

WATER INFRASTRUCTURE AND PRACTICAL KNOWLEDGE IN PROGRESSIVE-ERA LOS ANGELES

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ABSTRACT: This article proposes that a history-of-knowledge approach offers innovative ways to study the use of domestic infrastructure in the household. More specifically, the article investigates the role of knowledge about water fixtures, such as meters, taps, and toilets, in the history of progressive-era Los Angeles. Building on the rich literature about how Los Angeles obtained its water, this article shifts the focus to the relationship that everyday consumers had with their water and how technology mediated this relationship. While the article analyzes three major fields of knowledge about the use of infrastructure (knowledge about personal and public hygiene, about the maintenance and repair of fittings, and about responsible levels of water consumption), it foregrounds users' agency in construing bodies of knowledge. Taken together, this article argues, first, that practical knowledge about water as a modern convenience was mutually developed by the utility's publicity department, meter men, municipal health authorities, elected officials, newspaper editors, middle-class reformers, property owners, working-class immigrants, and female householders. Second, the article emphasizes the dynamics, contingency, and locality of this knowledge, which was linked to the stunning growth of Los Angeles between 1880 and 1930.

Keywords: infrastructure; history of knowledge; water, Los Angeles; technological adaptation

INTRODUCTION

One summer in the 1920s, the Los Angeles Department of Water and Power (LADWP) produced a small notice that stressed in big letters, “Please do not waste water!” Claiming that Los Angeles was “passing through one of the dryest years” in history, the notice argued that it was not too late to “prevent a serious water shortage . . . if each of us as a water consumer, will STOP WASTING WATER.” The notice was distributed as an insert in water bills. It urged city dwellers to change their domestic routines to prevent water scarcity. The first rule was “Do not waste water on lawns and shrubs.” Another rule insisted, “Do not waste water by washing off your driveway and sidewalk when a broom will do the work just as well.” Other rules told residents, “Do not allow water to run from the faucet continuously when you are in the bathroom. Turn the water on only when you need it; turn it off as soon as possible.” Finally, a rule stated “Do not waste water through leaking plumbing connections.”¹

Although the environment in Southern California is a peculiar one and is often close to bringing natural disaster upon Los Angeles, the notice reveals that water scarcity is not only natural but is also coproduced by the materiality of the network and consumers.² It is true that from a meteorological perspective, the 1920s and 1930s were a period of overall dryness. For instance, the wet season of 1923–24 saw rainfall of only 6.67 inches in downtown Los Angeles, while the wet season of 1927–28 brought rainfall of 9.77 inches. Seasonal average precipitation in Los Angeles was around fourteen inches in the 1920s.³ However, even if 1924 and 1929 were drought years, Los Angeles had an abundance of water at its disposition. Starting with its completion in 1913, the massive Los Angeles Aqueduct had been carrying four times as

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1. Board of Water and Power Commissioners, “Please do not waste water!,” undated, Los Angeles Department of Water and Power Records Center (henceforth: LADWP Records Center), WPO5–45 (8).
2. About the fragile natural ecology of Los Angeles, see Mike Davis, *Ecology of Fear: Los Angeles and the Imagination of Disaster* (New York: Metropolitan Books, 1998), 16.
3. “Total Seasonal Rainfall (Precipitation),” *Los Angeles Almanac*, <<http://www.laalmanac.com/weather/we13.php>> (accessed June 2, 2020).

much water to Los Angeles as the city actually needed.⁴ Which factors, then, led the utility to warn of a water shortage in the 1920s?

On the one hand, the poor state of water mains and household fixtures caused large amounts of water to trickle away in the ground.



The bold cover of this Board of Water and Power Commissioners brochure, printed in black and white on an eye-catching red disk, warned water customers against common practices that wasted water. It was distributed as an insert in water bills in the 1920s. *Courtesy of Los Angeles Department of Water and Power.*

As a result, the material condition of the underground network could not meet the high demand during hot days. On the other hand, the

4. Kevin Starr, *Material Dreams: Southern California through the 1920s* (New York: Oxford University Press, 1990), 59; Marc Reisner, *Cadillac Desert: The American West and Its Disappearing Water* (New York: Viking, 1986), 63–92.

menace of water shortages depended on people's social expectations of "normal" water provision. What residents considered fair and normal—intermittent or continuous water supply; low or high pressure in the mains; and sanitary or contaminated tap water—were contested among different social or ethnic groups and neighborhoods. As a result, the LADWP notice suggests that the water scarcity in semiarid Los Angeles was caused by meteorological, material, and social factors.⁵

The LADWP's water-saving campaign also tells us the story of how residency was controlled and policed through resources.⁶ It is crucial for us to understand that the quest to teach urban dwellers about proper water conservation was a response to the social and racial complexity of boomtown Los Angeles. As more and more people from almost all regions of the world migrated to and settled in Los Angeles, pressure grew to render these new residents governable.⁷ Constraining people's water use, therefore, was a way to fashion the "modern" city and its citizenry. This settler-colonial context is of utmost importance for any understanding of the history of Los Angeles. However, the story is not just an issue of water and social control but also one of people's everyday agency. The fact that over the course of the twentieth century these bill inserts evolved into an elaborate campaign against water wastage hints that people nurtured their own ideas of rational consumption with regard to the water infrastructure. Consequently, any account of the LADWP's water pedagogy has to pay close attention to urban dwellers' own notions and practices of consumption.

From a broader perspective, the LADWP's water-saving campaign points to the significance of water for the history of Los Angeles.⁸ Mathew Gandy claims that the history of most cities can be read through the history of their water supplies and disposal networks.⁹

5. See also Nikhil Anand's study of Mumbai, with similar findings about water scarcities. Nikhil Anand, *Hydraulic City: Water and the Infrastructures of Citizenship in Mumbai* (Durham: Duke University Press Books, 2017), 32–59.

6. On the making of citizens, see Patrick Joyce, *The Rule of Freedom: Liberalism and the City in Britain* (London: Verso, 2003), 1.

7. On the attempt at "legibility" as a main feature of statecraft, see James C. Scott, *Seeing Like a State: How Certain Schemes to Improve the Human Condition Have Failed* (New Haven: Yale University Press, 1998), 2.

8. As an introduction with regard to Los Angeles's rivers, see William Deverell and Tom Sitton, *Water and Los Angeles: A Tale of Three Rivers, 1900–1941* (Oakland: University of California Press, 2016).

