

Last modified September 6, 2005

FIRST CLASS MEETS WEDNESDAY, SEPTEMBER 7, 2005
3:30-5:00PM, RM. T-112East

Wastewater and Health (EH 745)

Instructors: Richard W. Clapp, MPH, Sc.D. Professor of Environmental Health and Laura F. Orlando, B.S. Civil Engineering, MPA, Adjunct Assistant Professor, Director of the ReSource Institute for Low Entropy Systems

BUSPH EH 745 Fall 2005
Wednesday's 3:30PM-5:00PM, Room T-112East
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Credits: 2

Course Description

Half of the people in the world today do not have access to a toilet. Every year, 2.2 million children under the age of five die of infections related to poor sanitation. Meanwhile, in the richest country in the world, the controversial practice of applying sewage sludge to land is making people rethink sewerage's role in a healthy environment. The sustainable management of human excreta has hardly been considered, much less enacted, by public health officials, policy-makers, and institutional agencies. The purpose of this course is to give students a comprehensive understanding of the relationship between human health, ecological health, and sanitation. The science and politics driving sanitation regulations and technologies will be explored. Practical solutions toward sustainable sanitation will be presented for future policy-makers, public health experts, educators, community and environmental activists.

Course Objectives

After 14 sessions, students should be able to:

- Evaluate different treatment and disposal methods for human waste management
- Understand the history of population growth, settlements, and decision-making that has led to the current sanitation crisis
- Understand the current political and public health controversy surrounding the land application of sewage sludge
- Understand the elements involved in a sustainable sanitation program

Requirements

Students should attend class regularly and be prepared to contribute to class discussions on the readings. A reader for the course is available for registered BUSPH students on Courseinfo at http://courseinfo.bu.edu/courses/05fallspheh745_a1/. Materials not available on the web will be distributed in class. An average of two or three article- or chapter-length readings will be assigned each week, to be read before the session for which they are assigned. Recommended readings are not required readings, they are supplementary and will not be tested.

Grades will be based on attendance, participation in class and knowledge of the readings as reflected in class discussions, a mid-term paper, of up to 10 double-spaced pages, based on questions related to the readings, and a final paper (of up to 10 double-spaced pages) or group project (one paper per project and a classroom presentation), and the extent to which the student shows improvement over the course of the semester. The final paper / group project will evaluate an community's sanitation situation and present a working plan and policy suggestions for problem solving.

Course Schedule

Sept. 7 – Session 1. Introduction

Sept. 14 – Session 2. Sanitation in the 21st Century

Overview

Readings

“Flagging global sanitation target threatens other Millennium Development Goals,” Bulletin of the World Health Organization, Volume 82, Number 3, March 2004, (<http://www.who.int/bulletin/volumes/82/3/MDG034/en/>)

“Achieving the Millenium Development Target for Water and Sanitation,” In "Investing in the Future: Water's Role in Achieving the Millennium Development Goals," the Abridged Final report of the United Nations Millennium Project's Task Force on Water and Sanitation, pp 21-32. (<http://www.unmillenniumproject.org/who/task07.htm>)

The Global Water Supply and Sanitation Assessment 2000 Report, World Health Organization and UNICEF (http://www.who.int/water_sanitation_health/Globassessment/GlobalTOC.htm).

McGranahan, G., and D. Satterthwaite. 2002. “Environmental health or ecological sustainability? Reconciling the brown and green agendas in urban development.” In Zetter, R., and R. London, eds., *Planning in Cities: Sustainability and Growth in the Developing World* (London: ITDG).

