

# CCOL-AD 30: Water Science and Management

*Spring 2017 – Tuesday and Thursday, 11:50am to 1:05pm; C2-E049; 4 Credits*

***No prerequisites***

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## **Description**

From space, there is no view of Earth without blue – water is everywhere. From the ground however, there are many places – and many times – where there isn't enough to go around. Water is critical to our bodies, to the growth of our food, and to flushing away the wastes of human, economic, and industrial development. However, as the number of human feet on the planet increases and their economic footprints grow, the sliver of Earth's water that is available to us is spread thinner, and the distinction between water as a human need and right, and water as a scarce and precious resource, is blurred. To understand how to manage water in a way that respects both its scarcity (managing for efficiency) and the needs of those who use it (managing for equity), it is important to understand the myriad modes and scales through which water shapes the world we live in.

This course confronts the present and future challenge of sharing water resources that are abundant for some and scarce for others. We will start with the science of water, what it provides for us and how it constrains us. We will examine perceptions of scarcity through film and field trips. We will consider the way we use water and the tools we have for sharing it and valuing it. Finally, we'll draw on games and role play to draw out the challenges of managing water conflict and achieving equitable, efficient use of water resources.

*Textbook:*

**Water Resources (2010). Shimon C. Anisfeld**

Additional readings, including scientific articles and book chapters, are made available on NYU Classes or are available for free download through the NYU Library

*Instructor:* Andrew Bell is Assistant Professor of Environmental Studies, with research focusing on coupled natural-human systems.

*Office Hours (Room A5-117):* T,W,Th, 9:30am-11:30am. Sign up for a slot in advance at [goo.gl/3ezETN](https://goo.gl/3ezETN)

**Disability Disclosure Statement:** Academic accommodations are available to any student with a chronic, psychological, visual, mobility, learning disability, or who is deaf or hard of hearing. Students should please register with the Moses Center for Students with Disabilities (CSD), per the procedure at <https://students.nyuad.nyu.edu/campus-life/community-standards/policies/reasonable-accommodations-for-a-disability/>

## Grading and Student Expectations

Item	% of grade**
Weekly assignments	20
Film summaries	10
Short papers	30
Final paper panel presentation	5
Final paper submission	20
Field trip participation	10
In-class participation	10

Assignments and exams will be given a numeric score from 0-100. Late submissions will be penalized 5 points per whole/partial day late.

***\*\*The astute counter will note a sum of 105% across assignments. Careful attention to complete all class work and activity can bring a bump of up to 5% ... enough to turn a C- to a C, a B to a B+, or an A- to an A.***

### Grading Scale

I use the following scale to translate numeric scores into letter grades:

F	D	D+	C-	C	C+	B-	B	B+	A-	A
0	63	67	70	73	77	80	83	87	90	95

I grade carefully, and do not plan to curve the final scale or to round up decimals. I will not adjust scores downward; if I do choose to adjust scores upward in any way, it will be at my own consideration and not in response to any request from students.

**It is NYU policy that all work is expected to be your own. Plagiarism of any kind will result in a failing grade for the class, and referral to an academic dean. Plagiarism includes: copying sentences or fragments from any source without quotes or references; not citing every source used in your papers; citing internet information without proper citation; presenting someone else's work as your own; or copying verbatim from any source. You are subject to NYU-AD guidelines for Academic Integrity:**

<https://students.nyuad.nyu.edu/campus-life/community-standards/policies/academic-integrity/>

### *Weekly assignments*

These will take the form of short answer questions, summaries of readings, and numerical problems as appropriate. Assignments will be posted after the 2<sup>nd</sup> meeting of the week, online in NYUClasses, and will be due by the end of the Tuesday after (i.e., you will have approximately 10 days for each assignment, with office hours right in the middle of that period). Submission is via the NYUClasses page.

Weekly assignment responses should not be used verbatim in formal short papers, but where appropriate, students should consider adapting their assignment responses to support and flesh out arguments in their short papers.

Attendance and active participation in class will be necessary to successfully complete the assignments. There will be a total of 7 assignments over the semester. Your grade will reflect the average of your highest 6 assignment scores.

### *Field trips*

There will be a total of 3 field trip opportunities planned for the semester (all currently TBA), which will likely include visiting i) a restored mangrove site; ii) the al-Ain Oasis; and iii) a desalination plant. Each field trip will include a short written quiz or summary, submitted through NYU Classes. Students must sign up for and participate in TWO field trips to receive the full 10% credit.