9. Matthew Gandy, *Concrete and Clay: Reworking Nature in New York City* (Cambridge, MA: MIT Press, 2002), 22.

This assertion leads right to the heart of the past (and present) of Los Angeles. It is true that water has been the lifeblood of Los Angeles from the very beginning.¹⁰ In fact, the history of Los Angeles is a history of water because the city is an example of rapid urbanization in a semiarid environment.¹¹ Like many other regions west of the fourteen-inch rainfall line, Los Angeles suffered from a lack of precipitation, hot summer temperatures, and the resulting droughts.¹² As a consequence, the extent to which Los Angeles, still a tiny village in the mid-nineteenth-century, could rapidly grow into a major city was intimately linked to the waters of the Los Angeles River, as well as to the colonization of the Owens River waters, which were diverted to the city by means of a massive 215-mile aqueduct constructed between 1905 and 1913.¹³

The close connection between Los Angeles and its waters has been well established by prior research.¹⁴ Framing this story as one of stunning urban expansion in an environmental setting that was life-hostile and profoundly altered by man-made technologies, existing scholarship reveals the instability of human–infrastructure relationships.¹⁵ More recent research has prompted us to incorporate the categories of race and ethnicity into the story of water in Los Angeles.¹⁶ These

10. “William Mulholland—Maker of Los Angeles—Pioneer in Southern California’s Ceaseless Quest for Water—His Energy and Vision Have Made Possible the Colorado River Aqueduct,” *Western Construction News and Highways Builder*, August 1933, 330.
11. William Deverell and Greg Hise, eds., *Land of Sunshine: An Environmental History of Metropolitan Los Angeles* (Pittsburgh: University of Pittsburgh Press, 2005); Blake Gumprecht, *The Los Angeles River: Its Life, Death, and Possible Rebirth* (Baltimore: Johns Hopkins University Press, 1999); Norris Hundley Jr., *The Great Thirst: Californians and Water: A History* (Berkeley: University of California Press, 1992); Reisner, *Cadillac Desert*; Donald Worster, *Rivers of Empire: Water, Aridity, and the Growth of the American West* (New York: Oxford University Press, 1985).
12. William L. Bilodeau et al., “Geology of Los Angeles, California, United States of America,” *Environmental and Engineering Geoscience* 13, no. 2 (2007): 99–160.
13. William L. Kahrl, *Water and Power: The Conflict over Los Angeles’ Water Supply in the Owens Valley* (Berkeley: University of California Press, 1982).
14. In addition to works referenced above, see Steven P. Erie, *Beyond Chinatown: The Metropolitan Water District, Growth, and the Environment in Southern California* (Stanford: Stanford University Press, 2006); on the significance of water in the American West, see Carl Abbott, *How Cities Won the West: Four Centuries of Urban Change in Western North America* (Albuquerque: University of New Mexico Press, 2008), 150–61.
15. Norris Hundley Jr. and Donald C. Jackson, *Heavy Ground: William Mulholland and the St. Francis Dam Disaster* (Oakland: University of California Press, 2016); Abraham Hoffman, “The St. Francis Dam Disaster and Its Historiography,” *Los Angeles City Historical Society*, July 2016, 8–9.
16. David Samuel Torres-Rouff, *Before L.A.: Race, Space, and Municipal Power in Los Angeles, 1781–1894* (New Haven: Yale University Press, 2013); Natalia Molina, *Fit to Be Citizens? Public Health and Race in Los Angeles, 1879–1939* (Berkeley: University of California Press, 2006); William Deverell,

works have shown how deeply enmeshed the creation of water networks was with power relations in Los Angeles.¹⁷ While we know a great deal about how water was brought to Los Angeles from a distance, we know only little about the ways in which people actually used it in their everyday lives and how their practices were connected to knowledge. This article shifts the focus from engineers, public health advocates, social reformers, and city fathers (there were hardly any women) to city dwellers from various social and ethnic backgrounds. It does not offer a story about how Los Angeles obtained its water or where it came from. Instead, it explores the relationship that everyday consumers (households rather than industrial users) had with this water and how technology, such as taps, toilets, urinals, drinking fountains, and lawn or garden hoses, mediated this relationship.

In this article, I propose that a history-of-knowledge approach can serve as a vehicle for exploring residents' consumption of the water infrastructure in the late nineteenth and early twentieth centuries.¹⁸ To illustrate my point, saving water required knowledge about the limits of this resource, the climate conditions in Southern California, and the economics of household water routines, among other issues. Using technology necessitated practical knowledge about safety requirements, maintenance, and repair. Receiving tap water in the household went hand in hand with knowledge about hygiene and bacteriology. In the age of urbanization, supporting comprehension of the dangers of drinking raw water was of primary concern among social reformers. These three fields of knowledge—hygiene, maintenance, and conservation—are at the center of my analysis. I shall argue that the making, remaking, and unmaking of bodies of knowledge about water consumption floated within the tension between the LADWP's educational work and users' creative appropriation strategies derived from their quotidian experiences with infrastructure. To that end, I advance the idea that practical knowledge was mutually developed by producers, maintainers, repairers, and consumers of water.

Whitewashed Adobe: The Rise of Los Angeles and the Remaking of Its Mexican Past (Berkeley: University of California Press, 2004).

17. With regard to Ecuador's Guayaquil, see Erik Swyngedouw, *Social Power and the Urbanization of Water: Flows of Power* (Oxford: Oxford University Press, 2004).
18. I have learned much about this approach from Peter Burke, *What Is the History of Knowledge?* (Cambridge: Polity Press, 2016); and Steven Epstein, "Culture and Science / Technology: Rethinking Knowledge, Power, Materiality, and Nature," *Annals of the American Academy of Political and Social Science* 619 (2008): 165–82.

My argument will unfold in several stages. First, I will investigate how city council members and public health advocates in the last third of the nineteenth century distributed knowledge about hygiene and public health among residents and how this knowledge was transformed by city residents. Then, I will trace the heterogeneity and changeability of knowledge regarding the safety and maintenance of technological appliances among engineers, meter men, property owners, and female householders. Next, I will focus on Los Angeles households and examine the contested nature of knowledge about normal consumption. Finally, I will conclude by laying out some conceptual implications for the historiography of infrastructure and knowledge.

KNOWLEDGE ABOUT HYGIENE AND PUBLIC HEALTH

The most important driving force behind the establishment of engineered water supplies was the attempt to sanitize the city. During the Mexican era and well into the American period, water was delivered to the village from the Los Angeles River through open ditches, or *zanjas*.¹⁹ These ditches and the wells connected to them marked a space in which dwellers gathered to get water, take a bath, do their washing, or even dispose of their waste. In his memoir, *Sixty Years in Southern California*, Harris Newmark, who arrived in Los Angeles in 1853, colorfully recalls that the waters of the river were “none too clean, in part owing to the frequent passage of the river by man and beast. Animals of all kinds, including cattle, horses, sheep, pigs, mules and donkeys, crossed and recrossed the stream continually, so that the mud was incessantly stirred up, and the polluted product proved unpalatable and even, undoubtedly, unhealthful.”²⁰ It is unclear whether other city dwellers at the time regarded the *zanja* waters as unsanitary; we also lack information about how contaminated the *zanjas* actually were. We do know, however, that in 1862 and 1863, a smallpox epidemic killed a significant number of (nonwhite) residents in Los Angeles.²¹ What is also clear is that when Newmark

19. The Mexican era spanned from 1821 to 1848; the American period from 1848 to the present. Abraham Hoffman and Teena Stern, “The Zanjias and the Pioneer Water Systems for Los Angeles,” *Southern California Quarterly* 89, no. 1 (2007): 1–22.

