data?
- What does the author say is a necessary part of the definition of "sustainable?" (need to be for an unspecified, but long period of time)
- Author points out that many reports and publications about sustainability bring up human population increase as a problem for reaching sustainability and yet no

report outlines concrete steps to take to stop population growth (other than to educate everyone about the effects of population growth). Why is this? Why is the subject so sensitive?

- Bartlett has very brief discussions of "social justice and inequity" and "global trade." What are some of his main points and how do they compare with some of the "ecological footprint" issues seen in lecture?
- The second of Garrett Hardin's three laws of human ecology is "there is no away to throw to." What does that mean? How is that related to Bartlett's concerns about global trade and commonly-held ideas of "carrying capacity"--the limit to the number of humans the Earth can support in the long term without damage to the environment"?
- Summarize Boulding's three theorems, as presented by Bartlett.
- While discussing these theorems, Bartlett says misery is a sure-fire way to bring population to an equilibrium, but studies by the United Nations show that urbanization and the education of women reduce fertility rates.
- How could these factors relate to Boulding's third theorem (the "moderately cheerful theorem?")
- What are some of the author's critiques about the report of the UN Commission on Environment and Development (Brundtland Report)?
- What does Bartlett argue about various calls for economic "growth" and their impact on sustainability?
- The US economy is predicated on the idea of growth, that is, companies are considered successful if they continue to produce and sell more products than in the previous year. That scenario implies that more people are needed to buy the products. How does this compare with Bartlett's arguments about zero population growth and sustainability?
- How does Bartlett see the impact of technology on sustainability? *[Note contrast with the views mentioned in PPt]*
- Summarize Bartlett's conclusions, including his critique of many proposals to address sustainability.
  [Key: Stopping population growth his #1 solution but also calls for social justice/equity and reduced consumption vs. "growth"]

Appendix C: Lecture Outline for Lessons 2 and 3

I. Define "Natural Capital" (Slide 4)

a. The natural resources and services that keep life on Earth alive and support our economy.

b. Natural resources are materials and energy found in nature that we use: examples include solar energy, coal, oil, soil, water, air, trees, fish, copper, aluminum, etc. (Slide 5)

c. Natural Resources are categorized as renewable and non-renewable. (Slide 6)

i. Renewable resources are replaced at a rate equal to or greater than the rate at which they are used. Examples: solar, soil, water, air, trees (Slide 7)

Discussion Questions:

- How does the issue of reproduction affect certain renewable resources?
- What other factors could affect the rate of replenishment?
- What is the difference between "renewable" and "limited"?
- Can a renewable resource be limited?

ii. Nonrenewable resources are not replaced as fast as they are used. (Slide 8) Examples: coal, oil, fish, copper, aluminum, etc.

Most of these are mineral resources, but some are biological. When we overfish and drive species to extinction, that animal is a nonrenewable resource.

Discussion Questions:

- How does the issue of reproduction affect nonrenewable resources? [some are inorganic and do not reproduce, some may take thousands of years to develop, e.g. oil, coal]
- How could a renewable resource become nonrenewable? Can you think of any examples?

[Human overconsumption, environmental change hinder reproduction rates. Examples: species like passenger pigeon and dodo bird; see also http://www.eco-pros.com/renewableresources.htm]

*Note that concept of ecosystems can affect non-living resources like air, soil water

d. Natural services are processes that occur in nature and replenish renewable resources: clean the air, clean the water, create soil, control pests, recycle nutrients, produce food, etc. (Slide 9)

e. Natural services are also called "Ecosystem services" because they occur within specific ecosystems. (Slide 10 - 12)
    i. The term **ecosystem** refers to the physical factors (i.e. water, soil, air) and biological entities (plants, animals) that interact within a habitat.
    ii. The large marine ecosystem, for example, provides a habitat for 95% of the marine fishery biomass.
    iii. Wetlands are part of the freshwater ecosystem, and provide habitat for birds, fish, and amphibians. Wetlands also filter and purify water, and provide area for flood water retention.
    iv. Examples of Ecosystem Services include: Nutrient Cycling, Water Purification, Biodiversity, Soil Formation, Food Production, and Climate Regulation…

II. Nutrient cycling as an example of Ecosystem Services (Slide 13)
    a. Define nutrients: the elements/molecules that organisms need to live, grow, and reproduce. E.G.:
        i. Water – water purification
        ii. Carbon – climate regulation
        iii. Nitrogen – food production
        iv. Phosphorus – food production
        v. These cycles through the environment on their own, but we play a part in these cycles and in modifying the cycles.

III. *To the instructor: you may choose to cover both Nitrogen and Water, or just one of them as an example.*

    a. Nitrogen Cycle as an example of Nutrient Cycling (Slides 16 -26)
        i. Nitrogen is an element that is part of many proteins and vitamins.
        ii. Start the cycle in the Atmosphere where 78% of the volume of Earth's atmosphere is Nitrogen gas: a molecule made of two nitrogen atoms we refer to as N_2.

            As N_2, Nitrogen is inert, and most organisms can't use it to build proteins. The N_2 has to be converted into usable molecules by separating the two Nitrogen atoms and adding Hydrogen to them in varying amounts to create ammonia and other Nitrogen compounds. This process is called **nitrogen fixation**.

iii. Nitrogen fixation is carried out by:
    1. Lightening hitting N_2 in atmosphere, then N-compounds come down in rain.
    2. Bacteria fixing Nitrogen either in soil or in the roots of some plants (legumes in particular: beans, peanuts, alfalfa)
iv. Some of the N-compounds are used by plants, others are further converted by **nitrification** into nitrate (NO_3^-) ions, and then taken up by plants.
v. Animals eat the plants and use the Nitrogen to build their bodies.
vi. Animal waste and decay products from dead animals and plants return complex Nitrogen-compounds to the soil.
vii. Bacteria convert the waste and decay products to ammonia (NH_3) and water-soluble ammonium ions (NH_4^+) through the processes of **ammonification**.
viii. Other bacteria convert the ammonia to nitrogen gas (N_2) and nitrous oxide gas (N_2O) by the process **denitrification**. These gases return to the atmosphere, completing the cycle.

b. We modify the cycle by adding nitrogen to the soil in the form of fertilizer and animal waste. If we add more than can be taken up by the plants, then the nitrates end up in surface and ground water.
    i. In surface water, excess nitrogen will cause algae to grow faster than it can be removed by natural processes upsetting the chemical balance in the body of water (similar to the effect of excess phosphorus).
    ii. Nitrates in groundwater used for human consumption can cause health problems for babies (born and unborn) and young by decreasing the oxygen carrying capacity of blood.