Recommended Readings

"The Sanitation Gap: Development's Deadly Menace," Akhtar Hameed Khan, *Progress of Nations 1997*, UNICEF

"Sanitation Related Diseases," *Ecological Sanitation*, Esrey S., ed., Sida, Stockholm, 1998, pp. 8 – 16 (www.ecosanres.org/PDF%20files/Ecological%20Sanitation.pdf)

Review http://www.who.int/water_sanitation_health/en/

Sept. 21 – Session 3. Disposal and Treatment Methods

Readings

Sinnatamby, G. 1990. Low cost sanitation. In Cairncross, S., J. Hardoy and D. Satterthwaite (eds.), *The Poor Die Young*, London: Earthscan

Table: Survey of Systems Used to Treat and/or Dispose of Toilet Waste Or Wastewater, The ReSource Institute for Low Entropy Systems

"How the Clivus Multrum Works," Clivus Multrum, Inc.

Recommended Readings

"Wastewater Treatment: Overview and Background," Claudia Copeland, Congressional Research Service, Report for Congress, 2005
(<http://www.ncseonline.org/NLE/CRS/abstract.cfm?NLEid=211>)

World Development Report 1992, "Development and the Environment," World Bank Publication, pp. 98-113

"Health Aspects of Dry Sanitation and Waste Reuse," Anne Peasy, WELL Study (WELL is a resource center managed by the London School of Hygiene & Tropical Medicine and the Water, Engineering and Development Centre, Loughborough University.)

"Recycling Organic Waste: From Urban Pollutant to Farm Resource," Gary Gardner, *Towards Sustainable Sanitation*, The International Association of Impact Assessment, May 2001

"An Overview of Composting Toilet Systems," Carol Steinfeld, reprinted from the *Septic System Owner's Manual* and the *Composting Toilet System Book*.

"Evaluating Ecological Sanitation Systems for Handling Human Waste," Ketil Haarstad, ed., Henrik Lystad & William Warner, Norwegian Center for Soil and Environmental Research, 2000

Sept. 28 – Session 4. Sewers and Sludge

New York Sewage Sludge, Michael Moore, TV Nation segment

Crapshoot (2003), NFB Canada, Jeff McKay, Director

Readings

"What is Environmental Sustainability in Sanitation?" Robert Goodland and Abby Rockefeller, UNEP-IETC Newsletter, Summer 1996

"Let Them Eat Nutri-Cake," Sheldon Rampton, *Harper's Magazine*, November 1998

Oct. 5 – Session 5. Historical Perspective

Readings

"Civilization and Sludge: Notes on the History of the Management of Human Excreta," Abby Rockefeller, *Current World Leaders*, Volume 39, No. 6

Tarr, Joel A. (1985) 'Industrial Wastes and Public Health: Some Historical Notes, Part I, 1876-1932', *American Journal of Public Health*, Vol. 75, No. 9.

Recommended Readings

"History of the Chicago Sewer," Chicago Public Library, (<http://www.chipublib.org/digital/sewers/intro.html>)

Oct. 12 – Session 6. Sanitation and the Environment: Toxic Pollution in the Waste Stream

Readings

"The Fate of Organic Pollutants in Wastewater and Sludge Treatment: Significant Processes and Impact of Compound Properties," Alder A., Siegrist H., Fent K., et al, *Chimia* 51, 1997, pp. 922-928

Summary (<http://website.lineone.net/~mwarhurst/apeintro.html>), "An Environmental Assessment of Alkylphenol Ethoxylates and Alkylphenols," A. Michael Warhurst, January 1995, (<http://website.lineone.net/~mwarhurst/aperpt.pdf>)

Summary from 'Our Stolen Future' website (<http://www.ourstolenfuture.org/NewScience/oncompounds/PBDE/2001haleetal.htm>) "Flame retardants: Persistent pollutants in land-applied sludges," *Nature* 412: 140-141, RC Hale, MJ La Guardia, EP Harvey, MO Gaylor, T Matteson Mainor, and WH Duff. 2001

"The Basics of Polybrominated Diphenyl Ethers (PBDEs)," Adapted from Manchester-Neesvig et al. 2001. *Environmental Science and Technology* 35:1072-1077, (<http://www.ourstolenfuture.org/NewScience/oncompounds/PBDE/whatarepbdes.htm>)