20. Maurice H. Newmark and Marco R. Newmark, eds., *Sixty Years in Southern California 1853–1913: Containing the Reminiscences of Harris Newmark*, 3rd ed. (Boston: Houghton Mifflin Company, 1930), 116.

21. *Ibid.*, 322.

wrote his memoirs between 1913 and 1915, most people would have agreed in retrospect that sanitary conditions in early Los Angeles had been bad, even by mid-nineteenth-century standards.

As Los Angeles evolved into a notable city of the American West during the last third of the nineteenth century and the early twentieth century—with population numbers exploding from roughly 5,000 in 1870 and 50,000 in 1890 to 100,000 in 1900 and tripling from half a million in 1920 to 1.5 million in 1940—this transformation profoundly affected its sanitary conditions.²² Open ditches were replaced by underground mains, and corporeal hygienic practices moved from public spaces to private bathrooms. This process, which we can conceive of as the domestication of personal hygiene, was influenced by the bacteriological revolution, as well as the advancement of new sanitary principles and household appliances, not to forget the increasing use of soaps and disinfectants in the household.²³

It was the growing acceptance of germ theory and the global dissemination of bacteriological knowledge that spurred the replacement of open ditches and wells through underground pipes, as well as garbage removal and street cleaning, at the end of the nineteenth century.²⁴ This process relates the history of Los Angeles to that of England. With accelerating industrialization and urbanization, a sanitary movement formed in England in the 1840s. Edward Chadwick was among the sanitarians who advocated for increased standards in public health and the professionalization of urban bureaucracies to improve the filthy living conditions of the poor, which, in the end, was to help end the spread of infectious diseases.²⁵ While the sanitary movement began in England, it rapidly spread to continental Europe and to North America, where it coalesced with scientific findings in the young medical discipline of bacteriology.²⁶ Louis Pasteur in the

22. Robert M. Fogelson, *The Fragmented Metropolis: Los Angeles, 1850–1930* (Berkeley: University of California Press, 1993), 21, 78.

23. Matthew Gandy, “The Bacteriological City and Its Discontents,” *Historical Geography* 34 (2006), 14–25. See also below, pages 411–12.

24. Martin Melosi, *The Sanitary City: Urban Infrastructure in America from Colonial Times to the Present* (Baltimore: Johns Hopkins University Press, 2000), 103–16; John Duffy, *The Sanitarians: A History of American Public Health* (Urbana: University of Illinois Press, 1990).

25. On Chadwick’s famous *Sanitary Report*, see Christopher Hamlin, *Public Health and Social Justice in the Age of Chadwick: Britain 1800–1854* (Cambridge: Cambridge University Press, 1998); Melosi, *The Sanitary City*, 43–57.

26. On the transatlantic diffusion of knowledge, see Melosi, *The Sanitary City*, 58–72.

1860s and Robert Koch between the 1870s and 1890s made important discoveries that replaced the miasma theory as the predominant theory of disease transmission with germ theory, which identified microorganisms as the cause of epidemics such as cholera, typhoid, measles, diphtheria, or scarlet fever.²⁷

The fact that the histories of London and Los Angeles were entangled with regard to the distribution of knowledge is noteworthy because of its connection to the disciplining of the urban poor (and the alien) and the rise of the expert. First, sanitizing Los Angeles was a colonial project and was deeply intertwined with the production of class and race boundaries.²⁸ With regard to its population, Los Angeles in the late nineteenth century was a place full of contrasts: it was populated by affluent health seekers from the East or Midwest, real estate speculators, and business owners, as well as by workers from different social and racial backgrounds. To some extent, the city's industries of tourism and agriculture rested on Mexican, Japanese, and Chinese immigrants, who were among the largest ethnic groups in the town, and on poor immigrants from Europe.²⁹ City boosters, such as Mayor James R. Toberman or *Los Angeles Times* publisher Harrison Gray Otis, pursued the objective of cleansing Los Angeles in both a literal and figurative sense. They promoted the establishment of water supply and wastewater disposal infrastructure as a way to beautify the city, to morally uplift working-class people, and to make Los Angeles more attractive to potential settlers. At the same time, they employed the water network as a means to marginalize poor and nonwhite residents, whom they deemed dirty, dangerous, and inferior in a very general sense.³⁰ In abstract terms, they related the healthy human body to the formation of a healthy city body.³¹ Their discourse connected to anti-immigrant and anti-working-

27. Steve M. Blevins and Michael S. Bronze, "Robert Koch and the 'Golden Age' of Bacteriology," *International Journal of Infectious Diseases* 14, no. 9 (2010), 744–51. On the fight against cholera in nineteenth century New York City, see Charles Rosenberg, *The Cholera Years* (Chicago: University of Chicago Press, 1987).

28. On the intersection of public health and race in Los Angeles, see Molina, *Fit to Be Citizens?*

29. On the broader picture, see Abbott, *How Cities Won the West*, 65–69.

30. I explore these discourses and their nexus to infrastructure in Jan Hansen, "Shaping the Modern Body: Water Infrastructure in Los Angeles (1870–1920)," *Body Politics* 6, no. 9 (2018): 47–70.

31. About this process with a focus on Britain, see Joyce, *Rule of Freedom*, 65–66.

class sentiments at the time and to the broader “American pursuit of cleanliness.”³²

Second, urban sanitation in both Los Angeles and London was linked to the rise of the scientific expert. Historically a new figure in the second half of the nineteenth century, the expert was one of the most important promoters of public health and germ theory.³³ This was true not only for Los Angeles or London but also for the distribution of bacteriological knowledge on a global scale.³⁴ Scientific experts such as early bacteriologists, physicians, and engineers circulated these new bodies of knowledge to Los Angeles through publications, public lectures, and conferences. Joseph Henry Wythe was a preeminent bacteriologist in California. Born in England, Wythe was appointed Professor of Microscopy and Histology at Pacific Medical College in 1874, where he promoted germ theory.³⁵ One of the first bacteriologists in Los Angeles was Stanley P. Black, who arrived in Los Angeles in 1897 and became Professor of Bacteriology in the Medical Department of the University of Southern California in 1899.³⁶ Black was a vital player in developing practical applications of germ theory with respect to sanitation. Together with other experts, such as Ethel Leonard, who headed the first city laboratory of Los Angeles, Black advised city leaders on appropriate measures to sanitize Los Angeles.³⁷ In doing so, he contributed decisively to the rationalization of the city government and the professionalization of its bureaucracy.

The passing of a string of sanitary rules in 1873 and 1874 was an important and early attempt to sanitize the town. At first, the common council established a municipal Board of Health and the office of

32. Suellen Hoy, *Chasing Dirt: The American Pursuit of Cleanliness* (New York: Oxford University Press, 1995).

33. On the rise of the scientific expert and of “objectivity thinking,” see Theodore M. Porter, *Trust in Numbers: The Pursuit of Objectivity in Science and Public Life* (Princeton, NJ: Princeton University Press, 1995).

