

**DEPARTMENT OF LEGAL STUDIES AND BUSINESS ETHICS  
THE WHARTON SCHOOL, UNIVERSITY OF PENNSYLVANIA**

**LGST 6470  
THE BUSINESS AND GOVERNANCE OF WATER**

**JON FREEDMAN & CHARLES ICELAND  
Spring 2024**

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**I. INSTRUCTORS**

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**II. CLASS MEETING TIME AND LOCATION**

Wednesdays, 3:30 PM to 6:30 PM / Room - TBD

**III. COURSE OBJECTIVES**

Water is the lifeblood of business. Virtually every business imaginable -- everything from oil refining to semiconductor manufacturing to cloud computing -- requires copious supplies of freshwater. However, there is a fixed amount of water on Earth, and in any given place, the supply, demand, and quality of freshwater can change. As climate change increasingly impacts the Earth's hydrological cycle, it is increasingly important for today's business leaders to be able to understand water challenges and to implement solutions that will enable businesses to thrive in the future.

In addition to understanding and navigating water quality and quantity challenges, business leaders must operate in a highly regulated environment. Water is regulated at the multinational, national, regional, state and local levels, and it's important to understand who the key external stakeholders are and how to engage with them in productive ways.

Finally, future business leaders should learn about the growth opportunities in the global water sector. Water is an \$800 billion global industry whose value chain includes operating water utilities, engineering firms, technology companies, and financial services firms. Because the water industry tends to be fragmented and conservative, there are tremendous opportunities for consolidation and innovation.

Students are not expected to have any previous experience with the water industry.

#### **IV. ASSIGNMENTS AND GRADING**

Students will be required to complete the following assignments. There is no final exam in this course.

The final grade for the course will be determined as follows:

- **Class participation:** Each class will start with discussion prompts based on the reading assignments and/or topics currently in the news (40%)
- **Two papers of one and three pages in length** that address topics encountered in the readings. Professors will provide specific prompts. (30%)
- **Group project and presentation:** Develop a water sustainability program for Company X that identifies major water challenges and how to address them. Students will form groups which will in turn evaluate the water challenges faced by a global company, and then develop appropriate plans for ensuring the company has a path to a sustainable water future. Professors will assign a company to each group. (30%)

#### **V. TEXTS AND READINGS**

The following books are required:

- *Drinking Water*, James Salzman
- *The Three Ages of Water*, Peter Gleick

The instructors will provide additional readings in advance of each class.

#### **VI. COURSE OUTLINE**

##### **Class 1: January 17, 2024**

##### **Global Water Challenges and Opportunities**

- a. Introductions
- b. Review of Syllabus and Class Expectations
- c. Overview of Global Water Challenges

- d. Potential Solutions
- e. Key Stakeholders

**Readings:**

- [Aqueduct Water Risk Atlas](#) (WRI 2023)
- [Global Water Security – Intelligence Community Assessment](#) (US Defense Intelligence Agency et al. 2012)
- [High and Dry: Climate Change, Water, and the Economy](#) (World Bank 2016)

**Class 2: January 24, 2024**

**Drinking Water – A History**

In *Drinking Water*, Duke University professor and environmental policy expert James Salzman shows how drinking water highlights the most pressing issues of our time--from globalization and social justice to terrorism and climate change--and how humans have been wrestling with these problems for centuries.

**Readings:**

- *Drinking Water*, James Salzman

**Class 3: January 31, 2024**

**Innovation in the Heavily Regulated Water Sector**

- a. Net zero carbon water
- b. Water reuse and recycling
- c. Digital solutions
- d. Barriers to adoption of innovative solutions
- e. How can business leaders overcome these barriers?
- f. Case study on Atreides – Employing blockchain to clarify and record legal ownership of water rights and facilitate water rights trading

**Readings:**

- [Technology Challenges and tools for the implementation of the water-related sustainable development goals and targets](#) (UN Water 2015)
- [Water industry launches world's first sector-wide plan to deliver net zero carbon emissions by 2030](#) (November 13, 2020)
- [Water UK Net Zero 2030 Routemap: Summary for Policymakers](#) (Water UK 2021)
- [EPA Water Reuse Action Plan](#) (2022)
- [Atreides: Blockchain Water Management](#)

#### **Class 4: February 7, 2024:**

##### **The Three Ages of Water**

- a. How We Got Here (The First and Second Ages of Water)
- b. The Way Forward (The Third Age of Water)

##### **Readings:**

- *The Three Ages of Water*, Peter Gleick

#### **Class 5: February 14, 2024**

##### **Financing Water: Balancing Regulation, Investor Requirements and Community Needs**

- a. Venture Capital
- b. Private Equity
- c. Corporate Finance
- d. Infrastructure Funds
- e. Case study: How KKR and SUEZ Overcame Public Policy Concerns by Creating an Innovative Public-Private Partnership