IV. The Water Cycle as an example of an Ecosystem Service that renews the renewable resource of clean water. (Slides 27 - 40)
a. Only about 0.024% of the earth's water is readily available for life to use. Most of the Earth's water is in the oceans and too salty to use. As water moves through the water cycle, it is cleaned and brought within our reach.

b. Description of the Water Cycle as a global cycle:
    i. Water molecules cycle all around the globe: from the oceans to the atmosphere, to clouds, then rain/snow to continents, then rivers & lakes, to groundwater, back to the ocean.
    ii. The cycle is driven by solar energy and by gravity. Solar energy causes water to evaporate from the Earth's surface into the atmosphere. Wind, also driven by solar energy, moves the atmospheric water around until it precipitates back down, pulled by the Earth's gravity. Gravity also drives

the movement of the water from high to low elevations along rivers and helps it to percolate into the ground.

c. Water is purified as it cycles.
    i. Evaporation and precipitation naturally purify water, as only the water molecule is evaporated, leaving behind salt or other dissolved chemicals. Precipitation returns the water to the surface where we can use it.
    ii. Water flowing above ground degradable waste is broken down by bacteria.
    iii. Water flowing below ground is naturally filtered as it moves through soil and rock, and purified by biological activity.

d. We modify the cycle by using freshwater for agriculture and industry, and by polluting parts of the region the water cycles through.
    i. We sometimes withdraw freshwater faster than it can be replenished. (Sea of Aral)
    ii. Clearing land for agriculture and urbanization causes more run-off and less water soaking into the ground to replenish the groundwater supply—and leads to more flooding.
    iii. Pollution occurs in many of the reservoirs of the water cycle:
        1. Ocean: affects the biodiversity, but only water is evaporated into the atmosphere
        2. Streams and lakes: can cleanse through natural processes only if they are not overloaded with pollutants.
        3. Groundwater: Slow to cleanse, best to prevent from occurring.

V. Biodiversity as an Ecosystem Service (Slides 41 - 45)
    a. Biodiversity is the variety of the species on the Earth.
        i. Even within species there is genetic variation
        ii. Ecological diversity: different ecosystems are homes to different groups of species.

    b. Benefits of biodiversity:
        i. Supplies us with food, medicine, building materials and energy
        ii. Preserves quality of water, air and soil
        iii. Controls disease and pests.

    c. Threats to biodiversity:
        i. Lost of habitat
            1. caused by: agriculture, urbanization, climate change, pollution
        ii. Introduced species (Invasive species)

1. Intentional: ex. Kudzu vine: intentionally brought to the US from Japan to control soil erosion, but grows so fast it can cover trees and even parts of forests.
2. Unintentional: ex. Zebra mussel: brought to the Great Lakes, and subsequently many US rivers, from Russia and Europe in the ballast tanks of ships. They have out competed native species, tend to clog water intake systems of power plants and municipal water suppliers. and potentially concentrates botulism in its tissue making it toxic to birds. The good news is that by filtering the water as they feed, the lake-water clarity is much higher currently than in the past.

VI. Non-renewable resources (Slides 46 -51)
   a. If it isn't grown, it's mined: Mineral resources: copper, iron, lithium,
      i. Examples: silicon, copper, iron, lithium,
      ii. Seem plentiful to the US because we import what we don't supply.
      iii. But if world-wide demand increases, we will run out of these at a faster rate.
      iv. New technology increases demands for minerals like lithium (for batteries in electric cars), which are not mined in the US
      v. Effect of mining on the environmental is not fully included in the cost of extracting these resources.
      vi. Reducing use where possible and recycling are needed to make non-renewable mineral resources sustainable.
   b. Energy resources: gas, oil, coal, uranium
      i. In US we are aware that we import much of our energy (oil & gas).
      ii. Effect on the environment of extracting energy resources and of using energy resources is not fully included in the cost of them.

Appendix D Lecture Outline for Lesson 4

I. To understand Global Warming, one must understand the natural processes that control the Earth's Climate
   a. What is the difference between weather and climate?: (Slides 1- 4)
      i. Weather: the state of atmospheric conditions over a short period of time: Hours or days.
      ii. Climate: The long term average weather for an area: Months, years, centuries.
      iii. The global warming everyone talks about is a warming of the Earth's atmosphere.
   b. What controls climate? (Slide 5)
      i. Orbital factors - Milankovitch cycles. (Slides 7-14)
      Amount of heat reaching earth from the sun varies due to:
         1. Eccentricity - 100,000 yrs,
         2. Earth's tilt - 41,000 yrs,
         3. Precession - 23,000 yrs
            Overall temperature effect +/-4˚C
      ii. Reflectivity of Earth's surface (Albedo) (Slides 15 - 19)
      Sun's heat may be reflected back out -thus not absorbed by Earth.
      Albedo = the degree of reflectivity Albedo increases with: Increased cloud cover, Increased snow cover, Increased aerosols in atmosphere