34. Patricia Peck Gossel, “Pasteur, Koch and American Bacteriology,” *History and Philosophy of the Life Sciences* 22, no. 1 (2000): 81–100.

35. L. S. McClung and K. F. Meyer, “Beginnings of Bacteriology in California,” *Bacteriological Reviews* 38, no. 3 (1974): 253–54.

36. *Ibid.*, 262.

37. On the sometimes-tense relationship between medicine and public health, see Allan M. Brandt and Martha Gardner, “Antagonism and Accommodation: Interpreting the Relationship between Public Health and Medicine in the United States during the 20th Century,” *American Journal of Public Health* 90, no. 5 (2000): 707–15.

the city health officer.³⁸ The health officer was authorized “to cause all the public streets, private lanes and alleys, houses, lots and premises . . . to be thoroughly cleaned and freed from all filth and garbage in any way calculated to engender miasma or disease.”³⁹ Assigning these duties to the city’s health officer was a decisive step toward the professionalization of municipal government in Los Angeles. Passed in mid-1873, the ordinance also established the government’s claim to control private spaces, such as homes, lots, and premises, thereby calling into question what many people in the American West held in high esteem: individual autonomy, freedom, and self-regulation. A few months later, in early 1874, a second ordinance regulated the deposition of dead animals inside the city’s boundaries, taking a further step toward the rearrangement of residents’ hygienic habits.⁴⁰ Months later, in August 1874, the common council finally approved comprehensive “Sanitary Laws,” detailing a whole list of measures to improve the sanitary conditions in Los Angeles: compulsory vaccination against smallpox under penalty of imprisonment, the obligation to notify the authorities of any contagious diseases and deaths, quarantine for city dwellers infected with cholera and smallpox, and the establishment of records of all births and deaths.⁴¹

Behind this legislation was the belief that disseminating knowledge would change people’s habits and increase their life expectancies. Because bacteriologists and public health advocates regarded water contamination as a decisive factor in disease, it was vital for them that people acquire more knowledge about the risks of bodily waste.⁴² This is why urban dwellers were literally “bombarded by information about . . . the germ,” as Nancy Tomas phrases it in her groundbreaking essay, “The Private Side of Public Health.”⁴³ The

38. *The Ordinances and Resolutions of the City of Los Angeles, Passed between the 19th Day of August, 1872, and the 8th Day of April, 1875, Inclusive. Compiled and Indexed by M. C. Desnoyers* (Los Angeles: Herald Publishing Company, 1875), 62–64.

39. *Ibid.*, 63.

40. *Ibid.*, 75–76.

41. *Ibid.*, 100–03.

42. On the connection between clean water and life expectancy, see Joel Mokyr and Rebecca Stein, “Science, Health, and Household Technology: The Effect of the Pasteur Revolution on Consumer Demand,” *The Economics of New Goods*, ed. Timothy F. Bresnahan and Robert J. Gordon (Chicago: University of Chicago Press, 1997), 168–72.

43. Nancy Tomas, “The Private Side of Public Health: Sanitary Science, Domestic Hygiene, and the Germ Theory, 1870–1900,” *Bulletin of the History of Medicine* 64, no. 4 (1990): 509.

transmission belt between the field of bacteriology and urban dwellers in Los Angeles and elsewhere was the city's health officer and his staff. They acted as "domestic sanitarians"⁴⁴ and as a driving force in urban sanitization, repeatedly pushing council members to pass motions in the field of public health. In 1890, health officer Granville MacGowan criticized residents' practice of irrigating with sewer water because of "the very questionable sanitary effect of sewage irrigation in our climate."⁴⁵ Moreover, using sewage for irrigation caused "much annoyance," MacGowan wrote, "especially in damp and foggy weather, by forcing the gases back into the city where they pour forth from every manhole, to the disgust and inconvenience of every one within reach of the stench."⁴⁶ Sanitizing Los Angeles was a matter of common sense about smell disorders, but it also was a matter of common knowledge about the dangers arising from human excreta and the lack of adequate personal and domestic hygiene.

Implementing sanitary principles and increasing life expectancy was part of what James C. Scott identifies as the "state's attempt to make a society legible."⁴⁷ To change human behavior, the state rearranged populations in a way that would make them governable. Knowledge production about a populace was essential in this regard. By establishing birth and death records or regulating how infectious residents could move (or not move) in urban spaces, the city authorities in Los Angeles produced knowledge about its territory and its people to govern them more effectively. In fact, the attempt to influence people's behavior was characteristic of the late nineteenth and early twentieth centuries. In most Western societies, authorities on different levels, from state or city governments to social reformers in local settlement projects, attempted to influence human behavior. However, this social engineering was not fully successful because attempts at legibility, according to Scott, oversimplified the complexity and diversity of its subjects and their environments.⁴⁸ This connects to more recent literature emphasizing individuals' agency in

44. Ibid., 510.

45. *Annual Report to the Board of Health of the City of Los Angeles by the Health Officer for the Fiscal Year Ending November 30, 1889* (Los Angeles: Evening Express Company, Printers, 1890), 4, Los Angeles County Public Health Library.

46. Ibid., 5.

47. Scott, *Seeing Like a State*, 2.

48. Ibid.

urban environments. In his book *West Ham and the River Lea*, Jim Clifford suggests not only that the state regulated water and behavior but also that the working-class residents of the city pressured the government to meet their own need for cleaner, less contaminated water. Clifford shows that Londoners had knowledge about their water and its contamination and pressed for action.⁴⁹ In the case of Los Angeles, the residents were articulate about their water needs, too.

There were two main shortcomings in the attempt to bring public health to Los Angeles. Both relate to the heterogeneity and ambiguity of local social practices, and both failures shatter the seemingly stable and linear ideas of knowledge dissemination. First, it would be misleading to portray public health efforts in Los Angeles as top-down attempts to impose new knowledge on passive recipients. In many cases, residents did not have to be convinced of the risks of unsanitary water. They had knowledge about unsanitary conditions in Los Angeles and frequently pressed council members to abate nuisances. In a letter to the city council dated July 8, 1889, a group of property owners on West Seventh Street complained that a sewer built on that street caused a great stench that “is intolerable, causing people driving by on street [sic] to hold their noses.”⁵⁰ In another petition, a resident complained about “stagnant water” in front of his residence, which “will cause disease unless removed at once.”⁵¹ As a consequence, he urged the council to improve public hygiene in the city. There were numerous similar petitions to the council demanding that Los Angeles be sanitized. Residents, and newcomers in particular, as well as tourists and transitory laborers passing through, acknowledged the unsanitary conditions in Los Angeles and pointed out that these conditions were retarding the development of the dusty town into a great American metropolis. Citizens took the lead in the making of urban technologies and actively participated in the production of hygiene knowledge. It would also be wrong to conceive of hygiene as a top-down effort to influence residents, because female householders played a pivotal role in further developing the public health

49. Jim Clifford, *West Ham and the River Lea: A Social and Environmental History of London's Industrialized Marshland, 1839–1914* (Vancouver: University of British Columbia Press, 2017), 101–03.

