

Environment and Human Health: Drinking Water, Toxic Substances and Organic Food

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Course Description

The interactions between the environment and human health raise complex ethical questions related to environmental regulations and health policy decisions. This course will introduce the major types, sources, and environmental distribution of environmental agents and describe the mechanisms by which they exert adverse effects. Students will learn economic methodologies for analyzing environment and health problems and evaluating the related policies.

Prerequisites:

Econ 301 (Intermediate Microeconomics) or Econ 501 (Graduate Microeconomics)

Course Requirements and Grading

Students are expected to attend normal class time lectures for the entire semester. Students are expected to complete regular weekly reading assignments, homework assignments, and two tests. This work outside of class is typically six hours per week. In addition, students are expected to work as a team to present the selected paper in the case study session. The presentation should be 15-20 minutes. Grading for the class will be as follows:

- Homework Assignments (weighted equally): 25%
- Midterm: 25%
- Final: 30%
- In-class participation and Presentation: 20%

I will use the following grading-scale:

- A : 94 – 100; A- : 90 – 93; B+ : 88 – 89; B : 84 – 87; B- : 80 – 83; C+ : 78 – 79; C : 74 – 77; C- : 70 – 73; D+ : 68 – 69; D : 64 – 67; D- : 60 – 63; F : < 60

I encourage feedback throughout the semester to make sure my goals and your expectations are being met. I will distribute evaluations mid-semester.

Learning Objectives

Upon completion of the course, students will be familiar with the concept of environmental agents and the mechanisms by which they exert adverse effects, and with current empirical papers addressing these major environmental and health policy problems. Along with basic coursework in micro theory and econometrics, the course will assist students to develop the skills necessary to be a successful empirical researcher.

Required Materials

We will make use of the following textbooks. I may also provide additional reading materials that include journal articles, technical reports, and other writings.

- Molly K. Macauley, Michael D. Bowes, and Karen L. Palmer. Using Economic Incentives to Regulate Toxic Substances. Resources for the Future, 1992.
- Maurizio Canavari and and Kent D. Olson. Organic Food: Consumers' Choices and Farmers' Opportunities. 2007.
- Patrick Sullivan Franklin Agardy James Clark. The Environmental Science of Drinking Water. 1st Edition, 2005.

Course Policies

Questions about Course Materials and Email Policy

I strongly encourage you to contact me before or after lecture or during office hours. I will make every attempt to respond promptly to questions through email, but I cannot guarantee that your questions will be resolved quickly. The best way to discuss any questions/concerns you may have is in person.

During Class

I understand that the electronic recording of notes will be important for class and so computers will be allowed in class. Please refrain from using computers for anything but activities related to the class. Phones are prohibited as they are rarely useful for anything in the course. Eating and drinking are allowed in class but please refrain from it affecting the course. Try not to eat your lunch in class as the classes are typically active.

Attendance Policy

Attendance is expected in all lecture and lab sections. Valid excuses for absence will be accepted before class. In extenuating circumstances, valid excuses with proof will be accepted after class. For every class missed the participation grade will be dropped 1 point.

Late Assignments and Absences

Assignments will not be accepted after their due date unless prior arrangements have been made with the instructor. You must contact me in writing (email) prior to the due date and time with an explanation as to why you request an extension. It will be up to my discretion to grant this extension. A similar policy holds for all exams.

Academic Integrity and Honesty

This class will follow Iowa State University's policy on academic dishonesty. I will discuss any case of academic misconduct directly with the student and report the incident to the Dean of Students Office. Any academic misconduct will result in an F for the assignment. Please familiarize yourself with Iowa State's academic misconduct policies here: <https://knowthecode.dso.iastate.edu/>

Accessibility

Iowa State University is committed to assuring that all educational activities are free from discrimination and harassment based on disability status. Students requesting accommodations for a documented disability are required to meet with staff in Student Accessibility Services (SAS) to establish eligibility and learn about related processes. Eligible students will be provided with a Notification Letter for each course and reasonable accommodations will be arranged after timely delivery of the Notification Letter to the instructor. Students are encouraged to deliver Notification Letters as early in the semester as possible. SAS, a unit in the Dean of Students Office, is located in room 1076, Student Services Building or online at www.sas.dso.iastate.edu. Contact SAS by email at accessibility@iastate.edu or by phone at 515-294- 7220 for additional information.

