Teaching and Educational Methods

Teaching Water Economics by Building Problem-Based Case Studies

David Zetland[a]
[a]*Leiden University College*

JEL Codes: A12, A22, B52, Q25, Q5
Keywords: Case studies, problem-based learning, teaching, water, x-disciplinary

Abstract
Academic economists have many insights to contribute to water management at all scales. These contributions need to be placed in local institutional contexts and reconciled with insights from other disciplines if they are to affect policy, action, and evaluation. Case studies offer a useful way to organize different lines of thinking in the classroom or the field. This article reviews these factors—academic vs. practical perspectives; economic vs. other disciplines—and provides a framework for teaching water economics by building problem-based case studies.

1 Teaching and Understanding Complexity

> "*They're specialists, the whole lot of them, and they don't believe in a method of work which cuts into every field of science from botany to archaeology. They limit their own scope in order to be able to dig in the depths with more concentration for details. Modern research demands that every special branch shall dig in its own hole. It's not usual for anyone to sort out what comes up out of the holes and try to put it all together.*" —Heyerdahl (1950)

> "*If you're so smart, why ain't you rich?*" —McCloskey (1990)

> "*An expert knows more and more about less and less until they know everything about nothing.*" —Early 20th-century thinkers[1]

Economics is a powerful discipline that makes clear predictions about human behavior in specific circumstances. Since these circumstances do not hold in many instances of real life, there is a risk that economic insights are useless, confusing, or counterproductive. The quotations above illustrate the durability of a vexing paradox: too many smart ideas resulting in too few real-world improvements. The paradox indicates an opportunity—in fact, a dire need—to better match the supply of economic ideas to the demand for good ideas. Such an improvement will increase welfare for everyone.

In this paper, I discuss how case studies can improve the match between supply and demand for insights, on two margins. On the intensive margin, case studies help organize and focus economic insights to find useful solutions to existing problems. On the extensive margin, case studies raise new questions that deserve more attention from economists.

Note that I am using "case study" in the general sense of examining a particular area and situation. Case studies can take years to assemble, run for hundreds of pages, and involve a lot of data and deep analysis, but they can also be constructed in a short time with limited inputs and partial

[1] This saying evolved between 1911 and 1933 (https://quoteinvestigator.com/2017/10/25/more/).

analysis. Published cases tend toward the former, with "serious" characteristics;[2] classroom projects tend toward the later, with "superficial" characteristics. That said, it is difficult to define a bright line between superficial and serious, as one can clearly change to the other with additional time and effort. Although this paper focuses on the initial steps of building a case study—via a student project undertaken during a teaching term—it does not imply that such cases are without insight, opportunity for refinement, or potential publication.

Case-study building teaches water economics in three ways. First, case studies allow one to dive into rich but messy stories. Since water issues often depend on unique institutional characteristics, they are better suited to case study than abstract or general models.[3] Second, case studies naturally invite *x-disciplinary* perspectives and contributions, which can break through academic silos.[4] Third, case studies can be matched to teaching goals and constraints.

To "make the case for cases," I explore the boundaries between academic and practical perspectives on water (§2), argue that water issues deserve x-disciplinary treatment (§3), and explain how I use cases to teach a nonspecialist course in water economics (§4). My goal is to show how case studies can be used *not just* for exploring details in the classroom or reconciling academic perspectives *but also* for understanding real-world challenges—challenges that are increasing as climate change alters water cycles.

Before I get going, let me position this paper in the context of this journal. Economics is taught at many levels, from high school to PhD. Economics is used in an even broader range of settings. These patterns also apply to the teaching and use of water economics, so it is important to pitch ideas and techniques at the appropriate level and/or audience. In this paper, I am drawing upon my experiences teaching undergraduates as well as my interactions with policy makers, professionals, and the public. I am therefore going to describe how case studies can be used at any level, not just as a complement to academic textbooks. Readers (as teachers) should have no problem adding steps or constraints to encourage and challenge students of all backgrounds, disciplines and experiences.

2 Water Issues Are Real-World Issues

It takes time to understand water management. We all bring cultural, disciplinary, and institutional perspectives to water-as-a-topic, and we all need time to reconcile our perspectives. Cultural differences in language, history, and geography take time to identify, let alone master. Some institutions ("the rules of the game") are stable and fixed; others expand and contract with social trends (Coase 1998; Williamson 2000; North 1990).