      Q: What topographic factors could affect albedo? Human activities?
      Visual (Climatepedia, "Albedo"): http://www.climatepedia.org/Albedo

      iii. Solar radiation: Fluctuates with sunspot activity (Slides 20 -23)
      Increases in sunspots = increased energy production of sun.
      Sunspot cycle is ~9 to 11.5 years
      iv. Volcanic activity: Sulfur dioxide gas is ejected into the stratosphere, Combines with water to form an aerosol (mist) of sulfuric acid Blocks in coming solar radiation and cools the Earth (Slides 24 -25)
      v. Ocean currents: Redistributes the heat. Very complex. Another course! (Slides 26 - 28)
      vi. Atmospheric composition: Earth has a Greenhouse Effect and is warmer than the moon. Greenhouse gases include: Carbon dioxide (CO_2), methane, CFCs, and water vapor (Slides 29 - 32)

II. How the greenhouse basically works: (Slides 33-39)

Energy from the Sun (Ultraviolet Radiation-UV) comes to Earth and warms up the solid Earth. The Earth radiates heat out (in the form of Infrared Radiation-IR) to its atmosphere. Greenhouse gasses in the atmosphere absorb the IR heat and re-radiate it out-about half of which is directed towards the Earth warming up the atmosphere.

III. Where does the carbon come from or The Carbon Cycle? (Slide 40- 41)
   a. Carbon is stored in five major reservoirs on the planet and moves between them as it cycles.
      i. The atmosphere
      ii. The biosphere
      iii. The oceans
      iv. Sediments including fossil fuels.
      v. The Earth's interior.
   b. Short term cycling occurs between plants, animals and the atmosphere through respiration
      i. Plants take up CO_2 from the atmosphere, and use in to build plant matter. Animals ingest plant matter and use the Carbon to build themselves and also exhale CO_2.
      ii. When plants and animals die, CO_2 is released as their remains decay.
   c. Long term cycling occurs when the plant or animal remains are buried with sediments in the crust and cannot decay.
      i. Then the remains turn into fossil fuels like coal, oil, and gas (methane).
      ii. Shells of animals also store CO_2 as the rock limestone.

Visit: National Geographic, "Global Carbon Footprint"
http://environment.nationalgeographic.com/environment/energy/great-energy-challenge/global-footprints/

IV. Why is more CO_2 being put into the atmosphere? (Slides 42-43)
   a. Burning carbon-based fuel (fossil fuels) produces Carbon Dioxide (CO_2)
   fossil fuel + O_2 = Heat energy + H_2O + CO_2
   b. Carbon-based creates Carbon Dioxide when burned:

Oil	fossil fuel
Gasoline	fossil fuel
Natural gas	fossil fuel
Coal	fossil fuel
Bio-diesel	renewable
Wood	renewable

   c. Also referred to as Hydrocarbon fuels
      i. Compounds of hydrogen and carbon
      ii. Provide > 40% world's energy needs

iii. Provides 90% of world's transportation needs
iv. Also used to make: plastic, paint, nylon, synthetic rubber, fertilizer ….

V. How do we know it's the human made carbon dioxide that is increasing global atmospheric temperatures? (Slides 44-53)
   a. Climate Models
   b. Solar and volcanic activities have been responsible for some of the variations in Northern Hemisphere temperature over the past 1000 years.
   c. Neither solar nor volcanic activity can explain the dramatic warming of the late 20th century. Changes in these forces during the 20th century would actually have resulted in a small cooling since 1960.
   d. Only by adding the human-caused increase in greenhouse gas concentrations are the models able to explain the unprecedented warmth of the late 20th century.
   e. By removing the Carbon that was stored as fossil fuels and burning it, humans have changed the rate of the long term cycling.
   f. The rate of increase of CO_2 into the atmosphere has been very fast, and the natural cycles have not kept up with it.

Appendix E Panel Debate

This activity was developed by the Piloter at Brockport.

Timing: 90 minutes

Topic: Global Climate Change

Products: Video and transcript of the debate
Final written report of findings/conclusions
- Summary of panel
- Statement of the problem
- Tasks to be completed
- Conclusions/statement
- Reflection

Moderator: Classroom Professor

Panelists: John Blowhard, United States Senator
Sam Makecar, President of large auto maker
Al Gore, Nobel Prize winner
Dr. Holly Health, public health official
Al Gasser, CEO of large oil+gas company
Albert Spreadsheet, expert on climate change data
Boris Gromyko, President of Russia
Sara Code, climate modeler
John Levee, Mayor of New Orleans
JaneWindpower, head of alternative energy startup

Audience: Elke Deutscher, citizen of Germany
Boureima Diallo, citizen of Niger
Joe Helpless, citizen of the USA
Jimmie Sue Diesel, RV owner/fan
Firston Howelle, avid yachter and donor to the Sierra Club
Andy Roswell, conspiracy theorist and climate change denier
Amy Pandahugger, animal activist and member of WWF
Rev. Peter Earthlove, religious steward of the planet
Hank Sixpack, NASCAR fan
Ben Z. Beamer, drives a luxury SUV and assorted classic cars
Aysha Rayhan, citizen of Bangladesh

What is a panel discussion?: Many issues (such as global climate change) are too complex for a single person to handle, so a team of experts is assembled to address the topic. Having multiple speakers also introduces the possibility of multiple/conflicting perspectives on controversial issues. Panel discussions are not team presentations, because there is no collaborative preparation or agreed-upon views. It is somewhat like a debate, but does not follow the standard rules and procedures of competitive debate, and is not in fact a competition.

Format for Our Panel:

1. Each panelist will make a 1 ½ to 2 minute presentation, including introduction, the reason(s) he/she is a panelist, and overall perspective on global climate change. (18 minutes)
2. After each introductory presentation, the audience (or moderator) can ask a question, challenge an assertion, etc. – these remarks will be directed to the speaker who just finished
3. After all 10 presentations, the audience (or moderator) will ask a series of "set" questions to the whole panel. One or more panelists can answer the questions. After each answer, the audience (or moderator) can pose follow up questions.