### *Film Summaries*

I have assembled a library of fiction films (on DVD and Blu-Ray) that include water scarcity as a plot device, and that you can borrow and watch on your own. They span nearly a century of filmmaking across several countries, and include water scarcity sometimes as a thing expected, sometimes as a thing imaginable, and sometimes as a thing unimaginable. Along the semester, in your own time, you will watch at least 3 films and provide a summary, following a template available on NYU Classes.

I have tried to make the library as comprehensive as I can, and I encourage you to suggest other films you think might fit, particularly films from other parts of the world that I simply don't know about. The library includes films intended for many different audiences, and some films may include graphic violence, nudity or sexuality. I have indicated to the best of my ability where these appear in films, in case it is helpful in choosing which films (not) to watch, in the list here: <https://goo.gl/1RAXhM>.

### *In-class Participation*

Class meetings will consist largely of discussion and in-class activities. This structure works better when students come prepared, and when they engage. I may provide discussion questions in advance of class, request students to undertake light research tasks online before class, or be prepared to talk about films they have seen or articles they have read during class. Regular contribution in this form will earn a full participation grade.

### *Short Papers and Final Paper*

There are three short papers (4 pages in length, plus references) spaced across the semester, with thematic foci as defined below. Students may identify particular issues or cases within the themes outline below, and should expect to support their papers with some additional sources, but the goal of the writing is to take a position on one of the issues and develop a clear and critical argument (as opposed to in-depth research).

Students will receive written feedback on each short paper within one week of submission. Students will select one of their three short papers to develop into a longer, final paper (6-8 pages), which they will present in thematic panel sessions during the last week of the seminar, and submit at the end of classes.

<b>Stage</b>	<b>Due Date</b>	<b>Description</b>
<b>Short paper 1</b>	Feb 28	4 pages plus references, articulating a clear position and argument on the topic: <i>Water as a limiting factor in development</i>
<b>Short paper 2</b>	April 5	4 pages plus references, articulating a clear position and argument on the topic: <i>Hard and soft tools for solving water problems</i>
<b>Short paper 3</b>	May 3	4 pages plus references, articulating a clear position and argument on the topic: <i>Harmonizing competing uses in space and time</i>
<b>Final Paper Presentation</b>	Week of May 6	~10 minutes including time for questions. Presentation should clearly introduce the topic and position, present key elements of support and analysis, and discuss limiting assumptions in your argument.
<b>Final Paper</b>	May 17	6-8 pages plus references, developing the argument from one of the 3 short papers based on feedback from the instructor

I highly recommend using a reference management software such as [Mendeley](#) or [Zotero](#) (for those who write in Microsoft Word) or [PaperPile](#) (for those who write in Google Docs) to manage your documents and citations.

**It will change your life.**

**\*Approximate\* Meeting Schedule**

Week	Tuesday Meeting	Thursday Meeting	Suggested Readings	Assignments Due	Notes
22-Jan	Introduction	Water Science 1 - Water in physical and biological processes	Anisfeld Chapter 2		
29-Jan	Water Science 2 - The hydrologic cycle	Water metrics – Water footprinting	Anisfeld Chapter 3		
5-Feb	Water History 1 - Shaping food, trade, and civilization	Water metrics - Flooding	Anisfeld Chapter 5 Solomon Chapter 3, 4		Field Trip 1 – Noukhada Mangrove Tour February 11
12-Feb	Water History 2 - Shaping cities and disease	Water metrics - Drought	Anisfeld Chapter 10 Sedlak Chapters 3, 4 Solomon Chapters 5, 6, 10	Assignment 1	
19-Feb	Sector by sector 1 - Agriculture and irrigation	Sector by sector 2 - Domestic water use and drinking water	Anisfeld Chapter 9, 11 Sedlak Chapters 6-8	Assignment 2	
26-Feb	Sector by sector 3 - Industry and energy	Governance 1 - Hard and soft tools for water management	Richter Chapter 3 Anisfeld Chapter 7	Short Paper 1	Field Trip 2 – al Ain Oasis February 25
4-Mar	Governance 2 - Water rights and allocation	Spotlight - Irrigation and public goods games	Anisfeld Chapter 12 Rogers et al. (2002) Anderies et al. (2013)		
11-Mar				Assignment 3	
18-Mar					
25-Mar	Film Reviews Irrigation Games	Writing workshop – Sachi Leith	Nickson and Vargas (2002) Anisfeld Chapter 6 Thorsteinsson et al. (2013) Allan et al. (2013)		
1-Apr	Governance 2 – Water rights, allocation, markets, and trade	Spotlight – Dams	Tortajada et al. Chapters 1, 2 Solomon Chapter 13-15 Sedlak Chapter 11	Short Paper 2	
8-Apr	Climate variability and change	Spotlight – Desalination The water-energy-food nexus	Ringler et al. (2013) Sedlak Chapter 12, 13 Palenzuela Chapter 1	Assignment 4	
15-Apr	Governance 3 - Integrated water resource management and Transboundary water management	NO CLASS – ANDREW ON TRAVEL	Anisfeld Chapter 13 Solomon Chapter 16, 17 Pahl-Wostl et al. (2005)		
22-Apr	Role play - watershed management 1	Role play - watershed management 2	Kemper et al. (2005)	Assignment 5	
29-Apr	Role play - Basin Challenge	Role play debrief - conflict and cooperation in practice	Lawford et al. (2013)	Short Paper 3	
6-May	Final paper panel sessions 1	Final paper panel sessions 2			
17-May		<b>Final paper due</b>			