Any course in water economics needs to consider local conditions and constraints that reflect and affect local water-managing institutions (Ciriacy-Wantrup 1969; Easter, Rosegrant, and Dinar 1999). This diversity means that case studies are relatively more useful in a water course. Case studies can help organize complexity into a narrative that the researcher and reader—or the student and teacher, or the academic and civilian—can follow, question, and understand. This accessibility is due to the way that case studies force consideration of multiple disciplines, acknowledgement of the messy details of history and institutional path dependency, and reliance on the practical sides of water management—all while focusing on a concrete example.

Local institutional diversity also means that academic ideas must be compared, conversant, and complementary to practical realities. Section 3 explores how to harness and reconcile academic

[2] For examples, consider Ostrom (1965); Loaiciga and Renehan (1997); Ehrhardt and Janson (2010); Reynaud (2013); Venkatachalam (2015); Sanders (2016); Donoso (2017); Zetland and Colenbrander (2018); and Elhadj (2022).

[3] Elinor Ostrom's PhD dissertation on groundwater management in one region of Southern California sprawls to 600-plus pages (Ostrom 1965).

[4] The "x" in "x-disciplinary" stands for cross-, multi-, trans-, and whatever future prefix academics attach to "-disciplinary." I will not attempt to clarify how they differ or which might be more appropriate for a given situation.

diversity; this section focuses on balancing academic and practical perspectives on water management.

Figure 1 relates academic and practical perspectives by placing the economics–x-disciplinary range on the x-axis and the academic–practical range on the y-axis. Although a topic might appear anywhere within the figure, I've divided the space into four boxes to highlight potential combinations, from academic economics (value, in theory) to practical x-disciplinarity (outcomes, in reality) on the diagonal and practical economics (proposing ideas) and academic x-disciplinarity (exploring complexity) on the off-diagonal.

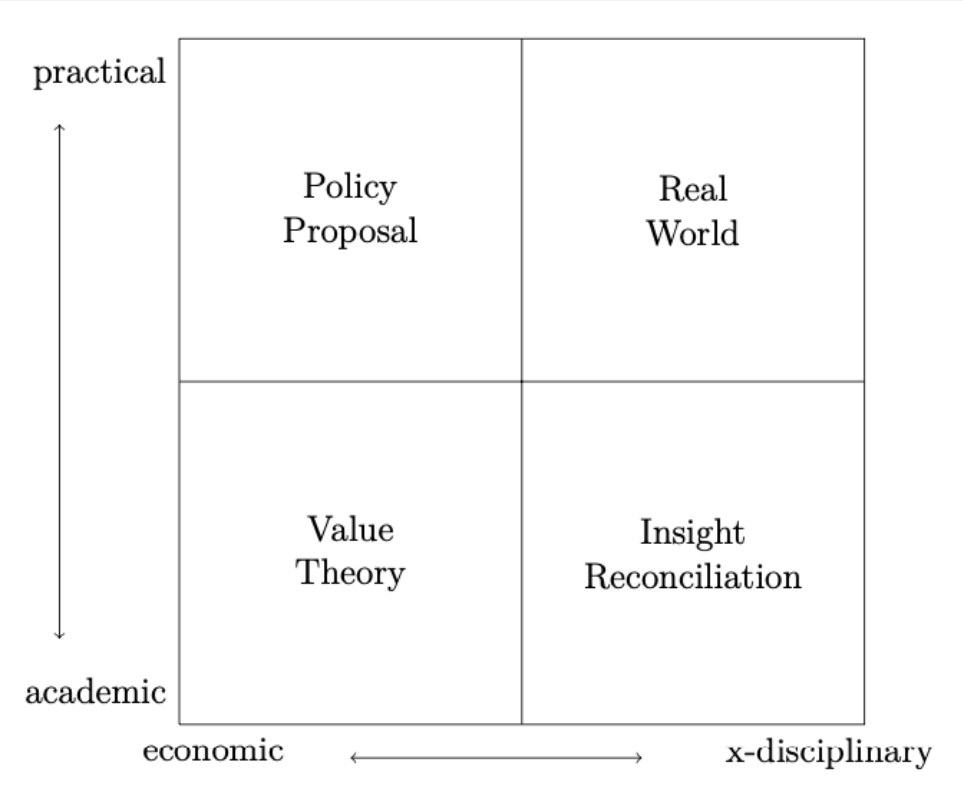

Figure 1: Different Perspectives on Water

Everyone knows, needs, and wants water. Such universality might seem a bug to those attempting to assess various perspectives, but I see it as a feature. The more people care about water policy, the larger our willingness and capacity to improve it. Water economists must play a role in these discussions, but they must also work with those who can contribute to discussions, design policies, and implement solutions. The rest of this section explores this academic–practical interface.

