

Princeton University
Woodrow Wilson School of Public and International Affairs
Spring 2003

WWS-475
Global Environmental Issues
Room 004 Wallace Hall
Mondays and Wednesdays 1:30 – 2:50 PM

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Overview:

As the world population grows and becomes more industrialized the human impact on the global environment also increases. This class will examine a set of global environmental problems including those which affect the global commons such as ozone layer depletion and climate change, and those which are of widespread regional importance such as loss of biological diversity, deforestation and desertification, long-range transport of air pollutants including acid rain, and the pollution and overuse of fresh waters. The course will provide an overview of the scientific basis for these problems and will then examine current and possible future policy responses.

Course Format:

Course topics will usually be covered in modules with the first part of the module covering the key scientific concepts surrounding the environmental issue and the second describing the present and possible future policy responses. There will be two class meetings each week with each class divided, very roughly, into half lecture and half discussion. All students are expected to do the required weekly reading which will form the basis for classroom discussion. Some of the reading is in a course packet available for purchase and the rest is available over the internet with web addresses noted below in the syllabus. A substantial portion of the course grade will be based on class participation.

Grading:

Grades will be based class participation a mid-term and final paper and a presentation. The following percentages will be used:

Class participation: 30%

Paper in lieu of midterm: 20%

Presentation of final paper: 10%

Final paper: 40%

SCHEDULE OF CLASSES

Week 1: February 3 & 5, 2003. Course Overview and Introduction.

Drivers influencing global environmental problems – growth in population and consumption, increasing global energy consumption, habitat loss. Disparity in wealth and consumption between developed and developing countries.

Reading:

Protecting Our Planet, Securing Our Future – Linkages among Global Environmental Issues and Human Needs, UNEP, NASA, World Bank, 1998, The book is available on the web at: <http://www-esd.worldbank.org/planet/>

Follow the link called ‘contents’ and read the Executive summary: pp. xv-xvii, Part 1, Introduction and Part 2, Global Environmental Issues: pp. 1-30.

E.O. Wilson, The Future of Life, chapter 2 “The Bottleneck”, pp. 22-41, 2002.

McDevitt, TM., World Population Profile: 1998, U.S. Census Bureau, 1999, pp. 1-2, 9-18. The complete document is available at <http://blue.census.gov/ipc/prod/wp98/wp98.pdf>.

Week 2. February 10 & 12, 2003. Stratospheric Ozone Depletion – Science

Ozone in the stratosphere protects life on earth from excess ultra-violet (UV) radiation. It has been depleted at all latitudes except the tropics by the emission of anthropogenic (human produced) chlorofluorocarbons (CFCs) and related substances. Increases in UV radiation result in an increase in the incidence of skin cancer, eye cataracts, decrease in productivity of some ecosystems, and a decrease in air quality. A near global phase-out of the production of CFCs is expected to permit a partial recovery of the ozone layer later this century.

Reading:

An introduction to the science of stratospheric ozone depletion and reasons behind the global phase-out of chlorofluorocarbons (CFCs) has been compiled by the U.S. Environmental Protection Agency and is posted at:

http://www.epa.gov/ozone/science/sc_fact.html

An international assessment evaluating the scientific understanding of ozone depletion is conducted every four years. The executive summary for the most recent report completed in 2002 is available at: <http://www.unep.org/ozone/pdf/execsumm-sap2002.pdf>

An excellent compilation by the 1998 international assessment committee of frequently asked questions regarding stratospheric ozone depletion is at:

<http://www.al.noaa.gov/WWHD/pubdocs/Assessment98/faq.html>

Follow the links to get answers to your questions in both words and pictures.

Week 3. February 17 & 19, 2003. Stratospheric Ozone Depletion – International policy response – the success of the Montreal Protocol.

The Montreal Protocol, an international treaty to protect stratospheric ozone, has resulted in a near global phase-out of CFCs and related substances. This treaty is considered one of the worlds global environmental success stories. We'll explore what made it possible and the lessons that can be taken from it to address other global environmental problems.