Transparency:

1. The panelists' initial statements will be published in advance
2. Many/most of the "set" questions will be available in advance
3. Audience members can come in with unpublished questions (to use as rebuttals/challenges mainly)

Preparation:

1. Character study and GCC position statement (all class members do this)
   a. Draft is due
   b. Final version due 1 week before debate
2. Panelists initial statements
   a. Draft due 2 weeks before debate
   b. Final version due 1 week before debate for distribution to whole class
3. Audience members submit 5 "set" questions each
   a. Due 2 ½ weeks before debate
   b. 10-15 will be selected for distribution to whole class
4. Panelist should prepare answers for (some of) the "set" questions
   a. Focus on question that are apropos to the character
   b. Answer in character

Character Study Outline (everybody does one):

1. Biographical information
   NOTE that some characters are simply "citizens," so you will need to develop a biography that takes into consideration the diversity with countries (like the factors below)
   a. home, birthplace, job, income level, religion, lifestyle, etc.

b. your politics
c. what is your country/state/area “like" (you may need to conduct some research, including to avoid generalization or stereotypes)
d. education level (especially science)
e. perhaps picture(s)

2. Interest in global warming (50-75 words)
3. position on the debate (250 words, carefully crafted)

EXAMPLE of panel discussion: http://www.youtube.com/watch?v=9dIfRoVW6Js

Post-Debate Reflection
Write a one-page reflection paper, comparing and contrasting the perspective of your character and another character who has some opinions that are diametrically-opposed to that of your character. Write this comparison from the perspective of a student in our class, not as a character who participated as either a panelist or audience member**.**

Appendix F: Lecture Outline for Lesson 5

Note to keep the file size from getting too big, there are four separate PowerPoint Presentations.

Presentation 1 covers transportation energy and home heating alternatives.
Presentation 2 covers alternative energy for generating electricity using hydro-power and stored energy
Presentation 3 covers alternative ways to generate electricity using nuclear & wind

Presentation 1

I. Energy Production: (Slide 3)
   a. Pose the questions to help students think about why current energy sources will not meet energy needs into the future:
      i. What traditional sources of energy are utilized?
      ii. What are some disadvantages of these sources?
      iii. What alternatives exist for energy production?

   b. Traditional sources of modern rnergy are typically fossil fuels: (Slide 4)
      i. Petroleum based fuels (gasoline, diesel, aviation fuel, kerosene, etc.)
      ii. Coal
      iii. Natural gas.
      iv. Percent of use world wide and by USA (Slide 5)
      v. What sectors use which energy in the USA (Slide 6)

II. Alternative Sources of Energy for Transportation:
   a. Examples: (Slide 7)
      i. Electrical battery cars
      ii. Hydrogen-powered cars
      iii. Solar and Battery
      iv. Alternative sources of gasoline-type fuels (ethanol based)
      v. Alternative sources of diesel-type fuels (algae, etc.)
   b. Non-petroleum fueled cars (like those listed above):
      i. Advantages: (Slide 8)
         i. Represents existing technology
         ii. 71% of petroleum used in the U.S. is utilized for gasoline,
         iii. Diesel and jet fuel. Reducing use of petroleum will reduce carbon footprint.
         iv. Some alternative energy vehicles maybe carbon neutral, and thus not produce CO_2 as a waste
      ii. Disadvantages: (Slide 9)

i. Currently all non-combustion vehicles are more expensive than their combustion counter-parts
ii. There are infrastructure modifications necessary to have many types of these cars usable nation-wide
iii. Two of the alternatives; hydrogen and battery vehicles have anumber of technological issues to have them be cost-effective

c. Battery Powered Cars (Slides 10-11)
i. Zero emissions (pollution and CO_2) directly from the car, but the source of the electricity can still be a problem regarding CO_2 emissions and the global climate.
ii. Utilizing nickel-hydride & lithium ion batteries has lightened the weight of vehicle batteries**.**
iii. Battery production does involve energy and other environmental impacts (including mining and disposal issues)
iv. New technologies will make battery-only cars feasible in near future.
v. Note: Hybrid vehicles use batteries and petroleum-based fuel.

d. Hydrogen Powered Cars (Slides 12 -13)
i. Hydrogen vehicles by definition emit only water vapor.
ii. Costs for hydrogen vehicles has remained high, innovation should bring this cost down.
iii. May need to use natural gas as the hydrogen source, rather thandissociation of water.
iv. Cost of separating hydrogen to use as a fuel is very energy intensive as this point.

e. What are some alternative fuels used for cars? (Slide 14)
i. Ethanol from corn, sugar cane or sugar beets.
ii. Ethanol from cellulosic fuel sources (switch grass, willow, etc.)
iii. Diesel from algae and other lipid sources.

f. What are some disadvantages? (Slide 15)
i. Not all of these sources are carbon neutral
ii. Usage may increase the cost of food worldwide
iii. Any increase in the amount of CO_2 to the atmosphere is due to fossil fuel in producing fertilizer or to plant & harvest the crop

III. Alternative Sources of Energy for Heating (homes & buildings):

Q: Recall from our last lesson: what is a renewable resource? Can you think of one that can be (and is) used for heating?

A: Solar, maybe geothermal [wood, though problems with renewability]

Electricity can be used for heating, and generated in different ways, which we will discuss next. Here we will discuss two renewable sources of heating energy, solar and geothermal. Another set of important concepts: passive vs. active heating systems

Q: What do you think is the difference?
Passive heating utilizes a natural, renewable source and does not use additional energy sources (pumps, blowers, etc). (Slide 16)

Active heating: mechanical means are used store, collect, and distribute solar energy in building

a. Solar heating
- i. Utilization of solar radiation to heat water and indoor space.
  Q: What are some examples of passive solar heating systems? Active?
  Share webpage/explanation at http://greenliving.nationalgeographic.com/difference-between-active-passive-solar-collectors-3222.html
  Q: How would geography/climate affect these systems?
- ii. For water heating this process is best suited for warm regions (in USA, this would be southern and southwestern states) (Slide 17)

