



School of Freshwater Sciences

FRSHWTR 510

Economics, Policy and Management of Water

Wednesday 9 to 11:40 am.
Room 3097. School of Freshwater Sciences Building

Instructor: Ramiro Berardo, Ph.D.
Office hours: SFS 2003E, Wednesdays 12:00-1:30 pm, Thursdays 4:00-5:15 pm and by appointment
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Course Description

Water is a necessary resource, but also a scarce one. It is this scarcity that produces the conditions for the emergence of conflict among potential users, hence requiring the creation of institutions –or rules- that seek to accomplish an efficient and equitable utilization of water. This class examines such institutions in a variety of levels –state, federal, and international- and analyzes how they affect water access and use in a variety of areas (agriculture, energy, etc.). In addition to this, students in the class will also engage in a careful examination of other variables that may that lead to conflict and cooperation among water stakeholders on a regional and global scale. The main goal of the course is to provide students with tools to assess under which conditions conflict is likely to be solved in a manner that is conducive to the establishment of sustainable water uses.

Course's Goals

- To expose students to the study of water topics from a policy perspective
- To understand the role of national legislation in the regulation of behavior with potentially detrimental effects for water quality in the U.S.

- To learn about the potential and limitations of both free markets and governments in dealing with water management problems
- To learn how to translate policy analysis into usable directives for water policy makers and stakeholders

Required Readings

Book

Smith, J.; Gleick, P.; Cooley, H.; Allen, L.; Vanderwarker, A.; Berry, K. 2012. *A Twenty-First Century U.S. Water Policy*. New York: Oxford University Press.

Other Readings

Alley, W. 2006. "Tracking U.S. Groundwater: Reserves for the Future?" *Environment*, Vol. 48, No. 3, April.

Anisfeld, Shimon G. *Water Resources*. Washington: Island Press. Read chapter 12 (available in D2L).

Braga, Benedito, et al. 2014. *Water and the Future of Humanity*. New York: Springer. Read chapter 1 (available in D2L).

Boyd, J. 2008. "The Geography of Ecosystem Services." *Resources*, Fall.

Collier, P. 2008. "The Politics of Hunger." *Foreign Affairs*, November/December.

Dumas, D. 2008. "Landfill-on-Sea." *The Ecologist*, February 7, 2008.

Fedoroff, N., et al. 2010. "Radically Rethinking Agriculture for the 21st Century." *Science*, February 12, 2010.

Groenfeldt, David. 2013. *Water Ethics. A values approach to solving the water crisis*. New York, NY: Routledge. Read chapter 7 (available in D2L).

Hall, Noah D. 2006. "Toward a new horizontal federalism: Interstate water management in the Great Lakes region." *Colorado Law Review* 77: 405-456.

Hardin, G. 1968. "The Tragedy of the Commons." *Science*, Vol. 162, No. 3859: 1243-1248.

IPCC, 2013: Summary for Policymakers. In: Climate Change 2013: The Physical Science Basis. Contribution of Working Group I to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change [Stocker, T.F., D. Qin, G.-K. Plattner, M. Tignor, S. K. Allen, J. Boschung, A. Nauels, Y. Xia, V. Bex and P.M. Midgley (eds.)]. Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA.
http://www.climatechange2013.org/images/uploads/WGI_AR5_SPM_brochure.pdf

Jones, B; Keen, M.; Strand, J. 2008. "Paying for Climate Change." *Finance and Development*, Vol. 45, No. 1, March.

Klare, M. 2007. "Global Warming Battlefields: How Climate Change Threatens Security." *Current History*, Vol. 106.

McKibben, B. 2009. "Climate Change." *Foreign Policy*, January/February.

Morrisette, J; Borer, D. 2005. "Where Oil and Water Do Mix: Environmental Scarcity and Future Conflict in the Middle East and North Africa." *Parameters*, Vol. Winter 04-05.