2.1 Differing Water Priorities

"Water" is a multifaceted topic. It is the focus of the sixth Sustainable Development Goal (SDG): "to ensure availability and sustainable management of water and sanitation for all." SDG 6, like the other sixteen goals, includes subtargets (eight in this case) to deal with water's complexity, from "provide safe and affordable drinking water" (Target 6.1) to "protect and restore water-related ecosystems" (Target 6.6). Water, like love or inequality, has many sides. Complexity prevents a quick or definitive study of water; caveats and dependencies abound.

Communities prioritize different uses of water. Poorer communities worry more about drinking water than environmental flows. Farmers focus more on irrigation; households on domestic

supply. Richer consumers worry about mitigating climate change; the poor adapt. Too few communities—rich or poor—have political leaders who are able to keep their water systems in full repair, let alone adapt them to evolving needs. The big push for drinking water and sanitation that began roughly 150 years ago bequeathed massive benefits to generations, but that push is outside our memory—making it hard to motivate action and easy to accept decay.

Economists can play a useful role in explaining interdependencies, documenting successes and failures, and creating solutions that reconcile constraints, preferences and resources.

2.2 Tidy Theory Meets Messy Reality

There is an old joke about a drunk guy looking under a streetlight for his lost keys "because that is where I can see." Academics have a similar bias toward data, language, and institutions. If good water management practices could be copy-pasted anywhere, then we could study water in our neighborhood and generalize to the world, but we cannot and should not. Yes, we can explain the importance of marginal cost pricing or how to reduce risk with storage, but so could anyone paying more for less or digging a well. The challenge is to understand why marginal pricing is used (or not) or what steps are taken (or skipped) when balancing storage across seasons.

A delightful book, *Priests and Programmers* (Lansing 1991), contrasts local adaptive institutions to generalized deductive reasoning. Its author, an anthropologist, tells how World Bank experts ("programmers") told locals to ignore "inefficient" methods of cultivating rice that were codified in temple ceremonies. Long story short, yields rose briefly before crashing. The programmers had failed to understand see how local "superstitions" had internalized centuries of trial and error.[5] Economists need to start more conversations with "tell me why that is" instead of "do this."

That said, economists (and other academics) should continue to highlight fallacies and contradictions. An Ivory-Tower perspective might not capture the gritty reality of the streets, but it can help set goals and monitor progress toward them.

2.3 Inductive Search as a Complement to Deductive Prediction

Deductive reasoning moves from first principles to narrow conclusions through logical steps and assumptions. It is rational, abstract, and useful for investigating and testing ideas. Inductive reasoning begins with a situation and searches for patterns and choices that can explain observed facts. Inductive reasoning can be mistaken for just-so storytelling, but it allows for creativity, twists, and details that do not fit into deductive models. Both methods can help us understand water issues that have strange origins but familiar results (or vice versa). Since academics often use deductive methods, I will focus on how inductive methods can contribute to teaching water economics.

The inductive method begins with observed phenomena and tries to match them to new or known patterns, hypotheses, and theories. The Law of Demand, for example, suggests that an increase in the price of water will reduce quantity demanded, but we observe many cases in which quantity does not respond to a price change. These observations do not falsify the Law of Demand as much as encourage one to delve deeper—perhaps checking whether *ceteris paribus* assumptions actually hold. One such assumption—full information—is perhaps too strong in cases where one person decides water use and another sees the water bill, or when water is so cheap that a price increase ("50 percent higher!") seems to go unnoticed. Is that a case of zero elasticity, or does "salience" provide a better explanation? Salience would make sense if demand for drinking water goes from undefined (no behavioral response to price changes) to defined, meaning that the actor is paying attention—perhaps for the first time—to their water demand. The situation, in other words, is not one of "excessive" changes in quantity demanded but the *appearance* of the demand curve. Alternative

[5] Henrich (2015) explores this cultural-evolution dynamic for our species.

explanations like these matter if we want to understand water (mis)management, and authors such as Whittington (2016) show how traditional thinking trumps economic logic.