- iii. Thermal (passive) heating for buildings involves utilizing construction materials that store solar radiation, thereby absorbing solar radiation during the day and radiating that heat during the night. (Slide 18)
- iv. Involves increased construction costs that are offset by lowering heating & cooling costs.
- v. Elements of active heating systems may involve other sources of energy

b. Geothermal
- i. Geothermal energy utilizes higher temperatures within the earth to heat water to either heat buildings or generate electricity. (Slide 19)
  Q: What is an example of a geothermal heat source? hot spring, geyser. etc
  Visit: http://www1.eere.energy.gov/geothermal/geothermal_basics.html

- ii. Advantages: (Slide 20)
  - i. Renewable source and technology exists (though could be refined)
  - ii. Does not generate any CO_2 as a waste
  - iii. They are relatively cheap to operate (<½ cost of coal)

- iii. Disadvantages: (Slide 21)
  - i. For large scale electricity generation it is restricted to areas that are volcanically active

Q: What regions of the US have geothermal sources? The world?

Operating in: Iceland, New Zealand, Costa Rica, Kenya, El Salvador, & The Philippines. The largest group of plants are located in California (The Geysers). (Slide 22)

World map midway down page at:
http://www.geolsoc.org.uk/gsl/geoscientist/page2916.html

ii. Geothermal facilities are relatively expensive to build
iii. Geothermal energy facilities are relatively large and with their piping systems they can cover an even larger area

iv. Smaller scale home heating applications utilize at heat exchanger that
i. allows an exchange of warm or cold water (depending on the season) to preheat or cool water for home heating and air conditioning.
ii. This type of system is very cost efficient to run
iii. However installation costs (including drilling of closed-loop system in the ground) generally runs in the $20,000 to $30,000 range. (Slide 23)

NOTE: At this point, the instructor could shift to the jigsaw activity noted in the plan. Text and visual aid links for each energy source could be provided to the groups and the instructor might aid in displaying the former to the class.

Presentation 2

IV. Alternative Sources of Energy-Generating Electrical Energy
a. WHAT are some examples of renewable electricity-generating energy sources?: (Slide 3)
Hydroelectric (dams, turbines, tidal, ocean currents, etc.)
Stored Energy
Nuclear Energy
Wind Energy
Solar (multiple sources)
Biomass/Algae
b. Hydroelectric I – Dams Q: What might be advantages and disadvantages?
Visual (US Geological Survey) http://ga.water.usgs.gov/edu/hyhowworks.html
i. Advantages of Dams (Slide 4)
i. Existing form of energy production (2.4 % in the U.S.)
ii. Have a very low relative cost to operate (<½ coal)
iii. Do not produce hazardous by-products (waste or air pollution)
iv. Once built can have a very long life decades or longer

v. Reservoir can be used for recreation purposes & irrigation
vi. Stored water is a constant energy source

ii. Disadvantages of Dams (Slide 5)
i. Expensive to build, especially if they are to last (sediment issue)
ii. Impact large area upstream (reservoir – people & wildlife)
iii. Jurisdiction issues on rivers between adjoining states/nations
iv. Rise of local water table is possible
v. Interruption of sediment flow on rivers
vi. Impact on flushing of water pollution

iii. Examples:
Niagara Falls, USA Hydroelectric Dams (Slide 6)
Three-Rivers Gorge Dam, China (Slides 7-8)
Environmental impact includes endangering the Siberian crane and the River Dolphin.

iv. Underutilized resource (Slide 9)
Of the 80,000 dams in the U.S. only ~3% are used to generate electricity. Price to build is already paid, cost to run is low– therefore we are missing a large opportunity here to use an already expensively built resource.

v. Example: New York State has over 600 registered dams, not including many associated with the lock system on the barge canal. Most do not generate electricity but could be retrofitted to capture this energy source. (Slide 10)

c. Stored Energy – Pumped Stored Hydroelectricity (Slides 11-13)
i. Like dams but uses water pumped to higher elevation to store energy for periods of high demand.
ii. During periods of low electrical demand excess (low cost) electricity can be utilized to run pumps to store water at higher elevation, and then during periods of higher demand the water is released and electricity is produced through turbines in the system.
iii. Due to energy losses in the turbines and during pumping this system is a net energy consumer, but if run correctly will run at a net profit.
iv. Basically stores energy produced during low need times for use during high needs time. To be carbon neutral would need other carbon-neutral source of electricity.

d. Hydroelectric II –Tidal (Slides 14-16)
i. Involves creation of 'tidal-dams' or free standing turbines in estuaries to capture flow and drive turbines
ii. Advantages:
i. Do not produce hazardous by-products (waste or air pollution)
ii. Located in areas that are otherwise not being utilized
iii. Disadvantages:
i. Relatively costly to build & cost to operate is variable

ii. Would be limited to coastal regions, and only those with
iii. Relatively large tidal fluctuations
iv. Has intermittent energy production (predictable)
v. Can impact organisms that live in these areas (especially those associated with estuaries – which generally have larger tidal effects)

iv. Examples of Tidal Energy Production
La Rance, France

e. Hydroelectric III – Ocean Currents (Slide 17)
i. A potentially very important source of electrical energy
ii. Currently it is only speculative in nature