Reading:

Protecting the Ozone Layer: The United Nations History by Stephen O Andersen and K Madhava Sarma, United Nations Environment Program, 2002. Chapter 10 pp. 345-368.

Week 4. February 24 & 26, 2003. Climate Change – Science

Human activities, primarily the burning of fossil fuels such as coal, oil and natural gas, and deforestation are increasing the concentrations of gases in our atmosphere which trap heat. We will examine the current understanding and evidence for climate change as well as its potential future impacts.

Reading:

The Great Global Experiment, Jonathan Shaw, *Harvard Alumni Magazine*, December 2002. 13 pages.

The entire three part report on climate change written by the Intergovernmental Panel on Climate Change (IPCC) is available on the web at: <http://www.ipcc.ch/> However, for class, please focus on: Climate Change 2001: The Scientific Basis, Technical Summary, Intergovernmental Panel on Climate Change (IPCC), Working Group I, at: http://www.grida.no/climate/ipcc_tar/wg1/010.htm . If you'd prefer to read a shorter summary for policymakers, you can instead read: http://www.grida.no/climate/ipcc_tar/wg1/005.htm

Climate Change Science: An analysis of some key questions, National Academy Press, 2001.

Protecting Our Planet, Securing Our Future – Linkages among Global Environmental Issues and Human Needs, UNEP, NASA, World Bank, 1998, Available at: <http://www-esd.worldbank.org/planet/> Appendix 2, p. 81.

Week 5. March 3 & 5, 2003. Climate Change – International policy response – Framework Convention, Kyoto Protocol and the Intergovernmental Panel on Climate Change (IPCC)

The Framework Convention on Climate Change (FCCC) was signed at the 1992 Earth Summit in Rio and put the issue of climate change on the international stage. The Kyoto Protocol, negotiated in December 1997, introduced the first commitments to reduce emissions of greenhouse gases by developed countries. The IPCC, set up in 1988 by UNEP and the World Meteorological Organization, and composed of scientists from around the world, reviews the state of scientific knowledge on climate change and issues comprehensive reports every 5-years. We will examine similarities and differences between the policy approach to climate change and stratospheric ozone depletion.

Guest Lecture Wednesday March 5, 2003, Prof. Michael Oppenheimer.

Reading:

Valuing the Global Environment: Actions and Investments for a 21st Century, Global Environment Facility, 1998: The Climate Challenge and Opportunity, pp. 92-109.

The Technology Assessment Approach to Climate Change, Edward Parson, *Issues in Science and Technology*, Summer 2002.

Grubb, M. The Kyoto Protocol: A Guide and Assessment, Chapter 4: The Kyoto Protocol, pp. 115-152, 1999.

Climate Change 2001: Synthesis Report, Summary for Policymakers. Available at: <http://www.ipcc.ch/pub/SYRspm.pdf>

Week 6. March 10 & 12, 2003. Linkages between energy choices, air pollution and climate change and health – science and policy

Environmental protection has traditionally addressed specific environmental issues in isolation. A better understanding of the linkages among different issues can help us avoid implementing policies that benefit one environmental issue at the expense of another and rather simultaneously improve a number of problems.

Protecting Our Planet, Securing Our Future – Linkages among Global Environmental Issues and Human Needs, UNEP, NASA, World Bank, 1998, Available at: <http://www-esd.worldbank.org/planet/> Read Part 3: Meeting Human Needs within the Environmental Envelope, pp. 31-51; and Part 4: Policies for Linking Human and Environmental Needs, pp. 53-74.

"Hidden Health Benefits of Greenhouse Gas Mitigation," Luis Cifuentes, Victor H. Borja-Aburto, Nelson Gouveia, George Thurston, Devra Lee Davis, *Science*, vol. 293, pp. 1257-1259, 17 August 2001.

"Public Health Impact of Air Pollution and Implications for the Energy System," Ari Rabl and Joseph V. Spadaro, *Annual Reviews Energy Environment*. 2002. 25:609-27.

First paper due: March 12, 2003 in class.