3 Water Is X-disciplinary

Economists working on water topics cannot go for long without drawing upon the ideas and expertise of other disciplines. Engineering, history, law, politics, public health, and many other disciplines study water issues that cross and ignore our tidy (academic) silos. For most economists, it is easier to borrow ideas from other social sciences than other disciplines, but there are plenty of exceptions to such provincialism—exceptions that might be driven by project funding, social networks, or sheer curiosity. No matter the reason, it is inevitable that we will need help from—and can offer help to—colleagues in other disciplines.

Such activity is often hard to justify when there are strong incentives to publish research in disciplinary journals. X-disciplinary cooperation in teaching, in contrast, is easier to justify when students expect applied insights and professional risk is lower (academics worry more about research, so there is more room to take chances in teaching). Although bureaucratic rules may inhibit cooperation, they can also encourage it—witness the endless calls for interdisciplinary collaboration.

Economists are late to the water game in comparison to engineers, lawyers, and scientists, but early in comparison with ecologists, ethicists, and psychologists. These different vintages can result in gate keeping ("we've known this for decades"), confusion ("we've always called it *y*; why do you say *x*?"), and conflict ("how dare you ignore our advice"), but they also provide an obvious opportunity to learn from the wisdom of elders and build on the energy of newcomers. It is a question of attitude—and most water people are excited to geek out with fellow travelers.

For those of us excited to learn from other disciplinary perspectives, case studies offer a convenient mechanism. Cases based on real-world questions are neutral to disciplinary boundaries, so they are less vulnerable to turf wars. Cases also present a focal point for asking questions and seeking answers that prioritize quality over purity. Cases—by virtue of involving practitioners—also force academics to focus on robust practicality over disciplinary obsession. And cases are eminently suited to organizing numerous perspectives that must be reconciled on many levels in order to build bridges toward new ideas and deeper understanding.

4 Teaching Water Economics with Case Studies

The importance of water management is increasing as climate change grows stronger because water is the vector through which climate impacts arrive—via storm, drought, sea-level rise, and so on. Demands for improved understanding and better policies need to be met with greater supplies of data and ideas from academics, economists among them.

Case studies provide an excellent framework for testing, rejecting, or adapting ideas. Cases can be scaled to local data, resources, and circumstances. Cases modeled on local conditions are also accessible to nonspecialists who can help with fact-checking, policy design, and— ultimately—action. Cases help people organize their data, ideas, and experiences into a story that anyone, regardless of their starting point, can relate to, which means they can be used to suggest questions, guide discussions, and further collective action. Students may struggle in the early stages of building a case study, but the wholeness of reality will eventually help them make connections. This characteristic explains why problem-based learning (PBL) works so well for teaching (Reimann 2004), and case studies are well suited to PBL environments.

These ideas and ideals work in the practical, policy, and professional worlds, but they also apply in the classroom, where the stakes are lower, the space for exploration is greater, and future problem solvers are learning valuable skills.

4.1 How Do Cases Contribute to Teaching?

Hands-on (first-hand) learning is more effective than "distant-handed" learning (Stein, Isaacs, and Andrews 2004; Henrich 2015).[6] Its effectiveness comes from the way in which learners need to reconcile facts, theories, and local institutions in a real-time process that will alter or create patterns of understanding. Since this process is directed at writing a case study that outsiders will recognize (and may use), it is less likely to be side-tracked by conflicting academic discourses.

Cases also benefit from students' intrinsic desire to understand a topic they have (typically) chosen to pursue. Their desire to understand will lead them to ask for interviews, read newspapers, or dig into archives. To understand those sources, they will learn techniques, test theories, and diversify their toolkit. They are more likely to go off the [disciplinary] reservation in their search, which will expose them—and others—to new and useful x-disciplinary combinations.

Perhaps the most useful aspect of teaching with case studies is the way in which they encourage collaboration between "town and gown" (practitioners and academics). Although there is a long history of either side accusing the other of missing the big picture, collaboration creates an opportunity to find common ground in a little case study picture. Since cases put more emphasis on "dirtbag pragmatism" than theological purity, they allow students to use an effective blend of tools (Rubin 2021).