##### **Readings:**

- [2022 State of the Water Industry: Executive Summary](#) (AWWA 2022)
- [Financing Water: Investing in Sustainable Growth](#) (OECD 2018)
- [Bayonne Water and Wastewater Concession Agreement](#) (UNC Environmental Finance Center 2016)
- [NAWC – Contract Operations: Concessions](#) (NAWC nd)
- [Private Capital, Public Good – Drivers of Successful Infrastructure Public-Private Partnerships](#) (Brookings 2014)

#### **Class 6: February 21, 2024**

##### **Ethics: Doing the Right Thing on Water and ESG**

- a. Identifying & engaging with external stakeholders
- b. Philanthropy
- c. Employee engagement
- d. Community engagement
- e. Case study: The Navajo Nation

##### **Readings:**

- [WBCSD CEO Guide to Water: Building Resilient Business](#)
- [The United Nations world water development report 2019: leaving no one behind, executive summary](#)
- [Safe Water Network 2020 Annual Report](#)

- [Worldserve International 2020 Highlights](#)

### **Class 7: March 13, 2024**

#### **Public Management of Water Resources**

- a. Water Resources Management in Israel
- b. Water Resources Management in California
- c. The Elephant in the Room: Agriculture
- d. Is Water an Economic Good?

#### **Readings:**

- [Water Management in Israel: Key Innovations and Lessons Learned for Water-Scarce Countries](#) (World Bank 2017)
- [Water Resources Management in California](#) (Sandoval-Solis, UC Davis, 2020)
- [How beef eaters in cities are draining rivers in the American West](#) (Richter 2020)
- [Hey Reporters: Let's Get This Story Straight](#) (Richter 2021)
- [The Economic Conception of Water](#) (Hanemann 2005)

### **Class 8: March 20, 2024**

#### **Corporate Water Sustainability and Commitments**

- a. Standards for corporate water stewardship
- b. Examples of cutting-edge corporate water stewardship and risk management
- c. Investor water risks and need for risk management
- d. Corporate Management of Water Risks

#### **Readings:**

- [Corporate Water Resilience in an Uncertain Future](#) (CEO Water Mandate et al 2020)
- [Setting Site Targets Informed by Catchment Context: A Guide for Companies](#) (CEO Water Mandate et al 2019)
- [Developing Enterprise Water Targets Informed by Local Contexts: Cargill's Approach](#) (Walker, Kuzma, and Smoor 2021)
- [High and Dry: How Water Issues are Stranding Assets](#) (Lamb et al. 2022)

### **Class 9: March 27, 2024**

#### **Global Water Project Development**

- a. How do engineering services, technology and dollars all come together to create real water projects around the world in the face of different water governance rules
- b. What are the barriers and how can they be overcome?

- c. Case study: Red Sea-Dead Sea Water Conveyance Project – Foreign assistance to promote peace, development and water security in transboundary watersheds
- d. Case study: Los Angeles, CA – City Government adopts 100% water recycling goal to promote sustainable water management while addressing water quality perception concerns

**Readings:**

- [LA's Ambitious Goad: Recycle of the city's sewage into drinkable water](#) (LA Times 2019)
- [Edward C. Little Water Recycling Facility \(West Basin\) - Water Harvest S.T.E.A.M. Adventure](#)
- [50L Home Coalition](#)
- [Red Sea Dead Sea Water Conveyance Study](#) (European Investment Bank 2017)

**Class 10: April 3, 2024**

**Capitalizing on Opportunities in the Global Water Sector While Maintaining Social License to Operate**

- a. Value chaining the global water sector
- b. Identifying pockets of profitability
- c. Water utilities
- d. Water technology companies
- e. Global engineering firms
- f. Global project developers
- g. Water rights and trading platforms
- h. Block chain and water ledgers
- i. Case study: US Filter – How a bunch of Wharton students created a multibillion dollar water company

**Readings:**

- [The Case for Investing in Water](#) (S&P Global 2020)
- [Global water crisis: Investing in water](#) (Fidelity Viewpoints 2020)
- Other readings TBD

**Class 11: April 10, 2024**

**A Firsthand Look at How Governments Make and Implement Water Policies**

- a. Field Trip to Washington, DC (this class session will likely occur on a date other than the day of the week when the class normally meets)
- b. Meet with representatives from:
  - i. White House
  - ii. Department of Interior