Harassment and Discrimination

Iowa State University does not discriminate on the basis of race, color, age, ethnicity, religion, national origin, pregnancy, sexual orientation, gender identity, genetic information, sex, marital status, disability, or status as a U.S. Veteran. Inquiries regarding nondiscrimination policies may be directed to Office of Equal Opportunity, 3410 Beardshear Hall, 515 Morrill Road, Ames, Iowa 50011, Tel. 515 294-7612, Hotline 515-294-1222, email eooffice@iastate.edu

Religious Accommodation

Iowa State University welcomes diversity of religious beliefs and practices, recognizing the contributions differing experiences and viewpoints can bring to the community. There may be times when an academic requirement conflicts with religious observances and practices. If that happens, students may request reasonable accommodation for religious practices. In all cases, you must put your request in writing. The instructor will review the situation in an effort to provide a reasonable accommodation when possible to do so without fundamentally altering a course. For students, you should first discuss the conflict and your requested accommodation with your professor at the earliest possible time. You or your instructor may also seek assistance from the Dean of Students Office (<http://dso.iastate.edu>) at 515-294-1020 or the Office of Equal Opportunity (<https://www.eoc.iastate.edu>) at 515-294-7612.

Course Outline

The schedule is tentative and subject to change. The learning goals below should be viewed as the key concepts you should grasp after each week, and also as a study guide before each exam, and at the end of the semester. Each exam will test on the material that was taught up until 1 week prior to the exam. I will try to stick to this schedule, but might deviate slightly to accommodate any extra time needed to cover course material.

PART I: INTRODUCTION

Week 01, 08/15 - 08/19: Course Goals and Foundations

- A. Overview and introduction (pre-class survey)
- B. Visions of the future: environment and human health

Week 02, 08/22 - 08/26: Environmental agents and economic approach

- C. The environmental agents and transmission mechanisms
- D. The economic approach in environment and health policy

PART II: DRINKING WATER

Week 03, 08/29 - 09/02: Current Drinking water issues

- A. Water scarcity: drinking water supply and sanitation
- B. Water pollution: toxic substances and nutrient pollution

Week 04, 09/05 - 09/09: Economic value of water quality

- C. Water quality index: subjective and objective measurements
- D. Determinants of the economic value of water quality: empirical evidence

Week 05, 09/12 - 09/16: Benefit Transfer

- E. Ecosystem service modeling and valuation
- F. Benefit-cost analysis (BCA) (Assignment #1)

Week 06, 09/19 - 09/23: Case Study: Drinking Water

- G. Presentation and course discussion

PART III: TOXIC SUBSTANCES

Week 07, 09/26 - 09/30: Policies on Toxic Substances

- A. Toxic substances: manufacturing, processing, distribution and use
- B. Toxic Substances Control Act (TSCA) and Pollution Prevention Act (PPA)

Week 08, 10/03 - 10/07: Economic Instruments: Disclosures and Restriction and **Exam 1**

- C. Instruments: disclosure and restriction
- D. Review and Exam 1 (Mid-term evaluation and feedback)

Week 09, 10/10 - 10/14: Welfare Analysis on chemical regulations

- E. The costs and benefits of regulating chemicals
- F. Methods for measuring consumer Welfare (Assignment #2)

Week 10, 10/17 - 10/21: Case Study: Toxic Substances

- G. Presentation and course discussion

PART IV: ORGANIC PRODUCTS

Week 11, 10/24 - 10/28: Current organic market in US

- A. Organic foods market
- B. Organic labeling and related policies

Week 12, 10/31 - 11/04: Policy Instruments: Tax and Subsidy

- C. Tax and Subsidy
- D. Subsidy organic farmers

Week 13, 11/07 - 11/11: Estimating consumer willingness to pay

- E. U.S. Organic Accreditation, certification and Eco-labeling
- F. Consumer perceptions on organic label (Assignment #3)

Week 14, 11/14 - 11/18: Case Study: Organic Food

- G. Presentation and course discussion

Week 15, 11/21 - 11/25: Review and **Final**

Course Outline and Reading List

In case you want to learn more about a certain topic, additional readings for each class session are denoted here. The course outline and reading list may be updated as we progress through the course.

PART I: INTRODUCTION

Week 01, 08/15 - 08/19: Course Goals and Foundations

- Philp, Richard B. Environmental hazards and human health. CRC Press, 1995.
- Vesley, Donald. Human health and the environment: A turn of the century perspective. Springer Science & Business Media, 1999.
- Lemery, Jay, and Paul Auerbach. Enviromedics: the impact of climate change on human health. Rowman & Littlefield, 2017.

