

Urban Water (CEE 173)

Mondays and Wednesdays 1.00 PM - 2.20 PM
(Online, Synchronous with recordings available)

Here is a link to [our virtual classroom](#)

Instructor:

Dr. Archana Anand

Lecturer, Department of Civil & Environmental Engineering

archanaa@stanford.edu

Virtual office hours:

Mondays and Wednesdays after class and by appointment @ [Personal meeting room](#)

Course description: This course explores both quantitatively and qualitatively - technical, economic, institutional, social, policy, and legal aspects of urban water. The course will include lectures and discussions covering the following themes (1) history of urban water (2) journey of urban water including human health and ecosystem health impacts (3) sanitation (4) global urban water conflicts (5) disease prevention and pandemic response (6) practical and technical aspects of water quality analysis (7) economics of water (8) technology and water (9) seeds of hope. Lectures will provide foundational information on drinking water, wastewater treatment processes, contaminants, role of various stakeholders in the outcome of water conflicts as well as policies and guidelines (local national and WHO). Discussion sessions will include case studies of nuanced water conflicts that students will dive deep into using engaging conversation and debate. Technical classes will include water quality analysis on contaminants that students will work through during in-class discussions and homework assignments.

Adapting to Zoom: Due to the COVID-19 pandemic we will not be able to meet in person, but video conferencing via Zoom works well. Please join Zoom with your video on, so we can read each other's expressions just as if we were in the classroom. Actively participating through audio and video is a core part of this class. Unless you're unable to do so for technological or other reasons, please keep your camera on and talk in class.

Course objectives: By the end of the course, the student will:

- (1) Learn about wastewater and drinking water treatment processes
- (2) Acquire basic knowledge about key water contaminants and their health impacts
- (3) Gain knowledge on how water and sanitation is regulated and provided to people
- (4) Critically review urban water, disease prevention and global pandemic response
- (5) Characterize the incentives and roles of various stakeholders, including institutions and the public, in urban water conflicts

- (6) Review the evolution of economics and technology in urban water reform
- (7) Given a specific problem in urban water management, articulate how different stakeholders would frame the problem and pathway towards improvement
- (8) We also aim for students to (a) refine abilities to read, evaluate, and constructively criticize scholarly writing and (b) Improve oral communication skills both through formal and informal discussion and debate.

Pedagogic approach:

Core sessions – Core class sessions will be lectures and article-based discussions. Each session will explore a different topic on urban water. Students will read 1-2 articles for every session. Lectures will be delivered by the instructor following which article discussions will take place.

To prepare for the class, students will reflect on both the articles and the discussion questions prepared by the instructor for each article. During the class, the instructor will use a random number generator to identify the student who will offer the first response to the sequential discussion question. The sampling will be genuinely random, so that having recently answered a question will not affect the probability of being asked a subsequent question. As a class we will together discuss and critically reflect on the lessons that emerge. The instructor will make some summary comments.

After paper discussion sessions, each student will write a short reflection (250 words per article) on the articles discussed in order to prepare her or him better for presenting and being an active audience member (see table for summary of assignments and due dates).

Student led journal club - During the course, we will have a student-led journal club on several articles/case studies/book chapters. The objective is to explore issues of particular interest to students and to expand the discussion of themes we have engaged. We will break into 3 small groups for these discussions. Students will lead a 40 minute in class discussion, like a journal club.

Project – Students will pursue depth by exploring a water-related conflict over a water contaminant. The work will culminate in a virtual course conference “Urban Water Conference” held during finals week and an accompanying paper. Each student will give an oral presentation describing their work. The presentation will be 8 minutes in length; 2 minutes will be allowed for questions. There will be abstracts, outlines, progress reports, and drafts of your project due throughout the quarter (see table on the last page of the syllabus for a summary of due dates).

Grading:

- Attendance and participation that reflects close reading of the material and thoughtful responses to others’ ideas: 40%
- Written article reflections and homework assignments: 30%
- Final written project: 15%
- Oral presentations: 15%

Students with Documented Disabilities: Students who may need an academic accommodation based on the impact of a disability must initiate the request with the Student Disability Resource Center (SDRC) located within the Office of Accessible Education (OAE). SDRC staff will evaluate the request with required documentation, recommend reasonable accommodations, and prepare an Accommodation Letter for faculty dated in the current quarter in which the request is being made. Students should contact the SDRC as soon as possible since timely notice is needed to coordinate accommodations. The OAE is located at 563 Salvatierra Walk (phone: 723-1066, 723-1067 TTY).

Required text: All readings are available on the canvas website (canvas.stanford.edu). In order to access some of the course reading material, you must set up your browser to use the Stanford proxy. See <http://library.stanford.edu/using/connecting-campus>. This is a copyright protection rule.