Ostrom, E. 2009. "Beyond Markets and States: Polycentric Governance of Complex Economic Systems." Nobel Prize in Economic Science lecture. Excerpts from *Governing the Commons*, Cambridge University Press; and *Rules, Games and Common-Pool Resources*, University of Michigan Press.

Olmstead, S. 2010. "The Economics of Managing Scarce Water Resources." *Review of Environmental Economics and Policy*, Vol. 4, Issue 2: 179-198.

Pearce, F. 2009. "Consumption, Not Population Is Our Main Environmental Threat." *Yale Environment 360*, April.

Peterson, T.; Connolley, W.; Fleck, J. 2008. "The Myth of the 1970s Global Cooling Scientific Consensus." *American Meteorological Society*, September.

Peterson, E.; Posner, R. 2010. "The World's Water Challenge." *Current History*, January.

Rockstrom, J., *et al.* 2009. "A Safe Operating Space for Humanity." *Nature*, Vol. 461, September, 24.

Rothausen, S. G., & Conway, D. 2011. Greenhouse-gas emissions from energy use in the water sector. *Nature Climate Change* 1(4), 210-219.

Smil, V. 2011. "Global Energy." *American Scientist*, Vol. 99, No. 3, May/June.

Tiemann, M. 2010. "Safe Drinking Water Act (SDWA): A Summary of the Act and Its Major Requirements." Available at <http://www.fas.org/sgp/crs/misc/RL31243.pdf>

Tiemann, M. 2010. "Safe Drinking Water Act (SDWA): Selected Regulatory and Legislative Issues." Available at <http://www.fas.org/sgp/crs/misc/RL34201.pdf>

World Water Week 2013. Overarching Conclusions. Available in D2L.

Course Requirements and Grade Apportionment

1. Water Policy Paper 1 (due October 1 st at 8 am).....	15 %
2. Policy Brief (due December 3 rd in class).....	20 %
3. Participation in class	15 %
4. Written Midterm Exam (November 5/6)	25 %
5. Final Exercise (December 10/11)	25 %
Total	100%

Time Allocation

To comply with a Higher Learning Commission requirement, this syllabus provides information on the investment of time by an average student to achieve the learning goals of the course. The amount of time that an average student should expect to spend on this class, in order to achieve the learning goals of the course, is given below.

Time in the classroom (face to face instruction):	35 hours
Time taking exams:	10 hours
Time completing assignments:	30 hours
Time for reading (preparation and study):	69 hours
The total number of hours:	144 hours (48 hours/credit)

University Policies

The Secretary of the University web site contains the university policies, the link is: <http://www4.uwm.edu/secu/SyllabusLinks.pdf>

1. Students with disabilities. Special accommodations are provided to meet learning and testing needs in a timely manner. <http://www4.uwm.edu/sac/SACltr.pdf>

2. *Religious observances. Accommodations for absences due to religious observance should be noted.* <http://www4.uwm.edu/secu/docs/other/S1.5.htm>
3. *Students called to active military duty. Accommodations for absences due to call-up of reserves to active military duty should be noted. Students:* http://www4.uwm.edu/current_students/military_call_up.cfm *Employees:* <http://www4.uwm.edu/secu/docs/other/S40.htm> (Editorially Revised, 3/25/09)
4. *Incompletes. A notation of "incomplete" may be given in lieu of a final grade to a student who has carried a subject successfully until the end of a semester but who, because of illness or other unusual and substantiated cause beyond the student's control, has been unable to take or complete the final examination or to complete some limited amount of term work.* <http://www4.uwm.edu/secu/docs/other/S31.pdf>
5. *Discriminatory conduct. Discriminatory conduct will not be tolerated by the University. It poisons the work and learning environment of the University and threatens the careers, educational experience, and well-being of students, faculty, and staff.* <http://www4.uwm.edu/secu/docs/other/S47.pdf>
6. *Academic misconduct. Cheating on exams or plagiarism are violations of the academic honor code and carry severe sanctions, including failing a course or even suspension or dismissal from the University.* http://www4.uwm.edu/acad_aff/policy/academicmisconduct.cfm
7. *Complaint procedures. To be addressed by the academic unit in which the complaint occurred or the appropriate university office responsible for enforcing the policy.* <http://www4.uwm.edu/secu/docs/other/S49.7.htm>
8. *Grade appeal procedures. Procedures are available in writing from the respective department or the Academic Dean of the College/School.* <http://www4.uwm.edu/secu/docs/other/S28.htm>
9. *The final exam requirement, the final exam date requirement.* <http://www4.uwm.edu/secu/docs/other/S22.htm>