Presentation 3

I. Nuclear Energy
a. Advantages: (Slide 3)
i. Existing form of energy production
ii. Producing >8% of electricity for the U.S.
iii. Does not produce CO_2, and therefore does not increase our impact on Global Warming
b. Disadvantages: (Slide 4)
i. Extremely expensive (in many aspects)
i. Produces extremely toxic wastes that need to be secured for (very) long periods of time
ii. Requires very sophisticated and complex operations
iii. Accidents at these types of facilities can result in widespread contamination by radioactive materials
ii. Examples:
i. Kashiwazaki, Japan: World's largest nuclear plant.Japan generates 34.5% of their electricity from Nuclear power. (Slide 5)
ii. Paluel, France: France generates 78.8% of their electricity from nuclear power. (Slide 6)

c. Wind Generation
i. Advantages: (Slide 7)
i. Existing form of electricity production
ii. Producing <1% of electricity for the U.S.
iii. Does not produce CO_2
iv. Though tall, wind turbines do not cover a large area
v. Turbines come in a range of sizes and can be used for a number of applications both on & off the grid

ii. Disadvantages: (Slide 8)
    i. Has intermittent energy production (based on the consistency of the wind) thus can't reasonably have more than 20% of grid electricity from wind.
    ii. The public may consider wind turbines to be unsightly
    iii. Can be a hazard to bird (& migrating bird) and bat populations
iii. Recent advances: costs for wind generation are a fifth of what they were in the 1980's based on relatively conservative estimates, wind costs only 5% more than electricity from coal-fire power plants. (Slide 9)
iv. To get wind power from "windy" areas to rest of country requires an integrated Power Grid (Slides 10-11)

    This is also a factor for other alternative energy sources like: large scale solar farms.

v. Large-scale power lines are more efficient than smaller.(Slide 12)
vi. People don't like the look of large power lines and fear them
vii. Studies conducted in the 1990's on the effects of electromagnetic fields (associated with power lines) concluded "that there was no evidence that showed exposure to EMF from power lines presented a human health hazard." (Slide 13)

Presentation 4

d. Solar Energy

i. Advantages: (Slide 3)
    i. Existing form of electricity production,
    ii. producing <0.1% of electricity for the U.S.
    iii. Does not produce CO_2
    iv. Can be done on small scale and large scale effectively
    v. Energy can be collected by several different methods: photovoltaic (PV), Concentrating solar power, thermal and water heating
ii. Disadvantages: (Slides 4-5)
    i. Relatively costly to build & cost to operate is variable
    ii. Has intermittent energy production (though this is generally predictable)
    iii. Large solar farms can have environmental impacts
    iv. Not all region can take advantage of solar (US example in Slide 10 part 4)
iii. Photovoltaic method (PV) (Slides 6-7)
    i. Produces electricity directly from sunlight.
    ii. Photovoltaic's involves the creation of voltage in a material as a result of electro-magnetic radiation exposure (sunlight).
    iii. Photovoltaic's are relatively costly to install but have low operational costs.
    iv. PV cells may operate well for 30 years, and generally have warranties for 20-25 years.

iv. Concentrating Solar Power (CSP) (Slides 8-9)
    i. Uses mirrors and lenses to focus light onto PV surfaces
    ii. Or to heat fluids to generate electricity.
    iii. Again, costly to build, inexpensive to run.
    iv. To be cost-efficient these plants are, and will probably remain, restricted to areas with lots of sunlight**.**

e. Biomass
  i. Advantages (Slide 10)
    i. Existing form of energy production,
    ii. producing ~3.6% of overall power for the U.S.
    iii. It more efficiently utilizes solar radiation to generate energy
    iv. Recycles CO_2 in the atmosphere (**carbon-neutral**; efficiency of recycling varies based on which bio-material is used)
    v. Versatile: Can be used for fuel and to generate electricity
    vi. Theoretically, should be cheaper than oil as an energy source
  ii. Disadvantages: (Slide 11)
    i. Produces CO_2 as a waste
    ii. May increase cost for some agricultural products
    iii. May increase deforestation in tropical regions
  iii. Examples:
    i. Largest source of electricity from biofuels is landfill gas (methane, ethane & propane generated from the decomposition of trash) i.e., NH and NY in USA (Slide 12)
    ii. Onondaga County, NY utilizes trash incineration to dispose of solid waste. The incineration process produces electricity for over 25,000 homes in the area. (Slide 13)
    iii. Other Examples (Slides 14-15)
      (a) Wood burning stoves/hot water heating systems
      (b) Waste wood product for industrial electricity generation
      (c) Manure gas generation (Netherlands)
      (d) Algae: Current research is preliminary.

Appendix G: Lecture Outline for Lesson 6

I. Brief History of United Nations involvement in Sustainability Issues:
Q: What IS the UN? When was it created and why? How does it function?

Display UN webpage http://www.un.org/en/aboutun/index.shtml or text from it:

The United Nations is an international organization founded in 1945 after the Second World War by 51 countries committed to maintaining international peace and security, developing friendly relations among nations and promoting social progress, better living standards and human rights.

The UN has 4 main purposes

- To keep peace throughout the world;
- To develop friendly relations among nations;
- To help nations work together to improve the lives of poor people, to conquer hunger, disease and illiteracy, and to encourage respect for each other's rights and freedoms;
- To be a centre for harmonizing the actions of nations to achieve these goals.

Due to its unique international character, and the powers vested in its founding Charter, the Organization can take action on a wide range of issues, and provide a forum for its 193 Member States to express their views, through the General Assembly, the Security Council, the Economic and Social Council and other bodies and committees.

Q: How are sustainability issues related to the UN's 4 main goals?

a. Very early actions on sustainability: (Slide 4)
   1. 1949: UN Scientific Conference on the conservation and utilization of resources (Lake Success, New York, 17 August to 6 September). Mostly on how to manage the resources, not so much on conserving them.
   2. 1968: UN Economic and Social Council decided to hold the first "Earth Summit" in 1972

b. 1972 Stockholm: UN Scientific Conference on the Human Environment (aka the First Earth Summit) (Slide 5)
   1. Declaration that set out principles for preserving the human environment.
   2. Action plan with recommendations for international environmental action.
   3. Establishment of monitoring of atmospheric composition to track long term changes.
   4. Established the Governing Council of the UN Environment Programme (UNEP), the Environmental Fund, and the Environmental Coordination Board.

a. Mostly concerned with water resources, marine mammals, renewable energy resources, desertification, forests,environmental- legal framework.