Spring Break

Week 7. March 24 & 26, 2003. Long range transport of air pollution – Science of acid rain, ozone and particulate air pollution

Emissions of precursors to acid rain, ozone and particulate pollution all come from fossil fuel combustion and biomass burning and have been controlled largely due to their impacts on health. These pollutants can be transported long distances and effect regions outside the countries where they were emitted. We will examine differences between pollution levels in developed and developing countries.

Reading:

Crutzen and Graedel, *Atmosphere, Climate and Change*, Chapter 3: Chemistry in the Air, pp. 35-57. (on e-reserve at Stokes library)

Wilkening, K.E., Barrie, L.A., Engle, M. Trans-Pacific Air Pollution, *Science*, 2000 October 6; 290: 65-67.

Week 8. March 31 & April 2, 2003. Policy responses to air pollution and acid rain -- Command and control versus market based mechanisms, Long Range Trans-boundary Air Pollution treaty, etc.)

Readings:

Cramton, Peter, A Review of Markets for Clean Air: The U.S. Acid Rain Program, *Journal of Economic Literature*, pp. 627-633, September 2000.

Bell, RG, Russell, C, Environmental Policy for Developing Countries, *Issues in Science and Technology*, Spring 2002.

Description of the Long Range Transboundary Air Pollution Treaty (LRTAP)
http://www.unece.org/env/lrtap/lrtap_h1.htm

Week 9. April 7 & 9, 2003. Biodiversity – Science

Continuing and accelerating destruction of biodiversity threatens to impair the natural ecosystem infrastructure supporting human society and economic systems. Extinction is permanent. The root causes include habitat loss, deforestation, water degradation, urban expansion, introduction of non-native species, lack of enforcement of environmental regulations, etc. We will examine the natural distribution of biodiversity on earth and the extent of biodiversity loss.

Reading:

John Terborgh, *Diversity and the Tropical Rain Forest*, Chapter 1: The Biological Exuberance of the Tropics, pp. 1-29; Chapter 3: The Global Diversity Gradient, pp. 53-71.

Articles in: Biodiversity, E. O. Wilson, ed., National Academy Press, Washington D.C., 1988

E.O. Wilson, The Current State of Biological Diversity, pp. 3-18.

Paul Ehrlich, The Loss of Diversity: Causes and Consequences, pp. 21-27

Pauly, Daniel, et al., Towards sustainability in world fisheries, *Nature* 418, August 2002, pp. 689-695.

Week 10. April 14 & 16, 2003. Loss of Biological Diversity – Policy responses

Various efforts are being made to protect biodiversity including the establishment of national parks, the passage of the U.S. Endangered Species Act and the international Convention on Biological Diversity following the 1992 'Earth Summit' in Rio de Janeiro. We will examine how much these initiatives are helping stem the rapid loss of biodiversity and will explore what else might help.

Guest lecture, Monday April 14, 2003, Prof. David Wilcove

Reading:

Articles in: Biodiversity, E. O. Wilson, ed., National Academy Press, Washington D.C., 1988

W. Michael Hanemann, Economics and the Preservation of Biodiversity, pp. 193-199.

Valuing the Global Environment: Actions and Investments for a 21st Century, Global Environment Facility, 1998: The Biodiversity Agenda, pp. 67-91.

John Terborgh, *Diversity and the Tropical Rain Forest*, Chapter 8: Conserving Biodiversity pp.185-211; Chapter 9: Managing Tropical Forests, pp. 213-232.

E.O. Wilson, The Future of Life, chapter 7, The Solution, pp.149-189

Week 11. April 21 & 23, 2003 Sustainable Development

What can be done to encourage the use of natural resources in a sustainable fashion?

Reading:

World Bank. The Environment and the Millennium Development Goals.

Gretchen Daily and Brian Walker, Seeking the great transition, *Nature*, pp. 243-245, 2000.

Week 12 April 28 & 30, 2003 (and session during reading period if necessary) Oral reports by students of term projects.

Final term papers due: Friday May 9, 2003.