Recommended Readings

"Viral Tracer Studies Indicate Contamination of Marine Waters by Sewage Disposal Practices in Key Largo, Florida," Paul J., Rose J., et al, *Applied and Environmental Microbiology*, June 1995, pp. 2230-2234

"Identification of Alkylphenols and Other Estrogen Phenolic Compounds in Wastewater, Septage, and groundwater on Cape Cod, Massachusetts," Rudel R., Melly S., Geno G., Brody J., *Environ. Sci. Technol.*, 1998, pp. 861-869

"Behaviour of Alkylphenol Polyethoxylate Surfactants in the Aquatic Environment-I. Occurrence and Transformation in Sewage Treatment," Ahel M., Giger W., Koch M., *Wat. Res.* Vol. 28, No. 5, 1994, pp. 1131-1142

Oct. 19 – Session 7. Sewage Sludge

History of Sewage Sludge Disposal
Science and Politics
Regulations

Readings

"New U.S. Waste Strategy, pt. 2: Sewage Sludge," Peter Montague, *Rachel's Environment & Health Weekly* #561, August 28, 1997

Review of the EPA's biosolids web page (<http://www.epa.gov/OWM/bio.htm>)

"The Sludge Hits the Fan," John Stauber and Sheldon Rampton, *Toxic Sludge Is Good For You*, Common Courage Press, 1995, pp. 99-122 (<http://www.cqs.com/toxsludg.htm>)

Recommended Readings

"The Incongruity of Policies Regulating New York City's Sewage Sludge: Lessons for Coastal Management," R. Lawrence Swanson, *Coastal Management*, Vol. 21, 1993, pp. 299-312

Review "Biosolids" home page, a project of the Water Environment Federation (WEF) and the EPA. (<http://biosolids.policy.net/>)

Review the Water Environment Federation web page (<http://www.wef.org>)

"CDC sounds a warning on risks of sludge," John Tuohy, *USA TODAY*, July 13, 2000 (<http://www.usatoday.com/life/health/general/lhgen056.htm>)

"Mom Says Sludge Killed Son," James Buchanan, *Portsmouth Herald*, March 4, 2001
(http://www.portsmouthherald.com/news/3_4b.htm)

"Did Sludge Kill Central PA. Boy?" *The Morning Call*, Bob Laylo, October 8, 2000
(<http://www.mcall.com/cgi-bin/slwebsto.cgi?DBLIST=mc00&DOCNUM=39515>)

"Health Fears Over Sludge Spur Quest For Controls," David Snyder and Fredrick Kunkle,
Washington Post, August 6, 2001

Recommended Readings

"The Case for Caution: Recommendations for Land Application of Sewage Sludges," Ellen Harrison, Cornell Waste Management Institute, 1999
(<http://www.cfe.cornell.edu/wmi/PDFS/LandApp.pdf>)

David Lewis, EPA microbiologist, expert testimony, State of New Hampshire Rockingham County Superior Court, Joanne M. Marshall v. Wheelabrator Water Technologies, Inc., January 23, 2001 (<http://members.aol.com/lewisdavel/Expertreport.htm>)

Oct. 26 – Session 8. Development: Ideas, Themes, Practices

Readings

Leach, M. and Mearns, R. 1996. Environmental Change and Policy. In Leach, M. and Mearns, R. ed. *The Lie of the Land: Challenging Received Wisdom on the African Environment*, pp.1-33.

Sahlins, Marshall. 1992. Economics of develop-man in the Pacific. *Res* 21: 12-25.

Goldman, Michael. 2001. The birth of a discipline: Producing authoritative green knowledge, World Bank-style. *Ethnography* 2, 2: 191-217

Recommended Readings

Mitchell, Timothy 1995. The Object of Development: America's Egypt. In Jonathan Crush, ed. *Power of Development* (Routledge), pp. 129-157

Peets, R. with E. Hartwick. 1999. *Theories of Development*. Chapters 5-6

Nov. 2 – Session 9. Community Participation, Choice, Methods

Whittington, D., J. Davis, H. Miarsono, and R. Pollard. 2000. Designing a “neighborhood deal” for urban sewers: A case study of Semarang, Indonesia. *Journal of Planning Education and Research* **19**: 297-308.