c. Post-Earth Summit (Slide 6)
   1. 1987 Environmental Perspective to the Year 2000 and Beyond. Introduced Sustainable Development
   2. 1988 The Intergovernmental Panel on Climate Change was established.
   3. 1989 Montreal Protocol to protect the Ozone layer

d. 1992 Rio de Janeiro, Brazil, The UN Conference on Environment and Development (aka The Earth Summit) (Slide 7)
   1. Created a framework for how to attain international agreements on protecting the environment.
   2. Main outcome was Agenda 21 – a document reflecting the global consensus for protecting the environment while allowing development of underdeveloped countries. Agenda 21 is available at http://www.un.org/esa/dsd/agenda21/index.shtml.
   3. Began signing of the UN Framework Convention on Climate Change - an international agreement to stabilize concentrations of greenhouse gasses in the atmosphere in order to reduce the threat of global warming.
   4. Convention on Biodiversity.

e. 1997 Kyoto Protocol to reduce Carbon dioxide emissions

f. 2000 Millennium Development Goals (MDGs)
   1. Ensuring environmental sustainability is one of the goals.
   2. Over seen by UN Division for Sustainable Development

II. Treaties to protect the environment: (Slides 8 - 9)

a. Structure and follow up activities
   1. Typically there are 2 types:
      a. Ones that deal with specific locations, entities (i.e., a particular river), or a species.
      b. And ones that are global (to deal with more global issues like climate change).
   2. Each treaty may result in a conference of the parties – regular meetings of the members – and a secretariat – a small office to facilitate the meetings. It may even have a group of scientific advisees.
   3. Members need to report data for their country to secretariat to demonstrate compliance and progress.

b. Difficulties in getting the treaties to work. (Slides 10 -11)
   1. Secretariat may not have power to verify reports from members.
   2. Secretariat may not have funding to enforce treaties.
   3. Lack of central locations for all of these treaties means that there is overlap and redundancy. Centralization would make the process more efficient. There was some agreement to this in the Agenda 21, but haven't followed through on it.

4. Trade agreements sometimes conflict with Environmental treaties.
5. Members may lack the funds or technology to implement treaty actions. Global Environment Facility (GEF) created to address this.

III. Notable UN entities

a. Commission on Sustainable Development (CSD) More info is at: http://www.un.org/esa/dsd/csd/csd_aboucsd.shtml (Slide 12 - 13)
   1. Created at 1992 Earth Summit
   2. Forum for reviewing progress of Agenda 21
   3. Monitors activities of governments, private sector, etc. For example, member have been asked to report if they have formulated and implemented a national Sustainable Development Strategies (NSDS). An online map is viewable at: http://www.un.org/esa/dsd/dsd_aofw_nsds/nsds_map.shtml
   4. The UN Division of Sustainable Development is the secretariat to the CSD.

b. The Intergovernmental Panel on Climate Change (IPCC) (Slide 14)
   1. To study greenhouse warming and climate change
   2. To study the global effect of climate change on sea level, food production, water resources, etc.
   3. Has established itself as the state of the art repository of data and of the interpretation of that data. Well regarded and trusted by a vast majority of the climate science community.

c. UN Framework Convention on Climate Change (Slides 15- 17)
   1. Signing of this treaty began at the Rio Earth Summit in 1992.
   2. To consider what can be done to reduce global warming and to cope with whatever temperature increases are inevitable.
   3. Recognized that climate system is a shared resource.
   4. Kyoto Protocol is an addition to the treaty
   5. Climate Change Secretariat is located in Bonn, Germany (since 1996)
   6. Coordinates with the IPCC and the GEF.
   7. Major agreement on Carbon Equity: idea that per capita emissions should be more equitable across the world. Right now USA is way higher than all the rest of the world.
   8. More info is at: http://unfccc.int/2860.php

IV. Q: What are some important actions to be taken within countries?

a. Climate change – need to change over to Carbon-neutral sources:
   1. Cap and trade of Carbon dioxide
      a. Will only work if Carbon is properly monetized
      b. Money collected will need to be invested in clean energy technology.
      c. Need to keep financial institutions out of it.
   2. Building codes
      a. New construction will be more energy efficient.
      b. Include energy costs in mortgage requirements.

    c. To encourage sellers to improve houses before selling.
3. Transportation (cars, specifically)
    a. Governments can use their purchasing power to bring new technology to the market.
    b. Then increase the requirements for millage.

Q: How could/does the UN encourage these actions?

Appendix H Additional Resources

Background Readings for the Instructor
In addition to the readings assigned to the class, the instructor may find the following resources to be helpful for background material.

Miller, G.T., & Spoolman, S.E. (2009). Sustaining the Earth: An integrated approach, 9th edition. Brooks/Cole Cengage Learning pub. (ISBN -13: 978-0-495-55687-9).

Ewing B., S. Goldfinger, A. Oursler, A. Reed, D. Moore, and M. Wackernagel. (2009). The Ecological Footprint Atlas 2009. Oakland: Global Footprint Network.

http://www.globalization101.org
http://www.millenniumassessment.org

http://www.unep.org/ecosystemmanagement/
http://www.un.org/esa/population/unpop.htm

Additional Resources
Lesson 1

The United Nations Department of Economic and Social Affairs, Population Division. (n.d.). Retrieved from: http://www.un.org/esa/population/unpop.htm

Lesson 2-3
Living Beyond Our Means: Natural Assets and Human Well-being (Statement of the Millennium Ecosystem Assessment Board). (2003). Retrieved from:
http://www.millenniumassessment.org/en/Reports.aspx#

Ecosystem Management. (n.d.). United Nations Environment Programme Retrieved from:
http://www.unep.org/ecosystemmanagement/

The Millennium Ecosystem Assessment (2003). Slide show retrieved from:
http://www.millenniumassessment.org/en/SlidePresentations.aspx

Water Scarcity: Real and Virtual Implications. (2007, May 23). Globalization101. Retrieved from: http://www.globalization101.org/water-scarcity-real-and-virtual-implications-2/

Ewing B., S. Goldfinger, A. Oursler, A. Reed, D. Moore, and M. Wackernagel. (2009). The Ecological Footprint Atlas 2009. Oakland: Global Footprint Network.