Course Schedule

Week 1- September 3 Introduction

Required readings:

Braga, Benedito, et al. 2014. *Water and the Future of Humanity*. New York: Springer. Read chapter 1 (available in D2L).

Week 2- September 10 Common Pool Resources

Required readings:

Hardin, G. 1968. "The Tragedy of the Commons." *Science*, Vol. 162, No. 3859: 1243-1248.
<http://www.cs.wright.edu/~swang/cs409/Hardin.pdf>

Ostrom, E. 2009. "Beyond Markets and States: Polycentric Governance of Complex Economic Systems." Nobel Prize in Economic Science lecture.
http://www.nobelprize.org/nobel_prizes/economics/laureates/2009/ostrom_lecture.pdf

Week 3- September 17 Water law, institutional frameworks, Clean Water Act

Required readings:

21st Century US Water Policy (chapters 1 and 2).

Bearden, David M., Claudia Copeland, Linda Luther, James E. McCarthy, Mary Tiemann, Robert Esworthy, and Jerry H. Yen. 2013. "Environmental Laws: Summaries of Major Statutes Administered by the Environmental Protection Agency." Available at <http://www.fas.org/sgp/crs/misc/RL30798.pdf>. Read pp. 25-33.

Yeager-Kozacek, Codi. "Great Lakes Drinking Water Fouled by Toxic Algae." Available at <http://www.circleofblue.org/waternews/2014/world/choke-point-index-great-lakes-drinking-water-fouled-by-toxic-algae/>

Egan, Dan. "Dead zones haunt Green Bay as manure fuels algae blooms." In the *Journal Sentinel*. Available at <http://www.jsonline.com/news/wisconsin/dead-zones-haunt-green-bay-as-manure-fuels-algae-blooms-die-offs-b99344902z1-274684741.html>.

Egan, Dan. "Toxic algae cocktail brews in Lake Erie." In the *Journal Sentinel*. Available at <http://www.jsonline.com/news/wisconsin/toxic-algae-cocktail-brews-in-lake-erie-b99344890z1-274542731.html>

Suggested reading:

21st Century US Water Policy, chapters 5 and 6.

Rockstrom, J., *et al.* 2009. "A Safe Operating Space for Humanity." *Nature*, Vol. 461, September, 24.

Scanlan, Melissa K. 2012. "Implementing the Public Trust Doctrine: A Lakeside View into the Trustees' World." *Ecology LQ* 39: 123-193.

[History of the Great Lakes Water Quality Agreement](#)

[A Renewed Commitment to Action: The 2012 Great Lakes Water Quality Agreement](#)

Week 4- September 24

Water law, institutional frameworks, Safe Drinking Water Act

Required readings:

Tiemann, M. 2010. "Safe Drinking Water Act (SDWA): A Summary of the Act and Its Major Requirements." Available at <http://www.fas.org/sgp/crs/misc/RL31243.pdf>

Contaminate Candidate List. Visit the EPA's website for Contaminant Candidate List and familiarize yourself as much as possible with the process of designing the CCL. <http://water.epa.gov/scitech/drinkingwater/dws/ccl/>

National Drinking Water Advisory Council Report on the CCL Classification Process to the U.S. Environmental Protection Agency. 2004. Available at: http://www.epa.gov/safewater/ndwac/pdfs/report_ccl_ndwac_07-06-04.pdf

National Research Council. 2001. Classifying Drinking Water Contaminants for Regulatory Consideration. http://www.nap.edu/openbook.php?record_id=10080&page=1

Week 5- October 1
Economics of Water Resources

Required readings:

Anisfeld, Shimon G. *Water Resources*. Washington: Island Press. Read chapter 12 (available in D2L).