Chambers, R. 1994. Participatory Rural Appraisal (PRA): Challenges, Potentials and Paradigms. *World Development* 22,10: 1437-54.

Nelson, N. and S. Wright. 1995. Participation and power. In Nelson, N. and Wright, S. ed. *Power and Participatory Development: Theory and Practice*, pp.1-18.

Recommended Readings

(Especially if Chambers and PRA are new to you)

Chambers, R. 1994. The Origins and Practice of PRA. *World Development* 22,7: 953-969.

Chambers, R. 1994. PRA: Analysis of Experience. *World Development* 22,9: 1253-68.

Nov. 9 – Session 10. Providing Water and Sanitation to the Poor

Policy

Politics

Economic

Social and Cultural

Technical

Maintenance

Who Buys, Who Sells?

Readings

Table: Constraints in improving water supply and sanitation services in developing countries, WHO, 1984, reproduced in *Water in Crisis*, Peter Gleick, ed., 1993

"Sanitation Myths: Obstacles to Progress?" M. Simpson-Herbert, Technical Officer, World Health Organization.

Recommended Readings

"Sanitation for the Twenty-First Century: Building Infrastructure," Laura Orlando, *Towards Sustainable Sanitation*, The International Association of Impact Assessment, May 2001

Nov. 16 – Session 11. Elements of a Sustainable Sanitation Programs

Policy

Political and Societal

Economic/Finance

Technical

Maintenance

Institutional and Corporate Frameworks

Readings

"Meeting Demand for Dry Toilets in Mexico," Ron Sawyer, part of the Sanitation Promotion Kit for the Water Supply and Sanitation Collaborative Council Working Group on promotion of Sanitation.

"Making Ecological Sanitation Work," *Ecological Sanitation*, Sida, Stockholm, 1998, pp 44-72.

Recommended Readings

"Large-Scale Dry Sanitation Programs: Preliminary Observations and Recommendations from Urban Experiences in Mexico," Ana Cordova, Human Dimensions Research Unit Series No. 01-6, Dept of Natural Resources, Cornell University. May 2001.

"Sustainable Sanitation: A Global Health Challenge," Laura Orlando, *Dollars & Sense*, 2001 (<http://www.dollarsandsense.org/archives/2001/0501orlando.html>).

"Solving the Sewage Crisis: Oaxaca City," William F. Foote, ICWA Letters, July 2, 1996.

Nov. 23 – No Class (Thanksgiving recess)

Nov. 30 – **Session 12. Sustainable Sanitation: Case Studies**

Readings

Review <http://www.ecosanres.org/>

Review <http://www.riles.org/pmmex.htm> and <http://www.riles.org/photos.htm>

Review <http://www.oasisdesign.net/design/examples/maruata/>

Recommended Readings

Sustainable Sanitation, Part 1: <http://www.riles.org/musings28.htm>. In Toward Sustainable Sanitation, eds. Robert Goodland, Laura Orlando, and Jeff Anhang, 2001.

Sustainable Sanitation, Part 2: <http://www.riles.org/musings29.htm>. In Toward Sustainable Sanitation, eds. Robert Goodland, Laura Orlando, and Jeff Anhang, 2001.

Sustainable Sanitation, Part 3: <http://www.riles.org/musings30.htm>. In Toward Sustainable Sanitation, eds. Robert Goodland, Laura Orlando, and Jeff Anhang, 2001.

Dec. 7 – **Session 13. MWRA / Deer Island Tour**

Readings

Review MWRA "Sewer System" web page (<http://www.mwra.com/03sewer/html/sew.htm>)

Dec. 14 – No Class (Study Period)

Dec. 21 – **Session 14. Student Presentations / Conclusions**