Week 02, 08/22 - 08/26: Environmental agents and economic approach

- Coase, R.H., 1960. The problem of social cost. In Classic papers in natural resource economics (pp. 87-137). Palgrave Macmillan, London.
- Weitzman, M.L., 1974. Prices vs. quantities. The review of economic studies, 41(4), pp.477-491.
- Muller, Nicholas Z. and Robert Mendelsohn. 2009. "Efficient Pollution Regulation: Getting the Prices Right." American Economic Review. 99 (5): 1714-1739.

PART II: DRINKING WATER

Week 03, 08/29 - 09/02: Current Drinking water issues

- Bartram, Jamie, et al. "Global monitoring of water supply and sanitation: history, methods and future challenges." International journal of environmental research and public health 11.8 (2014): 8137-8165.
- Cairncross, Sandy, and Banco Mundial. "Sanitation and water supply: practical lessons from the decade." (1992).
- Fawell, John, and Mark J. Nieuwenhuijsen. "Contaminants in drinking water Environmental pollution and health." British medical bulletin 68.1 (2003): 199-208.
- Zhang, W. L., et al. "Nitrate pollution of groundwater in northern China." Agriculture, Ecosystems Environment 59.3 (1996): 223-231.

Week 04, 09/05 - 09/09: Economic value of water quality

- Tyagi, Shweta, et al. "Water quality assessment in terms of water quality index." *American Journal of water resources* 1.3 (2013): 34-38.
- Cude, Curtis G. "Oregon water quality index a tool for evaluating water quality management effectiveness 1." *JAWRA Journal of the American Water Resources Association* 37.1 (2001): 125-137.
- Ward, Frank A., and Ari Michelsen. "The economic value of water in agriculture: concepts and policy applications." *Water policy* 4.5 (2002): 423-446.
- Gibbons, Diana C., and Diana C. Gibbons. *The economic value of water. Resources for the Future*, 1986.

Week 05, 09/12 - 09/16: Benefit Transfer

- Loomis, John B. "The evolution of a more rigorous approach to benefit transfer: benefit function transfer." *Water Resources Research* 28.3 (1992): 701-705.
- Boyle, Kevin J., and John C. Bergstrom. "Benefit transfer studies: myths, pragmatism, and idealism." *Water Resources Research* 28.3 (1992): 657-663.
- Morrison, Mark, et al. "Choice modeling and tests of benefit transfer." *American journal of agricultural economics* 84.1 (2002): 161-170.
- Arrow, Kenneth J., et al. "Is there a role for benefit-cost analysis in environmental, health, and safety regulation?." *Science* 272.5259 (1996): 221-222.

Week 06, 09/19 - 09/23: Case Study: Drinking Water

- Azizullah, Azizullah, et al. "Water pollution in Pakistan and its impact on public health—a review." *Environment international* 37.2 (2011): 479-497.
- Zhang, Xiao-jian, et al. "Emergency drinking water treatment during source water pollution accidents in China: origin analysis, framework and technologies." (2011): 161-167.
- Chau, Nguyen Dang Giang, et al. "Pesticide pollution of multiple drinking water sources in the Mekong Delta, Vietnam: evidence from two provinces." *Environmental science and pollution research* 22.12 (2015): 9042-9058.
- Mohod, Chaitali V., and Jayashree Dhote. "Review of heavy metals in drinking water and their effect on human health." *International Journal of Innovative Research in Science, Engineering and Technology* 2.7 (2013): 2992-2996.

PART III: TOXIC SUBSTANCES

Week 07, 09/26 - 09/30: Policies on Toxic Substances

- Lerner, Steve. *Sacrifice zones: the front lines of toxic chemical exposure in the United States*. Mit Press, 2012.
- Wardrop, Peter, et al. "Chemical pollutants sorbed to ingested microbeads from personal care products accumulate in fish." *Environmental science technology* 50.7 (2016): 4037-4044.
- Portney, Paul R., ed. *Public policies for environmental protection*. Routledge, 2016.