Lesson 4
Climate Change, Emission Standards are Air Quality, and The Kyoto Protocols. Energy in Depth. (n.d.). Globalization101. Retrieved from: http://www.globalization101.org/category/issues-in-depth/energy/

Copenhagen Climate Change Conference: Negative Reviews for a Weak Post-2012 Agreement. (2009, December 22). Globalization101. Retrieved from: http://www.globalization101.org/copenhagen-climate-change-conference-negative-reviews-for-a-weak-post-2012-agreement-2/

Global Warming. (n.d.). Globalization101. Retrieved from: http://www.globalization101.org/global-warming/

Chap 13: Climate Change *in*: Ecosystems and Human Well-being: Policy Responses, a synthesis report of the Millennium Ecosystem Assessment. Retrieved from: http://www.millenniumassessment.org/en/Reports.aspx#

Lesson 5
Energy in Depth. (n.d.). Globalization101. Retrieved from: http://www.globalization101.org/category/issues-in-depth/energy/

Lesson 6
Rio 20+, a Failed Effort to Build a New Worldwide Sustainability Agreement (2012, June 29). Globalization101. Retrieved from: http://www.globalization101.org/rio-20-a-failed-effort-to-build-a-new-worldwide-sustainability-agreement/

Assessments

Environment Presentation

You are a member of one of the following groups (your choice):

- An international group of business leaders
- An international group of officials from the UN's environmental agencies
- An international group of members of environmentalist NGOs
- An international group of governmental leaders
- An international group of residents of "Spaceship Earth" who are not in one of the above groups

In your role, prepare a scientifically sound argument on a local environmental issue to present at a town forum or in a town newspaper. This may be prepared in the form of a speech or panel presentation (which should include your response to 3-5 follow-up questions.

Your presentation should draw upon, and properly cite, at least seven of the sources from this module. It should be 4-6 (double-spaced) pages in length.

Olympic Bid Presentation

This activity was developed and piloted by Sarah Zipp at SUNY Cortland.

Project:	Olympic Bid City
Type:	Group
Oral Presentation:	15-20 minute + discussion. Business attire.
Written Report:	6-8 pages, double spaced, 12 pt type

Instructions:

Students will deliver a presentation and written report from the perspective of a bid city organizing committee. The goal is to persuade the audience to vote for your city to host the 2020 Olympic summer games. Presentations and reports will be based on 5 elements for hosting the Olympics:

1. National/Regional/Bid City Characteristics
2. Marketing
3. Environmental Protection

4. Olympism, Culture and Legacy
5. Facilities, Venues, Infrastructure, and Accommodations

National/Regional/Bid City Characteristics

- Culture – How will language, food, art, entertainment, etc. contribute to the games?
- Politics – How can the government support the hosting of this event? Is it stable?
- Geography – What geographical landmarks, characteristics will affect the games, athletes, and spectators (i.e. are there beaches? Mountains? Rivers? Etc.). Is the host city easy to access?

Marketing

- Create a marketing proposal on behalf of the city. Include the following:
- Olympic "theme" (i.e. Rio is "Live your passion" and Vancouver was "I Believe"). Theme should encompass national character (i.e. Brazil is lively, passionate. Canada is a country of bounty, possibilities).
- Choose 2 or 3 sponsors from among the following sponsorship categories: non-alcoholic beverage, auto, retail food services, telecommunications/wireless communications, film/photography/imaging, information technology, financial servicer (i.e. credit card), carrier/delivery, apparel/gear). Provide brief description of how sponsor would contribute to games.
- Provide specific action items and plans for the activation of these sponsorships
- How will you ensure that the games will be commercially viable, yet not overly commercial?

Environmental Protection

- How will venues be created or renovated in an eco-friendly way?
- What steps will the organizers take to reduce the carbon footprint of the games?
- How will concern for the environment be promoted or encouraged through these games?

Olympism, Culture, and Legacy

- How will hosting the games benefit the residents of this city, region, and country?
- What is the economic impact of the games to the city?
- What will the legacy of the games be? (i.e. infrastructure, host city visibility, employment, sport structure)

Facilities, Venues, Infrastructure, and Accommodations

- What types of facilities and venues will be constructed or used for the sport competitions?
- How will athletes, spectators and media be accommodated?
- How many hotel rooms are available?
- Is the city infrastructure capable of hosting this event?

TIPS:
Research past Olympics. Provide evidence regarding facilities, economic impact, environmental efforts, etc based on past games.

Be specific – avoid vague ideas and general statements. Focus on detailed items and provide evidence (citations).

Be direct – make a "proposal". Tell me exactly WHAT YOU ARE GOING TO DO. Don't just state ideas, word them in a way that directly indicates what you plan to do. For example, "we will activate the VISA sponsorship by . . . " Avoid statements like "We will have VISA as our sponsor and everyone will benefit." This is a vague, meaningless, throw away statement that tells me nothing about what you are going to do!

Proofread, proofread, proofread. Grammar and spelling count, heavily.

Write report from "we" perspective. Use a formal tone. Avoid "you." Avoid slang and overuse of contractions.

Possible Host Cities for 2020 Summer Olympics

Budapest, Hungary
Busan, South Korea
Cape Town or Durban South Africa
Delhi, India
Milan, Rome, Venice or Palermo, Italy
Dubai, UAE
Tokyo, Japan

Notes

The French book must be purchased for the module since the lessons use multiple chapters.

French, Hilary. (2000). *Vanishing Borders: Protecting the Planet in the Age of Globalization*. W.W. Norton & Co., New York.

The lesson all contain extensive lectures. To engage students, it might be useful to start the classes with the discussion of the readings first before getting to the lectures. Feel free to shorten the lectures and cover only a portion of the materials provided.