One of my favorite papers in water economics (Loaiciga and Renehan 1997) was written by two geographers based on data provided by the Public Works Department of Santa Barbara (California). Their case study explains how higher prices and public communications reduced water demand by 46 percent in the short run (39 percent in the long run) during an extended drought in the 1990s. Their case, like most others, tells an accessible, compelling story of how various ideas were developed, tested, and then dropped or reconciled with other ideas and policies. Their case also works without the benefit (or delusion) of a *ceteris-paribus* analysis designed in a friction-free environment, which can lead to misleading conclusions. Vaux Jr. and Howitt (1984), for example, advised against investing in urban water security when water could be bought from irrigators in markets. Their faith in "assume a market and the water will come" looks foolhardy to anyone who has waited for decades for such markets to appear. Many Californian cities are now spending billions of dollars on infrastructure that markets were supposed to replace.

4.2 How Can Cases Be Used for Teaching?

Case studies come in many forms, so the teacher can decide on details.[7] Cases can, for example:

- Align with the course's ambitions and duration in detail, scale, and scope.
- Build on students' connections, culture, knowledge, and language.
- Help students understand the exceptions, strengths, and weaknesses of theory.
- Use available data and insights from other disciplines.
- Encourage students to interact with nonacademics, which can strengthen their inter-personal skills and professional development.

4.3 How I Use Cases to Teach

I teach a course on water scarcity to undergraduates in our teaching-oriented, honors program. In the course, "scarcity" refers to an inadequate supply of good quality water in comparison to human and environmental demands. Our class of around twenty students meets for two hours, twice per week

[6] Although definitions vary, I am using "first hand" in the sense of touching or doing something directly (e.g., irrigating a field). Second-hand learning comes from watching someone irrigate a field. One learns third hand by reading a farmer's irrigation journal. Fourth-hand learning occurs when reading a text book author's description of how farmers irrigate.

[7] Their more rigorous cousin, the analytical narrative, often includes game-theoretic models and testable hypotheses (Levi and Weingast 2022).

over the eight-week term.

The description of the case-study assignment in the syllabus explains its focus and goals:

> *During this course, you will research, write, and present a case-study paper on water scarcity affecting a major city and its political and hydrological surroundings.*[8] *Your case will help everyone understand water issues at different scales (local vs. regional), scopes (issues for farmers versus cities), and disciplinary perspectives (e.g., engineering and politics). You will explain how management evolves, succeeds, and/or fails for different stakeholders.*

In Week 2, students bring proposals for cities/regions to study. I discuss these proposals with the whole class to expose their varied interests, reconcile overlaps (e.g., two students choosing Cape Town), and suggest approaches (e.g., referring them to literature or experts I know).

During Weeks 2–5, they learn about their cases by answering the questions in Table 1 (graded pass/fail), which is on the next page.

They also learn through their own research (i.e., interviewing residents and local experts, collecting data from journalistic media and gray literature, and cross-checking their findings with the academic literature). The course reader—15–20 articles written by academics, journalists, and professionals—provides multiple perspectives for them to consider.

They write their case study after a few intermediate steps, i.e., writing a blog post on one aspect of water scarcity from their case study, writing a draft that is subject to anonymous (to them) review by two of their peers,[9] and presenting their cases to the entire class.

Although students are free to structure the case study in any way they want, the syllabus gives the following guidance, which I reproduce here (nearly verbatim) as a means of explaining the learning goals and grading rubric:

[8] "Scarcity does not just mean an empty reservoir. The poor living in slums have *economic scarcity*, which means they often lack the political power needed to get water supplies. Think of challenges and impacts at the macro- and micro-scale, respectively, that is, the big forces leading to under-supply and over-demand (macro) and then the individual or family-scale micro impacts of scarcity, in terms of sickness (mortality/morbidity), time spent collecting water, money spent to get clean water, etc." [This footnote is also in the syllabus.]

[9] The peer review gives the author detailed feedback, but it also exposes reviewers to other styles and techniques.