- iii. EPA
- iv. Congress
- v. State Department / USAID
- vi. World Bank

**Class 12: April 17, 2024**

**Class Presentations**

Group presentations on water sustainability programs developed for Company X that identify major water challenges and how to address them

### **Additional Suggested Readings for Deeper Understanding of Specific Issues:**

- *The Last Drop – Solving the World’s Water Crisis* – Water scarcity is the next big climate crisis. Water stress – not just scarcity, but also water-quality issues caused by pollution – is already driving the first waves of climate refugees (Tim Smedley, 2023).
- *Cadillac Desert* – book published by Viking about land development and water policy in the western United States (Marc Reisner, 1986).
- *Unquenchable: America's Water Crisis and What to Do About It* – We can’t engineer our way out of the problem, either with traditional fixes or zany schemes to tow icebergs from Alaska. In fact, new demands for water, particularly the enormous supply needed for ethanol and energy production, will only worsen the crisis. America must make hard choices—and Glennon’s answers are fittingly provocative. He proposes market-based solutions that value water as both a commodity and a fundamental human right (Robert Glennon, 2010).
- *The Future of Water: A Startling Look Ahead* – Around the world, water tables have dropped lower and lower as more straws are dipped into the finite number of water aquifers. With the challenges of population growth, dilapidated infrastructure, and polluted water, the solutions take on new complications. The authors present scenarios for the broad trends that will have a significant impact upon future water challenges— population, economic growth, energy, climate change, and general demographic trends. Examine what might be in store for us and how individuals, water utilities, industries, and countries can change the future of water. With a Foreword by Bruce Babbitt, the book discusses how water usage and storage must change in our homes, in agriculture and industry to deal with this crisis (Scott Yates and Steve Maxwell, 2011).
- *The Big Thirst: The Secret Life and Turbulent Future of Water* – A startling examination of the passing of the golden age of water and the shocking facts about how water scarcity will soon be a major factor in our lives (Charles Fishman, 2011).
- *Water: The Epic Struggle for Wealth, Power, and Civilization* – Far more than oil, the control of water wealth throughout history has been pivotal to the rise and fall of great powers, the achievements of civilization, the transformations of society's vital habitats, and the quality of ordinary daily lives. Today, freshwater scarcity is one of the twenty-first century's decisive, looming challenges, driving new political, economic, and environmental realities across the globe (Steven Solomon, 2011).
- *Water 4.0: The Past, Present, and Future of the World's Most Vital Resource* – Turn on the faucet, and water pours out. Pull out the drain plug, and the dirty water disappears. Most of us give little thought to the hidden systems that bring us water and take it away when we’re done with it. But these underappreciated marvels of engineering face an array of challenges that cannot be solved without a fundamental change to our relationship with water, David Sedlak explains in this enlightening book. To make informed decisions about the future, we need to understand the three revolutions in urban water systems that have occurred over the past 2,500 years and the technologies that will remake the system. The author starts by describing Water 1.0, the early Roman aqueducts, fountains, and sewers that made dense urban living feasible.



He then details the development of drinking water and sewage treatment systems—the second and third revolutions in urban water. He offers an insider’s look at current systems that rely on reservoirs, underground pipe networks, treatment plants, and storm sewers to provide water that is safe to drink, before addressing how these water systems will have to be reinvented. For everyone who cares about reliable, clean, abundant water, this book is essential reading (David Sedlak, 2014).

- *The Poisoned City: Flint's Water and the American Urban Tragedy* – In the first full account of this American tragedy, Anna Clark's *The Poisoned City* recounts the gripping story of Flint’s poisoned water through the people who caused it, suffered from it, and exposed it. It is a chronicle of one town, but could also be about any American city, all made precarious by the neglect of infrastructure and the erosion of democratic decision making. Places like Flint are set up to fail—and for the people who live and work in them, the consequences can be fatal (Anna Clark, 2018).
- *When Rivers Run Dry* – A new edition of the veteran science writer's groundbreaking work on the world's water crisis, featuring all-new reporting from the most recent global flashpoints (Fred Pearce, 2006).
- *Let There Be Water* –illustrates how Israel can serve as a model for the United States and countries everywhere by showing how to blunt the worst of the coming water calamities. Even with 60 percent of its country made of desert, Israel has not only solved its water problem; it also had an abundance of water. Israel even supplies water to its neighbors-the Palestinians and the Kingdom of Jordan-every day (Seth M. Siegel, 2015).
- *Elixir: A History of Water and Humankind* – Today, we are entering a third age of water: As the earth's population approaches nine billion and ancient aquifers run dry, we will have to learn once again to show humility, even reverence, for this vital liquid. To solve the water crises of the future, we may need to adapt the water ethos of our ancestors (Brian M. Fagan, 2011).
- *Water Wars: Privatization, Pollution, and Profit* - "The world's most prominent radical scientist." The Guardian’s Vandana Shiva, a world-renowned environmentalist and campaigner, examines the water wars of the twenty-first century: the aggressive privatization by the multinationals of communal water rights. While drought and desertification are intensifying around the world, corporations are aggressively converting free-flowing water into bottled profits. The water wars of the twenty-first century may match -- or even surpass -- the oil wars of the twentieth. In *Water Wars: Privatization, Pollution and Profit*, acclaimed author Vandana Shiva sheds light on the activists who are fighting corporate maneuvers to convert this life-sustaining resource into more gold for the elites. In *Water Wars*, Shiva uses her remarkable knowledge of science and society to outline the emergence of corporate culture and the historical erosion of communal water rights. Using the international water trade and industrial activities such as damming, mining, and aquafarming as her lens, Shiva exposes the destruction of the earth and the disenfranchisement of the world's poor as they are stripped of rights to a precious common good. Shiva calls for a movement to preserve water access for all and offers a blueprint for global resistance based on examples of successful campaigns (Vandana Shiva, 2002).