50. Petition to the City Council, July 8, 1889, Los Angeles City Archives (henceforth: LACA), Box B-4, Vol. 71.

51. Petition to the City Council, November 27, 1891, LACA, Box B-7, Vol. 81.

officer's approach. As Jennifer Koslow shows in her research, middle-class women in Los Angeles worked tirelessly to bring public health—nursing, midwifery, and housing reform—into the homes of working-class or immigrant people to uplift their standard of living.⁵² They did not simply act as intermediaries between city authorities and residents; they filled in during the absence of strong health authorities in Los Angeles. Instead of city authorities, affluent female reformers were central to the sanitary endeavor in Los Angeles.⁵³

The second shortcoming was that social planners overlooked the simultaneity of old and new technologies and the respective bodies of knowledge associated with them. David Edgerton famously points out that “the seemingly old was much more important than we sometimes care to recognize.”⁵⁴ Tellingly, in Los Angeles, different systems of water provision and waste disposal coexisted until the beginning of the twentieth century.⁵⁵ The *zanja* system was not abandoned until 1904, and this means that people could continue to use *zanja* water for household needs, irrigation, or industrial purposes until the beginning of the twentieth century.⁵⁶ Different technological systems of provision were connected with different bodies of knowledge, and while new routines in domestic hygiene took root in Los Angeles in the 1880s and 1890s, old techniques of waste disposal remained in use. This synchronicity of old and new technologies implied that residents might have knowledge about the dangers of contaminated *zanja* water, but they continued to dump their garbage into *zanjas*. This is exactly what happened in 1901 when the owners of the oil tanks on College Street drained some of their oil into the *Zanja Madre*, stirring a public outcry.⁵⁷ In other words, knowing did not necessarily result in changed behaviors. As a consequence,

52. Jennifer Lisa Koslow, *Cultivating Health: Los Angeles Women and Public Health Reform* (New Brunswick: Rutgers University Press, 2009), 2.

53. There also were social agencies, such as the Los Angeles Plaza Community Center, providing residents with hygiene instructions and a medical clinic. Saty Satya-Murti and Jennifer Gutierrez, “Addressing the Social Determinants of Health: A Los Angeles Community Center’s Narrative from 1913 to 1925,” *Southern California Quarterly* 101, no. 4 (2019): 357–95.

54. David Edgerton, *Shock of the Old: Technology and Global History since 1900* (London: Profile Books, 2008), 51.

55. On the simultaneity of old and new technologies, see *ibid.*, esp. ch. 2.

56. Hoffman and Stern, “The *Zanjas* and the Pioneer Water Systems for Los Angeles,” 19.

57. “Oil on the Waters Causes Trouble: Patrons of the *Zanja Madre* Make Complaint,” *Los Angeles Times*, March 31, 1901.

there was not always a causal link between knowing something and acting accordingly and no uniform way in which people interacted with water.

In addition, social planners ignored female householders' myriad forms of knowing. City authorities' educational work urging residents not to drink water directly from the taps but to boil water distributed this way instead or use chemical disinfectants in the household implicitly reveals how they underestimated women's ability to recognize the danger of floodwater contamination and their knowledge about how to safely use raw water in the domestic sphere.⁵⁸ In 1914, health officer L. M. Powers stated, "Impure drinking water . . . is the main cause of typhoid, and boiling it thoroughly before using is the only sure way to make such water safe."⁵⁹ The fact that this warning came as late as 1914 might hint at residents' delayed appropriation of sanitary principles. However, establishing public health in Los Angeles was no teleological (or linear) process. Rather, these campaigns expose how the utility and city boosters disregarded generations of accumulated knowledge about people's washing, cooking, and irrigating gardens in favor of uniform bacteriological knowledge and germ theory. What female householders accepted as validated knowledge depended on various factors: education, socialization, tradition, and religion, to mention only a few. Although difficult to discern in the primary sources, these alternative ways of knowing influenced their everyday practices and worked well for them. While the efforts to sanitize Los Angeles were devoted to turning "what was a social hieroglyph into a legible and administratively more convenient format," these campaigns overlooked the diversity and locality of women's ways of using water.⁶⁰ They also neglected the instability and contingency of knowledge dissemination. This becomes even clearer when we turn to practical knowledge about the maintenance and repair of household fixtures, such as water taps or toilet facilities, and household devices, such as water heaters.

58. On sanitation practices in pre-1850 America, see Melosi, *The Sanitary City*, 17–42; on water practices in early Los Angeles, see Hoffman and Stern, "The Zanjias and the Pioneer Water Systems for Los Angeles," 2–8.

59. "Boil Water You Drink! City Health Office Warns of Danger in the Wake of the Flood," *Los Angeles Times*, February 27, 1914.

60. Scott, *Seeing Like a State*, 3.

KNOWLEDGE ABOUT SAFETY AND MAINTENANCE OF
TECHNOLOGICAL APPLIANCES

In Los Angeles, access to engineered water supplies increased after 1890. As more and more migrants settled in the area, demanding a level of domestic comfort that they knew from their Midwestern homes, more and more houses in Los Angeles became connected to the water network. White middle-class householders were among the first who could afford to pay for tap water and for toilets attached to public sewers. However, it took some time for indoor sanitary appliances to become more common among urban dwellers in Los Angeles.⁶¹ A major immigrant group in Los Angeles, most Chinese Americans in the nineteenth century remained excluded from the water networks because they could not pay for house connections due to the intersection of race and class discrimination.⁶² Another reason for the uneven distribution of indoor sanitary appliances was Los Angeles's topography. With its hilly neighborhoods, the insufficient water pressure in underground mains remained a constant headache in Los Angeles well into the twentieth century.⁶³ This contributed to residents' exclusion from supplied water in Los Angeles.

The early decades of the twentieth century witnessed an increase in the number and sophistication of campaigns to influence people's water use practices. This coincided with the availability of inexpensive printed materials in North America, such as advice books, periodical literature, and utility pamphlets. With mounting frequency, the staff of LADWP's communication division produced a variety of manuals and mailers and sent them out to the customers. These were often welcome letters for new customers, detailing the utility's expectation of future user behaviors. In many cases, these circulars were delivered as inserts in water bills.

A first step to deciphering this user pedagogy is to trace the addressee: who were the residents that the utility's communication

61. On this nationwide development, see Maureen Ogle, *All the Modern Conveniences: American Household Plumbing, 1840–1890* (Baltimore: Johns Hopkins University Press, 1996), 119–52.