Table 1: Prompts to Help Students Learn about Their Cases

Week Number	Question Number	Prompt
2	1	Find an example of conflict over water allocation (e.g., water for irrigation or a river; water to one city or another) in your case-city's region and assess each side's claim to the water.
3	1	Find the regulator for your case-study city. (Municipal "public" utilities are usually overseen by people from city government; investor-owned "private" utilities are usually overseen by a separate commission.) Read the paperwork from a recent meeting on charges and services. What did you learn that is interesting?
3	2	Find your customer class for your cases study city. (Most residential customers are grouped according to the size of their piped connection, i.e., 0.5–0.75 inches or 15–20 mm.) Compare your service and water charges to those of other classes (multi-family, commercial, etc.).
4	1	Pretend you have no water at your home as it is a 5-minute walk away. Assuming you cannot go get your own water (for this question), how much would you pay someone to deliver 10 liters of water to your home each day? How much would you pay for a second delivery of 10 liters?
4	2	Find out if there are programs to help people who cannot pay their water bills in your case-study city. If there are, then how are they funded? If there are no programs, then what happens if people do not pay their bills?
4	3	Find a commodity crop that you consume often at https://www.wri.org/applications/aqueduct/food/. Check a package of that food in your home and find out if it is produced in a region facing water stress.
5	1	Identify a major project (treatment plant, network extension, dam, etc.) for your case-study city. Compare its cost to how it was (or will be) financed (e.g., bonds repaid by monthly service charges) over its service life.
5	2	Get a water quality report for your case-study city and compare the levels of allowed and measured contaminants in the utility's water.

Source: Author's course syllabus.

Your goal is to present a complete description that will help the reader understand the issues, even if solutions may be unrealistic or difficult to implement. I suggest (but do not require) the sections below. Word counts are suggested (adjust as needed), but the overall limit is 4,000 words.

Introduction: *Define the scarcity challenge(s), describe and quantify their impacts on the local community, explain why these impacts (and thus scarcity) must be addressed, and give a short summary of the causes you identified, and how you suggest they be addressed (250 words).*

Background: *Describe the city and its political and hydrological surroundings. Identify a timeline (history) of major events and outcomes reducing/increasing water scarcity. Your weekly exercises will contribute to this section (500 words).*

Data: *Use maps, tables, and figures to explore and explain the spatial, operational, fiscal, and sustainable dimensions of your case. For example, quantity of water consumed and prices paid by customer class; formal vs. informal water vendors; and share of water use by sector (agricultural, municipal, and industrial) as well as residential use (indoor/outdoor). Please use SI units (e.g., cubic meters of water) and always provide USD/EUR equivalents if you are using local currencies. Qualitative data (surveys, manager performance, regulatory activity) can also be useful. Also discuss what went right or wrong on collecting information on your case study. This will help me understand how easy/hard your research was for you (1,000 words).*

Analysis: *Explain how formal rules and informal norms (institutions) have led to current scarcity, recount history up to the current situation (perhaps go back to a time of abundance and then trace the emergence of scarcity), and show how hydrological, engineering, political, economic, and social forces interact, cooperate, or conflict to increase or reduce scarcity (1,000 words).*

Distribution: *Use a summary table or figure to explain the costs and benefits of scarcity and give 2–3 quantified impacts of scarcity. It will be useful to identify winners and losers, their power or leverage, and how they may (not) support change. You may want to draw lessons from other interactions of these groups (750 words).*

Recommendations: *Suggest a new way and/or evaluate existing attempts of reducing (quality/quantity) scarcity and the resulting adverse impacts. Consider the costs of various ideas and who will pay them. It is usually easier to start with a small improvement that can be expanded later. Discuss barriers to change and potential ways to overcome those barriers (500 words).*

Grading: *Your grade will be based on quality of writing and organization (25%), your analytical and institutional analysis (50%), and recommendations for addressing impacts (25%). You will get an A for a complete and clear analysis that improves on weaknesses in your presentation. Spelling errors, confusing structure, or missing or unjustified costs/benefits will lower your grade.*

Bonus points: *You can get a bonus of 0–10 percent on this grade for soliciting and receiving outside opinions on your case and/or recommendations. These outside opinions should be summarized in an annex that includes their name, title, and contact information (see me about anonymous sources). There is no guarantee that I will give points, but it is more likely if I see that you've engaged/learned from an expert.*

In sum, students need to explain the causes of scarcity and its evolution, estimate the costs and benefits of the current situation, describe potential policies or remedies to scarcity, identify barriers and complications that might prevent improvement, and reflect on what they learned in the process.

This course requires a lot of effort from students (an average of 12 hours per week outside of class) in the process of giving them a crash-course introduction to the political economy of water. Its case-study structure, in my opinion, aids greatly in helping students assimilate, organize, and understand a host of new ideas, theories, and facts.