Course Calendar:

L - lecture, D - article discussion, P - presentation, C - case study, JC - journal club

| Date | Module | Class | Readings | Assignments |
|----------|--|-------|--|--|
| April 5 | History of urban water - Course introduction, history of urban water, wastewater treatment technologies | L | | |
| April 7 | Water & War | L+D | 1. Gleick 2014. "Water, drought, climate change, and conflict in Syria" 2. Christopher, Mark. 2013. "Water wars: The Brahmaputra River and Sino-Indian relations. Case study. Newport, RI: US Naval War College, Center on Irregular Warfare and Armed Groups." | Write a 500 word reflection on "What is the evidence that water scarcity is linked to war? What are the incentives for various actors to promote the idea that water insecurity can lead to war?" Due: April 21st |
| April 12 | Journey of urban water – human health impacts: what happens when drinking water disinfection fails? | D | 1. Case study of <i>Cryptosporidium</i> outbreak in Milwaukee. | Case studies and groups assigned for April 19 session |
| April 14 | Journey of urban water – human and ecosystem health impacts: Wastewater discharge impacts, Technical analysis of dataset | L+D | 1. Cheung et al 2016 Seasonal variation in the abundance of marine plastic debris in the estuary of a subtropical macro-scale drainage basin in South China | Homework assignment will be given out (due Apr 28 th) |
| April 19 | Journey of urban water – human health impacts: Improving health in cities | C | Case studies from Rietveld et al 2016 + Group presentations | Students are encouraged to ask questions to the group that is presenting. |

| | | | | |
|----------|---|-----|---|---|
| April 21 | Sanitation - Why don't the urban poor want toilets? | L+D | Peletz et al. 2017 "Supply and Demand for Improved Sanitation: Results from Randomized Pricing Experiments in Rural Tanzania". | |
| April 26 | Sanitation - Human behavior | JC | 1. Drinking water crisis in Chile and Bangladesh: arsenic. | Come prepared with 2 questions for in-class discussion |
| April 28 | Urban water conflicts - Water Politics | L+D | Conflicts in Tijuana River Watershed – a bilateral watershed and looming lawsuit, background on the US Clean Water Act | Due May 3rd: Turn in 2-page outline for your paper describing your independent project electronically through canvas. |
| May 3 | Urban water conflicts - local/regional conflicts | L | Urban water conflicts in developing and developed countries – case studies will be presented | Write a short reflection on political prioritization of water citing regional/local examples (500 words) Due May 17th |
| May 5 | Pandemic response - urban water and disease prevention | L+D | 1. Wigginton et al. 2020 "Emerging investigators series: the source and fate of pandemic viruses in the urban water cycle" 2. "The impact of COVID-19 on the water and sanitation sector" – 2020 report by IFC, World Bank | |
| May 10 | Practical & technical aspects of water quality analysis – different types of contaminants, water bodies, nutrient chemistry | L | Dataset from real-life case studies will be discussed | Homework assignment will be given out (due May 24 th) |
| May 12 | Economics of water - how do you price water? And Diamond-water paradox | L+D | Jenkins et al 2020 "Economic losses for urban water scarcity in California" | Do the current arrangements of economic regulations or the urban water industry have shortcomings? What can be some potential focus areas? (500 word essay) Due May 26th |

| | | | | |
|--------|---|-----|---|--|
| May 17 | Practical & technical aspects of water quality analysis – different types of contaminants, water bodies, nutrient chemistry | L | Dataset from real-life case studies will be discussed | Homework assignment will be given out (Due: June 2nd) |
| May 19 | Modern technology and urban water - Socio-technical innovation and public participation in urban water governance | L+D | <ol style="list-style-type: none"> 1. Hoffmann et al 2020 “A Research Agenda for the Future of Urban Water Management: Exploring the Potential of Nongrid, Small-Grid, and Hybrid Solutions” 2. Mukhtarov et al 2018 “The influence of information and communication technologies on public participation in urban water governance: A review of place-based research”. | <p>Does social media help in enabling a more responsible society that is conscious of urban water sustainability? Give examples in a 500 word critique.</p> <p>Due: June 4th</p> |
| May 24 | Modern technology and urban water - Social media and big urban data | JC | <ol style="list-style-type: none"> 1. Zhang et al 2016. “Social Media Meets Big Urban Data: A Case Study of Urban Waterlogging Analysis” 2. Digital water city | |
| May 26 | Seeds of hope - urban water reform | D | <ol style="list-style-type: none"> 1. Bakker 2007 “The common versus commodity: alter globalization, anti-privatization, and human right to water in the global south” 2. Beall et al 2010. “Victims, villains, and fixers: the urban environment and Johannesburg’s Poor.” 3. Optional reading: THE LAST DROP The New Yorker <p>Topics that will be covered include: Singapore’s NEWater; Cyprus’ water reuse plan; Tianjin’s water shortage; Honolulu’s success story in water reuse; Australia’s urban reuse water schemes; Improving air quality in Mexico city by recycling water</p> | Come prepared with 2 questions for in-class discussion |
| June 2 | Urban water Conference (virtual) | P | Presentations | Report due for independent projects (June 4th) |