62. Torres-Rouff, *Before L.A.*, 219–27.

63. As an example, "Water Famine on Rose Hill," *Los Angeles Times*, September 22, 1916. In the face of high temperatures in 1918, the Bureau of Water Works expected, "in a few of the higher elevations . . . , that a scarcity of water may result. This will be not through an inadequate supply, but from the inability of the smaller laterals to carry a sufficient quantity to meet the demand." "Practice Conservation," *Public Service Bulletin*, May 1918, Vol. 2., No. 5, LADWP Records Center.

division wanted to educate? In essence, the manuals and mailers targeted white lower- to upper-middle-class house owners in Los Angeles,⁶⁴ as well as female householders who used indoor water technologies frequently.⁶⁵ While this story largely resolves without any known heroes (or known names), there are surprisingly few primary sources detailing what kinds of messages poor and/or non-white residents received. To the extent that they could not afford household connections, they did not receive LADWP's welcome manuals at all. Although the substandard living conditions of the urban poor and ethnic minorities aroused the attention of progressive health reformers and the wider public in the early twentieth century, actual standards of living and access to tap water in housing courts and Hoovervilles improved only gradually.⁶⁶ In addition, there is little evidence of how this differed by neighborhood and whether different census districts received different instructions. This might have to do with the uneven access to water networks, privileging homogenous middle-class households and disadvantaging the diverse majority of residents who could not pay for house connections, appliances, or large water bills. The fact that this user pedagogy primarily targeted white middle-class women and men also related to the prevailing model of citizenship in Los Angeles. Depicting Los Angeles as a white, wealthy, and sanitized city, both the utility and city council members marginalized nonwhite and poor residents, denying them full participation in the urban realm.⁶⁷

The manuals and mailers addressed a variety of topics, including knowledge about safety rules and maintenance skills among property owners and their tenants. Knowledge about safety requirements was

64. On the development of affordable tract housing for Los Angeles's working- and middle-class families in the first three decades of the twentieth century, see Kim Hernandez, "The 'Bungalow Boom': The Working-Class Housing Industry and the Development and Promotion of Early Twentieth-Century Los Angeles," *Southern California Quarterly* 92, no. 4 (2010): 351–92. Often, these houses had sewer, water, and electricity connections.

65. On the gendered division of housework tasks, see Ruth Schwartz Cowan, *More Work for Mother: The Ironies of Household Technology from the Open Hearth to the Microwave* (London: Free Association Books, 1989).

66. Reformer Jacob Riis played an important role in how progressive reformers in Los Angeles recognized housing as a public health issue. Riis visited Los Angeles in January 1905 on an inspection tour. See Koslow, *Cultivating Health*, 50–53.

67. Natalia Molina, *How Race Is Made in America: Immigration, Citizenship, and the Historical Power of Racial Scripts* (Berkeley: University of California Press, 2014); Stephanie Lewthwaite, *Race, Place, and Reform in Mexican Los Angeles: A Transnational Perspective, 1890–1940* (Tucson: University of Arizona Press, 2009).

of utmost concern for the utility's communication division. This was probably the field in which consumer pedagogy was most urgent. People drowned in cesspools, bathtubs, or *zanjas*, as the *Los Angeles Times* reported.⁶⁸ This is why the utility circulated guidelines telling residents how to safely use water infrastructure in public and private spaces. In particular, this concerned the construction and installation of house connections and new fixtures.⁶⁹ However, safety training was much more pressing with regard to electricity. Prior research has established that for the LADWP, the city service monopoly of both water and electric power distribution, people's safety concerns were a major obstacle in convincing them to switch their households from gas to electricity.⁷⁰ In turn-of-the-century Los Angeles, where electricity was first used for household lighting and then for other purposes as well, residents reluctantly moved from gas to power supplies. Their alternative bodies of knowledge about electrical power worked as an obstacle to the domestication of electricity. This is why Southern California Edison Company, the region's biggest private power utility company, informed residents that it was safe to use electricity in the domestic sphere, even belittling the "non-electrical person."⁷¹ Nevertheless, both Edison and LADWP continued to publish recommendations about how to handle electrical devices safely, warning customers, "Be Careful: Some Practical Suggestions Regarding the Using of Electrical Appliances."⁷² In the 1930s, electricity's assumed safety even became the selling argument for electrical devices. An advertisement from the 1930s called on consumers to buy electric water heaters. Emphasizing that a water heater was "flameless" and had "no dangerous, obnoxious fumes," this ad stressed the

68. One out of many examples, "Finds Death in Shallow Water: Buffalo Man Dies While in His Bath Tub," *Los Angeles Times*, January 3, 1910.

69. See *Rules and Regulations Governing the Rendition of Water Service by the Bureau of Water Works and Supply, Department of Water and Power, City of Los Angeles*, December 23, 1937, LADWP Records Center, WP05-47 (7).

70. About safety concerns among British consumers, see Graeme Gooday, *Domesticating Electricity: Technology, Uncertainty and Gender, 1880-1914* (London: Routledge, 2008), ch. 3; on American anxieties over electrification, see David E. Nye, *Electrifying America: Social Meanings of a New Technology, 1880-1940* (Cambridge, MA: MIT Press, 1991), 150-52.

71. H. R. Thomas, "The Consumer and the 'Mysterious Fluid,'" *Edison Current Topics* (December 1912), 13 and 17, Huntington Library, San Marino, CA, Southern California Edison Records, Box 308 (1).

72. As an example, "Be Careful: Some Practical Suggestions Regarding the Using of Electrical Appliances," *Edison Current Topics* (June 1917), 230, Huntington Library, San Marino, CA, Southern California Edison Records, Box 308 (6).

“advantage of safety,” which “should lead to a decision to replace your old water heater with an electric.”⁷³

How residents actually received this safety knowledge is difficult to say because there are only a few written documents detailing this process. It is, however, certain that their knowledge chiefly came from living with new technologies. They swiftly learned and knew how to use their water taps or flush their toilets, but it was not necessary for them to make the requisite knowledge explicit. In a slightly different context, Michael Polanyi talks about “tacit knowing,” which one can see as the implicit and often difficult-to-verbalize form of knowledge required to handle a complex technology.⁷⁴ Tacit knowing is a concept that is well suited to explaining how people appropriated the use of infrastructure.⁷⁵ Residents acquired know-how through training and observation and sometimes through trial and error.⁷⁶ It is also essential to consider the role played by various subaltern technicians in this process. Utility technicians, such as mechanics, meter men, workers at the garage department or substation managers, and contractors were pivotal in disseminating practical knowledge. Visiting households to conduct repair and renewal works or to read water meters, they often gave face-to-face lessons about the proper handling of water technologies. In many cases, their practical knowledge was more informal than the knowledge distributed through manuals and mailers, and this knowledge was, in turn, profoundly influenced by householders’ feedback—their needs, habits, and preferences. In a nutshell, it is crucial that we refrain from considering the utility’s and the consumers’ knowledge as contrasting. Both were interconnected and developed in parallel, and both were in themselves diverse, fluid, and changeable.

73. Bureau of Power and Light, “Hot Water with New Savings: Lowest Electric Rates,” [1930s], LADWP Records Center, WP21-6 (6).