Week 08, 10/03 - 10/07: Economic Instruments: Disclosure and Restrictions and Exam 1

- Vogel, Sarah A., and Jody A. Roberts. "Why the toxic substances control act needs an overhaul, and how to strengthen oversight of chemicals in the interim." *Health affairs* 30.5 (2011): 898-905.
- Krimsky, Sheldon. "The unsteady state and inertia of chemical regulation under the US Toxic Substances Control Act." *PLoS biology* 15.12 (2017): e2002404.
- Becker, Monica, Sally Edwards, and Rachel I. Massey. "Toxic chemicals in toys and children's products: limitations of current responses and recommendations for government and industry." (2010): 7986-7991.

Week 09, 10/10 - 10/14: Welfare Analysis on chemical regulations

- Foster, William, and Richard E. Just. "Measuring welfare effects of product contamination with consumer uncertainty." *Journal of Environmental Economics and Management* 17.3 (1989): 266-283.
- Leggett, Christopher G. "Environmental valuation with imperfect information the case of the random utility model." *Environmental and Resource Economics* 23.3 (2002): 343-355.
- Train, Kenneth. "Welfare calculations in discrete choice models when anticipated and experienced attributes differ: A guide with examples." *Journal of choice modelling* 16 (2015): 15-22.

Week 10, 10/17 - 10/21: Case Study: Toxic Substances

- Landrigan, Philip J., et al. "Pollution and children's health." *Science of the Total Environment* 650 (2019): 2389-2394.
- Verla, Andrew Wirnkor, et al. "Microplastic-toxic chemical interaction: a review study on quantified levels, mechanism and implication." *SN Applied Sciences* 1.11 (2019): 1400.
- Currie, Janet, et al. "Environmental health risks and housing values: evidence from 1,600 toxic plant openings and closings." *American Economic Review* 105.2 (2015): 678-709.
- Christensen, Peter, David Keiser, and Gabriel Lade. "Economic effects of environmental crises: Evidence from Flint, Michigan." *Michigan* (June 20, 2019) (2019).

PART IV: ORGANIC PRODUCTS

Week 11, 10/24 - 10/28: Current organic market in US

- Forman, Joel, and Janet Silverstein. "Organic foods: health and environmental advantages and disadvantages." *Pediatrics* 130.5 (2012): e1406-e1415.
- Smith-Spangler, Crystal, et al. "Are organic foods safer or healthier than conventional alternatives? A systematic review." *Annals of internal medicine* 157.5 (2012): 348-366.
- Dangour, Alan D., et al. "Nutritional quality of organic foods: a systematic review." *The American journal of clinical nutrition* 90.3 (2009): 680-685.

Week 12, 10/31 - 11/04: Policy Instruments: Tax and Subsidy

- Lohr, Luanne, and Lennart Salomonsson. "Conversion subsidies for organic production: results from Sweden and lessons for the United States." *Agricultural Economics* 22.2 (2000): 133-146.
- Walters, David M., Ken M. Fritz, and Ryan R. Otter. "The dark side of subsidies: adult stream insects export organic contaminants to riparian predators." *Ecological Applications* 18.8 (2008): 1835-1841.
- An, Ruopeng. "Effectiveness of subsidies in promoting healthy food purchases and consumption: a review of field experiments." *Public health nutrition* 16.7 (2013): 1215-1228.

Week 13, 11/07 - 11/11: Estimating consumer willingness to pay

- Magnusson, Maria K., et al. "Attitudes towards organic foods among Swedish consumers." *British food journal* (2001).
- Roitner-Schobesberger, Birgit, et al. "Consumer perceptions of organic foods in Bangkok, Thailand." *Food policy* 33.2 (2008): 112-121.
- Shepherd, Richard, Maria Magnusson, and Per-Olow Sjöden. "Determinants of consumer behavior related to organic foods." *AMBIO: A Journal of the Human Environment* 34.4 (2005): 352-359.

Week 14, 11/14 - 11/18: Case Study: Organic Food

- Jackson, Brian P., et al. "Arsenic, organic foods, and brown rice syrup." *Environmental health perspectives* 120.5 (2012): 623-626.
- Nasir, V. Aslihan, and Fahri Karakaya. "Consumer segments in organic foods market." *Journal of consumer marketing* (2014).
- Basha, Mohamed Bilal, et al. "Consumers attitude towards organic food." *Procedia Economics and Finance* 31 (2015): 444-452.
- Van Doorn, Jenny, and Peter C. Verhoef. "Willingness to pay for organic products: Differences between virtue and vice foods." *International Journal of Research in Marketing* 28.3 (2011): 167-180.