- *The Ripple Effect: The Fate of Fresh Water in the Twenty-First Century* – The questions he sought to answer were urgent: Will there be enough water to satisfy demand? What are the threats to its quality? What is the state of our water infrastructure—both the pipes that bring us freshwater and the levees that keep it out? How secure is our water supply from natural disasters and terrorist attacks? Can we create new sources for our water supply through scientific innovation? Is water a right like air or a commodity like oil—and who should control the tap? Will the wars of the twenty-first century be fought over water? (Alex Prud'homme, 2011).
- *The Price of Thirst: Global Water Inequality and the Coming Chaos* – The product of seven years of investigation across six continents and a dozen countries, and scores of interviews with CEOs, activists, environmentalists, and climate change specialists, *The Price of Thirst* paints a harrowing picture of a world out of balance, with the distance between the haves and have-nots of water inexorably widening and the coming crisis moving ever closer (Karen Lynnea Piper 2014).
- *Blue Covenant: The Global Water Crisis and the Coming Battle for the Right to Water* – a shocking account of deprivation, as millions around the globe struggle to access basic resources, while corporations are accelerating the global water crisis. Barlow depicts the history of water battles internationally, and documents the fatal mistakes being made in the fight for the right to water (Maude Barlow, 2007).

# Instructor Bios

## Jon Freedman, Senior Vice President, Global Government Affairs at Veolia



Jon Freedman is based in Washington, DC, where he represents Veolia in government affairs. Veolia is the world’s leading environmental services company, with 220,000 employees and \$40 billion in revenues. Previously, he led global government affairs & partnerships for GE’s water and nuclear business units. In addition, he led the creation of GE’s global environmental sustainability initiative (Ecomagination). He also helped GE create a global water business by leading the acquisition of an NYSE-listed water company.

Jon served on the advisory board of The Wharton School’s Institute for Global Environmental Leadership 2012-2020). He also currently serves on the board of directors of the WaterReuse Association, where he chairs the policy committee, the board of directors of the International Desalination Association, where he services as Secretary, and the Water Research Foundation. Jon has authored numerous articles and speaks frequently on water issues globally. He just completed his 10th year of teaching a class at the University of Pennsylvania called, “The Future of Water.”

Jon holds a bachelor’s degree from the University of Virginia, a law degree from William & Mary, and an MBA in finance from The Wharton School of the University of Pennsylvania.

## Charles Iceland – Director, Freshwater Initiatives at World Resources Institute



Charles Iceland is Director, Freshwater Initiatives with WRI’s Food, Land, and Water Program. In addition to overseeing the Global Water Team, Charles is implementing the *Water, Peace, and Security* Partnership with several European and American partner organizations. As part of this project, he and his team have developed machine learning-based conflict prediction tools that leverage information on environmental, political, economic, social, and demographic conditions worldwide. The partnership was awarded the 2020 Luxembourg Peace Prize for Outstanding

Environmental Peace.

He previously directed the *Aqueduct* project at WRI. With the original Aqueduct Team, he developed the concept for the *Aqueduct Water Risk Atlas*, which maps a variety of global water risks and has become the premier online tool for global water risk assessment and

prioritization. He also developed the concepts for *Aqueduct Floods* and *Aqueduct Food*. He is currently working on a new project – *Global Water Watch* – which will track global water availability in near real-time.

Charles earned his undergraduate degree from Yale University and a master's degree in international affairs from Columbia University. He also holds the Chartered Financial Analyst (CFA) designation.