74. Michael Polanyi, *The Tacit Dimension* (Chicago: University of Chicago Press, 1966).

75. On this discussion, see Chandra Mukerji, “Tacit Knowledge and Classical Technique in Seventeenth-Century France: Hydraulic Cement as Living Practice among Masons and Military Engineers,” *Technology and Culture* 47 (2006): 213–33; Sonja Petersen, “The Notebook and the Laboratory—Types of Knowledge in German Piano-Making, 1880–1930,” *History and Technology* 35, no. 1 (2019): 58–80.

76. Daniel Kahneman and Amos Tversky’s fast thinking heuristic system also helps explain how residents appropriated the use of infrastructure. Kahneman and Tversky differentiate two modes of thought: the one is fast and unconscious, the other is slow and conscious. Kahneman writes, “Expert intuition strikes us as magical, but it is not. Indeed, each of us performs feats of intuitive expertise many times each day.” Daniel Kahneman, *Thinking, Fast and Slow* (New York: Farrar, Straus and Giroux, 2011), 11.

One way to decode their knowledge is to trace how outreach workers, maintainers, and repairers anticipated the typical user and his or her behavior. More specifically, the utility's educational work almost always responded to patrons' specific behaviors. When these manuals and mailers expanded on their technological knowledge regarding the system's maintenance and repair—this was their second major theme after safety training—they taught the diverse class of customers the most basic engineering tasks because, from their viewpoint, there was a need to provide them with knowledge about the appropriate handling of technology.⁷⁷

In particular, handbooks and manuals emphasized engineering knowledge related to the connections between private houses and the city's water system and instructed consumers on how to find leaks in their pipes and fittings. Leaking pipes or fittings causing water loss were a major concern in semiarid Los Angeles. An LADWP mailer explicitly traced the source of wastage back to "leakage due to defective plumbing."⁷⁸ Rather than urging people to change their consumption patterns, it detailed a number of possible technical failures of water infrastructure: "The water closets may be out of repair and wasting water either in the process of flushing or when not in use. The faucet in the kitchen or bathroom may not shut off tightly. The hydrants in the yard may be worn or carelessly allowed to run."⁷⁹ What is important is that this mailer was not about responsible consumption, but about keeping water infrastructure in good condition. To detect leaks and to stop wastage, property owners had to make sure that all household appliances stopped consuming water, and then they had to track the meter's pointer to see whether it was still moving. If it moved, water was running through defective fixtures. With regard to toilet bowls, LADWP's handbooks informed property owners that it was often difficult to detect small streams of water spreading out in a porcelain bowl. Thus, one handbook recommended, "Bend a piece of stiff paper and hold it against the bowl

77. On the recent turn to maintenance and repair studies in the history of technology, see Andrew L. Russell and Lee Vinsel, "After Innovation, Turn to Maintenance," *Technology and Culture* 59, no. 1 (2018): 1–25; Steven J. Jackson, "Rethinking Repair," in *Media Technologies: Essays on Communication, Materiality and Society*, ed. Tarleton Gillespie, Pablo Boczkowski, and Kirsten Foot (Cambridge, MA: MIT Press, 2014), 221–39.

78. Bureau of Water Works and Supply, "Results of Water Wastage: Source, Detection and Prevention," undated, 2, LADWP Records Center, WP05–63 (11).

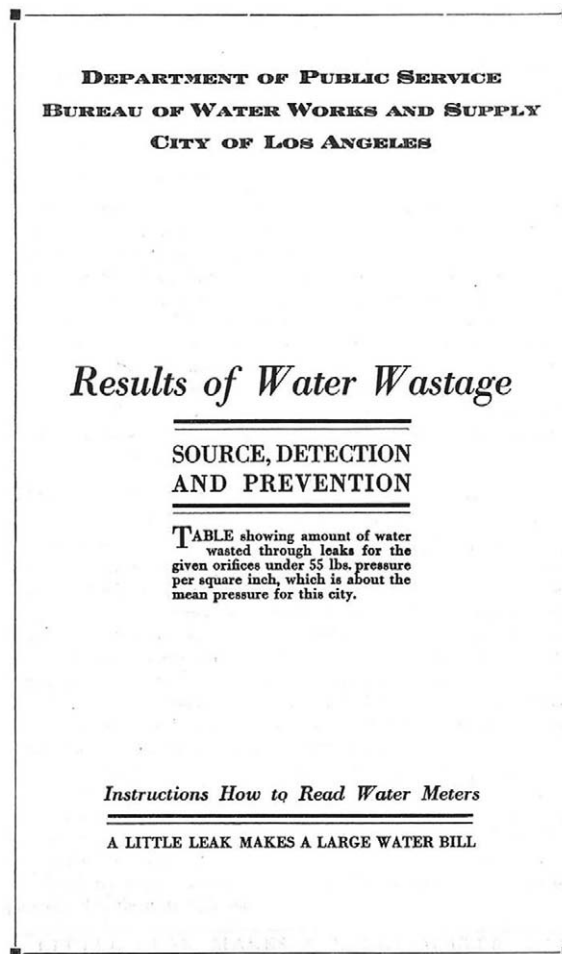
79. *Ibid.*

beneath the inlet, allowing the water to run down the curve.”⁸⁰ According to this handbook, this was the easiest way to find poorly working appliances in the household. Advising property owners to repair leaks themselves, one manual sought to disseminate maintenance knowledge and to foster individual responsibility for the good working condition of toilet facilities: “Keep the toilet flushing apparatus in good condition. The water meter is a perpetual invoice.” Not only was the meter “a perpetual invoice,” but it was also a subtle power technology that influenced consumers’ knowledge about domestic appliances. The addressee was imagined by the utility’s communication division to be the male head of the household, who had the talent and skill to do the maintenance and repair work. Encouraging male householders to handle toilet bowls, taps, and bathtubs with care, these handbooks tried to push people to accept responsibility for the good working condition of their domestic infrastructure and to have control over it.

Even when the bureaucratic and technocratic state is on full display here, it is crucial that we keep in mind that residents had agency and power to appropriate water infrastructure into their everyday needs, habits, and practices. By no means did the dissemination of safety and maintenance knowledge produce controllable subjects. This conclusion is supported by the fact that the LADWP’s instructions deemed it necessary to emphasize the significance of practical knowledge about repair, helping residents avoid breakdowns. Because manuals and mailers were revealing with regard to user behaviors, they signal a scarcely verbalized uneasiness over users’ willingness to anticipate technology’s needs. Further evidence comes from reports about patrons’ deficient understanding of water bills or their mishandling of water fixtures.

If it is true that the utility’s pedagogy responded to specific behaviors of users, the belief that consumers lacked comprehension skills about their water bills was a major driving force at the time. Consumers needed to learn to read the meter, the LADWP’s outreach workers assumed, so that they would better understand their final totals and refrain from filing complaints with the utility. There is plenty of archival evidence suggesting that (male) residents frequently

80. “Electric and Water Service Rate Schedules and General Information for Consumers,” November 1, 1927, 27–28, LADWP Records Center, WP05–46 (15).