Here are reflections from five students who recently took the course:[10]

Student 1: "*Even though I have taken this class online, which made the class much less enjoyable and entertaining, I would say my situation was the best possible case for an online student. I was living right next to my case study, I could see the lake from my window, and my work allowed me to talk with farmers who are experiencing water scarcity."*

Student 2: "*Working on this case study was a long and demanding, yet very engaging and rewarding process. Discovering the history, present and future predictions on Mexico City's water situation—in numerous aspects—was genuinely fascinating.*"

Student 3: "*I loved investigating the case of water scarcity in Guadeloupe. My favorite part was interviewing XX, who gave me a lot of insight when it comes to citizens' daily lives on the islands. I needed that information to better wrap my mind around what was going wrong in the region*."

Student 4: "*Doing this case study on water scarcity in Antwerp really opened my eyes to the issue of water scarcity in Western Europe. I never realized that water scarcity could also be severe in places like Belgium, which is supposed to have a rainy sea climate.*"

Student 5: "*Overall, I enjoyed working on this case. It was challenging to get a good overview as much of the data was scattered across websites, government and environmental reports, and academic literature. Moreover, the data was sometimes conflicting. However, there was enough data out there for me to get a feeling that I have a good idea of what was going on.*"

These students saw how their effort led to a deeper understanding of a complex topic. What is even more useful is how case studies, which help students explore real issues, also strengthen their research, interviewing, data analysis, writing, and other transferable skills. From a disciplinary perspective, the case study clarifies the intermingled roles of economics, politics, society, and the environment. Most important, this structure energizes students in their quest to understand more about the case they chose.

Good learning lasts longer than the school term, often for a lifetime. Students who are excited about their topics do not just learn more: They affect the people around them. They engage in policy and political discussions. And sometimes they change their career goals.

[10] Students have given me their written permission to include their comments in this paper.

4.4 Why Aren't Cases Used More Often?

Professors often teach what they know in a way they are comfortable with, rather than what students should learn in a way that matches students' learning styles. Case studies can make up for these weaknesses by allowing students to follow their own methods on topics they chose to focus on, but students need advice, corrections, and guidance.

Although we (professors) know that x-disciplinary work is better in many ways, it is hard to organize an x-disciplinary course—in terms of finding guest lecturers, grading assessments, and linking to subsequent courses. Case studies avoid many of these problems by encouraging students to find their own experts (academic or not) while holding them accountable for a clear analysis.

For students attending classes in multiple disciplines, this task is not as hard as it might seem. Students constantly reconcile different perspectives, methods, and epistemologies, which means they may be better prepared for cases than professors teaching in one discipline. The problem, in other words, is not that students cannot write cases, it's that professors don't ask them to.

5 From the Classroom to the Real World

Any course focusing on water is immediately complicated by the many ways in which water affects our lives. Such wide-ranging impacts call for a variety of approaches, which are hard to learn, let alone teach, in an academic setting. Even more important, these artificial, disciplinary boundaries rarely matter in nonacademic settings, so we need to help students manage them if they are to take useful lessons into the real world.[11]

Case studies help students explore real, local, and personal complexities. They push students to strengthen their research, interviewing, data analysis, and related skills. Cases put economics in context and reveal other influences affecting water management and use. Most importantly, cases motivate students to understand the complexities and seek answers to the questions they've asked.

About the Authors: David Zetland is a University Lecturer at Leiden University College. (Corresponding email: d.j.zetland@luc.leidenuniv.nl).

Acknowledgements: I thank Gábor Ungvári, Samuel Ian Rosen, two reviewers, and the special issue editors for their comments on an earlier draft of this paper. This version is almost entirely new in words (but not in goals), so I thank them for helping me sharpen its focus. All remaining mistakes are mine.

[11] Around 1 percent of OECD adults have doctorates. The U.S. share is 2 percent (OECD 2019).

References

Ciriacy-Wantrup, S.V. 1969. "Natural Resources in Economic Growth: The Role of Institutions and Policies." American Journal of Agricultural Economics 51(5):1314–1324. http://www.jstor.org/stable/1238009.

Coase, R.H. 1998. "The New Institutional Economics." American Economic Review 88(2):72–74. https://www.jstor.org/stable/116895.

Donoso, G. 2017. "Urban Water Pricing in Chile: Cost Recovery, Affordability, and Water Conservation." Wiley Interdisciplinary Reviews: Water 4(2):e1194. https://onlinelibrary.wiley.com/doi/abs/10.1002/wat2.1194.