## Listed Readings\*

*\*Additional readings may be added as the course progresses, at least one week in advance of relevant class meeting*

- Allan, C., J. Xia, and C. Pahl-Wostl. 2013. Climate change and water security: Challenges for adaptive water management. *Current Opinion in Environmental Sustainability* 5(6):625–632.
- Anderies, J. M., M. A. Janssen, A. Lee, and H. Wasserman. 2013. Environmental variability and collective action: Experimental insights from an irrigation game. *Ecological Economics* 93:166–176.
- Anisfeld, S. C. 2010. *Water Resources*. Island Press, Washington, DC.
- Kemper, K., A. Dinar, and W. Blomquist, editors. 2005. *Institutional and Policy Analysis of River Basin Management Decentralization*. World Bank, Washington, DC.
- Lawford, R., J. Bogardi, S. Marx, S. Jain, C. P. Wostl, K. Kn??ppe, C. Ringler, F. Lansigan, and F. Meza. 2013. Basin perspectives on the Water-Energy-Food Security Nexus. *Current Opinion in Environmental Sustainability* 5(6):607–616.
- Meinzen-dick, R., R. Chaturvedi, L. Domenech, R. Ghate, M. a Janssen, N. Rollins, and S. K. 2014. Games for Groundwater Governance : Field Experiments in Andhra:55.
- Nickson, A., and C. Vargas. 2002. The Limitations of Water Regulation : The Failure of the Cochabamba Concession in Bolivia 21(1).
- Pahl-wostl, C., and J. Sendzimir. 2005. The relationship between IWRM and Adaptive Water. *Water Management* 68(3):32–44.
- Palenzuela, P., D.-C. Alarcón-Padilla, and G. Zaragoza. 2015. *Concentrating Solar Power and Desalination Plants*.
- Richter, B. 2014. *Chasing Water: A Guid for Moving from Scarcity to Sustainability*. Island Press, Washington, DC.
- Ringler, C., A. Bhaduri, and R. Lawford. 2013. The nexus across water, energy, land and food (WELF): potential for improved resource use efficiency? *Current Opinion in Environmental Sustainability* 5(6):617–624.
- Rogers, P., R. De Silva, and R. Bhatia. 2002. Water is an economic good : How to use prices to promote equity , efficiency , and sustainability 4:1–17.
- Sedlak, D. 2014. *Water 4.0*. Yale University Press, New Haven, CT.
- Solomon, S. 2010. *Water: The epic struggle for wealth, power, and civilization*. Harper Collins, New York.
- van Steenberg, F. 2006. Promoting local management in groundwater. *Hydrogeology Journal* 14(3):380–391.

Thorsteinsson, T., T. Jóhannesson, and Þórunn Snorrason. 2013. Glaciers and ice caps: Vulnerable water resources in a warming climate. *Current Opinion in Environmental Sustainability* 5(6):590–598.

Tortajada, C., D. Altinbilek, and A. K. Biswas. 2012. *Impacts of Large Dams: A Global Assessment*.

### **Additional Readings (Optional)**

Mekonnen, M.M. & Hoekstra, A.Y., 2012. A Global Assessment of the Water Footprint of Farm Animal Products. *Ecosystems*, 15(3), pp.401–415.

Hoekstra, A.Y. (2013). *The Water Footprint of Modern Consumer Society*. Routledge, New York, USA.