Olmstead, S. 2010. "The Economics of Managing Scarce Water Resources." *Review of Environmental Economics and Policy*, Vol. 4, Issue 2: 179-198.
<https://ezproxy.lib.uwm.edu/login?url=http://search.ebscohost.com/login.aspx?direct=true&db=eih&AN=53442797&site=ehost-live>

In-class simulation (water rights market)

Week 6- October 8
Water and Energy

Required readings:

21st Century US Water Policy, Chapter 9.

Smil, V. 2011. "Global Energy." *American Scientist*, Vol. 99, No. 3, May/June.
<https://ezproxy.lib.uwm.edu/login?url=http://search.ebscohost.com/login.aspx?direct=true&db=a9h&AN=60367208&site=ehost-live>

In-class Activity: Exercises with the Pacific Institute models for water managers.

Suggested reading:

Darrah, Thomas H., Avner Vengosh, Robert B. Jackson, Nathaniel R. Warner and Robert J. Poreda. "Noble Gases Identify the Mechanisms of Fugitive Gas Contamination in Drinking-Water Wells Overlying the Marcellus and Barnett Shales." *Proceedings of the National Academy of Sciences*, 2014 DOI:[10.1073/pnas.1322107111](https://doi.org/10.1073/pnas.1322107111)

Mekonnen, M. M., and A. Y. Hoekstra. 2012 "The blue water footprint of electricity from hydropower." *Hydrology and Earth System Sciences* 16: 179-187.

IMPORTANT: Water Policy Paper is due on October 1st at 8 am (drop it in the D2L's dropbox called "Water Policy Paper")

Week 7- October 15 Water and Climate Change

Required readings:

21st Century US Water Policy, Chapter 10.

IPCC, 2013: Summary for Policymakers. In: *Climate Change 2013: The Physical Science Basis. Contribution of Working Group I to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change* [Stocker, T.F., D. Qin, G.-K. Plattner, M. Tignor, S. K. Allen, J. Boschung, A. Nauels, Y. Xia, V. Bex and P.M. Midgley (eds.)]. Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA. Available in d2l.

Ridley, Matt. "The World's Resources Aren't Running Out." *Wall Street Journal*, April 25th 2014. Available in d2l.

Suggested readings:

Klare, M. 2007. "Global Warming Battlefields: How Climate Change Threatens Security." *Current History*, Vol. 106.
http://faculty.maxwell.syr.edu/rdenever/IntlSecurity2008_docs/Klare_GlobalWarmingBattlefields.pdf

Jones, B; Keen, M.; Strand, J. 2008. "Paying for Climate Change." *Finance and Development*, Vol. 45, No. 1, March.
<https://ezproxy.lib.uwm.edu/login?url=http://search.ebscohost.com/login.aspx?direct=true&db=bft&AN=510770293&site=ehost-live>

McKibben, B. 2009. "Climate Change." *Foreign Policy*, January/February.
http://www.foreignpolicy.com/articles/2009/01/05/think_again_climate_change?page=full

Rothausen, S. G., & Conway, D. 2011. Greenhouse-gas emissions from energy use in the water sector. *Nature Climate Change* 1(4): 210-219. (Available in D2L)

In-Class Activity: Debate Malthusians versus Cornucopians.

Week 8- October 22
Municipal Water Use, Urban Issues, Infrastructure

Required readings:

21st Century US Water Policy, Chapter 7.

Great Lakes St. Lawrence River Basin Water Resources Compact (section 281.343 of the Wisconsin Statutes. Available at

<https://docs.legis.wisconsin.gov/statutes/statutes/281/III/343>

Water conservation, reporting, and supply regulation; after the compact takes effect (section 281.346 of the Wisconsin Statutes. Available at

<https://docs.legis.wisconsin.gov/statutes/statutes/281/III/346>

Wisconsin Department of Natural Resources. "Great Lakes Compact Review Criteria for a Community Within a Straddling County." Available in D2L.