Easter, K.W., M.W. Rosegrant, and A. Dinar. 1999. "Formal and Informal Markets for Water: Institutions, Performance, and Constraints." World Bank Research Observer 14(1):99–116. https://www.jstor.org/stable/3986540.

Ehrhardt, D., and N. Janson. 2010. "Can Regulation Improve the Performance of Government-Controlled Water Utilities?" Water Policy 12(S1):23–40. https://doi.org/10.2166/wp.2010.112.

Elhadj, E. 2022. "Ozymandias in the Desert: Irrigation in Saudi Arabia. Water International 47(6):969–978. https://doi.org/10.1080/02508060.2022.2123612.

Henrich, J. 2015. The Secret of Our Success. Princeton: Princeton University Press.

Heyerdahl, T. 1950. Kon-Tiki: Across the Pacific in a Raft. London: George Allen & Unwin.

Lansing, J.S. 1991. Priests and Programmers: Technologies of Power in the Engineered Landscape of Bali. Princeton: Princeton University Press.

Levi, M., and B.R. Weingast. 2022. "Analytic Narratives and Case Studies." In J. Widner, M. Woolcock, and D. Ortega Nieto, eds. The Case for Case Studies: Methods and Applications in International Development. Cambridge: Cambridge University Press, pp. 239–257.

Loaiciga, H.A., and S. Renehan. 1997. "Municipal Water Use and Water Rates Driven by Severe Drought: A Case Study." Journal of the American Water Resources Association 33(6):1313–1326.

McCloskey, D. 1990. If You're So Smart: The Narrative of Economic Expertise. Chicago: University of Chicago Press.

North, D.C. 1990. Institutions, Institutional Change and Economic Performance. Cambridge: Cambridge University Press.

OECD. 2019. Education at a Glance 2019. Paris: OECD Publishing. https://www.oecd-ilibrary.org/content/publication/f8d7880d-en.

Ostrom, E. 1965. Public Entrepreneurship: A Case Study in Ground Water Basin Management. Doctoral dissertation, UCLA. https://dlc.dlib.indiana.edu/dlc/handle/10535/3581.

Reimann, N. 2004. "First-Year Teaching-Learning Environments in Economics." International Review of Economics Education 3(1):9–38. http://www.sciencedirect.com/science/article/pii/S147738801530147X.

Reynaud, A. 2013. "Assessing the Impact of Price and Non-price Policies on Residential Water Demand: A Case Study in Wisconsin." International Journal of Water Resources Development 29(3):415–433. http://dx.doi.org/10.1080/07900627.2012.721670.

Rubin, A. 2021. Rocking Qualitative Social Science: An Irreverent, but Practical Guide to Rigorous Research. Stanford: Stanford University Press.

Sanders, K.T. 2016. "The Energy Trade-Offs of Adapting to a Water-Scarce Future: Case Study of Los Angeles." International Journal of Water Resources Development 32(3):362–378. http://dx.doi.org/10.1080/07900627.2015.1095079.

Stein, S.J., G. Isaacs, and T. Andrews. 2004. "Incorporating Authentic Learning Experiences within a University Course." Studies in Higher Education 29(2):239–258. https://doi.org/10.1080/0307507042000190813.

Vaux Jr., H.J., and R.E. Howitt. 1984. "Managing Water Scarcity: An Evaluation of Interregional Transfers." Water Resources Research 20(7):785–792.

Venkatachalam, L. 2015. "Informal Water Markets and Willingness to Pay for Water: A Case Study of the Urban Poor in Chennai City, India." International Journal of Water Resources Development 31(1):134–145. https://doi.org/10.1080/07900627.2014.920680.

Whittington, D. 2016. "Ancient Instincts—Implications for Water Policy in the 21st Century." Water Economics and Policy 2(2):1671002-1–13. https://www.worldscientific.com/doi/abs/10.1142/S2382624X16710028.

Williamson, O.E. 2000. "The New Institutional Economics: Taking Stock, Looking Ahead." Journal of Economic Literature 38(3):595–613.

Zetland, D., and B. Colenbrander. 2018. "Water Civilization: The Evolution of the Dutch Drinking Water Sector." Water Economics and Policy 4(3). https://www.worldscientific.com/doi/abs/10.1142/S2382624X18500121.