Waukesha's Application. Volume 1. Available in D2L.

Scientists comments on Waukesha's diversion proposal. Available in D2L.

Guest speaker: Peter McAvoy.

Suggested readings:

"New Waukesha lake diversion documents tout benefits to Great Lakes". Available at <http://www.jsonline.com/news/waukesha/new-waukesha-lake-diversion-documents-tout-benefits-to-great-lakes-b99117997z1-227617921.html>

"Michigan legislator seeks veto of Waukesha's Great Lakes water bid." Available at <http://www.jsonline.com/news/waukesha/michigan-legislator-seeks-veto-of-waukeshas-great-lakes-water-bid-b99165779z1-236271521.html>

Week 9- October 29
Water Use in Agriculture/ Food Security

Required readings:

21st Century US Water Policy, Chapter 8.

Fedoroff, N., *et al.* 2010. "Radically Rethinking Agriculture for the 21st Century." *Science*, February 12, 2010. <http://www.sciencemag.org/content/327/5967/833.full.pdf>

Collier, P. 2008. "The Politics of Hunger." *Foreign Affairs*, November/December. <http://www.jstor.org/stable/20699372>

Guest speaker: Professor Jenny Kehl.

Suggested reading:

Charles J Vörösmarty, PB McIntyre, Mark O Gessner, David Dudgeon, Alexander Prusevich, Pamela Green, S Glidden, Stuart E Bunn, Caroline A Sullivan, C Reidy Liermann, Peter M Davies. 2010. "[Global threats to human water security and river biodiversity](#)" *Nature* 467(7315): 555-561

Week 10- November 5
Midterm Exam

You will "pick up" the exam in D2L on November 5th at 9 AM, and will have 24 hours to complete it. The exam has to be submitted no later than 8:59 am on November 6th. I will discount 10 points from the grade for each hour of tardiness in the submission.

Week 11- November 12
Workshop-How to Write a Policy Brief

Guest speaker: Aaron Thiel (Center for Water Policy)

Week 12- November 19
Integrated Water Resources Management

Required readings:

Ana Carolina Coelho, Benedito Braga, Rodrigo Flecha, Nelson Freitas and Osman F. da Silva. 2014. "Main challenges and responses to federalism and water security in Brazil." In Garrick, D. E., Anderson, G.R.M., Connell, D., Pittock, J. (eds.) *Federal Rivers: Managing Water in Multi-Layered Political Systems*. Cheltenham, Edward Elgar. Available in D2L.

Falkenmark, Malin. 2004. "Towards Integrated Catchment Management: Opening the paradigm locks between hydrology, ecology and policy-making." *International Journal of Water Resources Development* 20(3): 275-282. Available in D2L.

Mostert, E., M. Craps, and Claudia Pahl-Wostl. 2008. "Social Learning: the key to integrated water resources management?" *Water International* 33(3): 293-304. Available in D2L.

Also, visit the following websites:

GWP. 2002. AToolBox to support IWRM. <http://www.gwp.org/ToolBox/>

ICIWARM. <http://www.iciwarm.org/en/>

UNESCO / WWAP (2009) Introduction of IWRM at River Basin Level. UNESCO's International Hydrological Programme and the World Water Assessment Programme
<http://unesdoc.unesco.org/images/0018/001850/185074e.pdf>

Guest speaker: Dr. Ana Carolina Coelho.

**Week 13- November 26
Turkey Armageddon**

**Week 14- December 3
Presentation of Policy Briefs**

**Week 15- December 10
Final Exercise**

You will "pick up" the exercise in D2L on the 10th at 9 AM, and will have 24 hours to complete it. The exam has to be submitted no later than 8:59 am on December 11th. I will discount 10 points from the grade for each hour of tardiness in the submission.