The cover of this undated booklet by the Bureau of Water Works and Supply (LADWP) is a good example of the educational work of the water utilities. It sought to teach consumers how to detect and repair leaks and how to read their water meters. In the process it not only conveyed technical knowledge but also fostered individual responsibility for maintaining domestic appliances in good working order. The booklet's cover included sketches of a power-generating station and the Los Angeles Aqueduct. *Courtesy of Los Angeles Department of Water and Power.*

sent complaint letters to the LADWP headquarters or the city council. In 1892, for instance, a contractor named Dodd gained publicity by urging council members to lower rates for water used in cement work.⁸¹ Against the backdrop of such letters, one set of instructions detailed how to read the water meter. As a first step, consumers had to

81. "The Water Rates: Special Session of the Council Yesterday," *Los Angeles Times*, February 12, 1892.

make sure that the meter was registering at all. To do so, they should “allow water to pass through [the meter]. If it is registering, movement of the pointer will occur on the dial of lowest measurement which . . . is that marked ‘One Foot.’”⁸² As a second step, this set of instructions advised patrons, “The best method of reading is from low to high. First read the dial marked ‘10’; then the one marked ‘100’ and continue in the order shown by the figures on the outside of each dial.”⁸³ Supported by meter men visiting the household in person, these instructions may read like trivial introductions to a mundane technological artifact’s functioning, but many people were encountering meters for the first time in the early twentieth century.

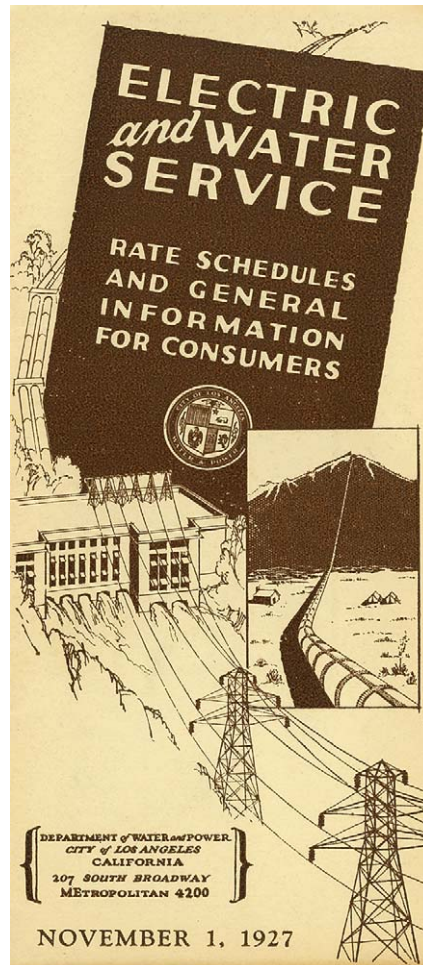
Connected to such a deficient understanding of water bills was the problem of the improper handling of water fixtures. For instance, while visiting the Del Rey Land and Water Company’s pumping plant, Mr. Fitts of the Southern California Edison Company (the private water and power entity serving other parts of Los Angeles County) discovered that, according to the written report, a hole had been “drilled in the side of the meter and a wire [had been] inserted with a bend which caught hold in the disk, keeping the meter from registering. To my mind, it was a deliberate plan.”⁸⁴ This quotation reveals how consumers (in this case, industrial workers) sought their way around the devices’ script of intended use to make them fit their needs (e.g., avoiding large bills). This quotation also shows how maintainers and repairers functioned as go-betweens, mediating the utility’s educational work and consumers’ needs. They frequently urged consumers to call the meter man immediately in cases in which the meter did not register accordingly when water was passing through it.⁸⁵ As a result, the LADWP representatives, such as meter men and repairmen, believed that knowledge about the system’s technological functioning should enable people to weave themselves into infrastructures as assemblages of material and immaterial components. In this way, they should become cogs in complex systems of circulation. Infrastructures were depicted as autopoietic—that is, capable of

82. “Electric and Water Service Rate Schedules,” 28.

83. *Ibid.*, 29.

84. Letter from District Agent to C. A. Howell, November 21, 1913, Huntington Library, Southern California Edison Records, Box 37 (1).

85. “Electric and Water Service Rate Schedules,” 29.



The Los Angeles Department of Water and Power issued a thirty-three-page booklet in 1927 explaining electric and water service rate schedules and general information for consumers. *Courtesy Los Angeles Department of Water and Power.*

maintaining themselves.⁸⁶ Users were envisaged to be part of this system, which blurred the lines between innovators, producers, maintainers, and consumers. In order to influence them to anticipate the requirements to sustain such a system of circulation, the utility's communication division aimed to familiarize consumers with knowledge about the maintenance and repair of sanitary appliances.⁸⁷

86. I borrow from Niklas Luhmann's description of society as autopoietic system, see Niklas Luhmann, *Theory of Society, Volume 1*, trans. Rhodes Barrett (Stanford: Stanford University Press, 2012), 32.

87. On building and maintaining the home according to sanitary principles, see Tomes, "Private Side of Public Health," 524–25.

However, most householders did not intentionally mishandle their fixtures; rather, they creatively appropriated meters and integrated them into their household needs. How such knowledge about a technology and its use was produced by both the utility's various actors (outreach workers, maintainers, and repairers) and users (property owners, female householders, and working-class immigrants) becomes more apparent through an analysis of debates about what "normal" consumption could mean.

KNOWLEDGE ABOUT "NORMAL" CONSUMPTION

In turn-of-the-century Los Angeles, conceptions of "normal" water consumption were contested. City boosters, social reformers, female householders, and recent migrants to the region nurtured significantly different notions about who was entitled to use what amount of water. From the LADWP's point of view, taking responsibility for proper water consumption was related to taking responsibility for minor maintenance of dripping faucets. This concept of "responsibility" was a case of the moral suasion that marked progressive-era reform. However, while the LADWP tried to implement social standards of behavior, their moral suasion clashed with the "entitlement thinking" among some of the middle-class householders in Los Angeles.

As the LADWP's outreach workers asked customers not to waste water, recommending specific household practices that would help householders save water, this came as an indicator that from the utility's viewpoint, consumers used more water than they should. However, as the selling of water was the LADWP's prime source of income, water conservation mitigated its revenue. This indicates that other motives must have contributed to this water-saving campaign as well. On the one hand, the campaign highlighted the scarcity of this resource in semiarid Los Angeles and made it seem more precious, thus helping customers accept their bills. On the other hand, the campaign tried to counter the problem of infrastructure overload. It was based on the fear that because of their poor condition, many underground mains would not be able to satisfy the constantly growing demand. Conversely, property owners demanded continuous and high-pressure supplies while they insisted on flat-rate billing. From this perspective, water conservation campaigns reveal disputed ways of knowing about proper levels of consumption.

The LADWP's communication division only taught a very limited group of residents how to consume water. In particular, they targeted recent migrants to the area to convert them from their old knowledge about water use to the new normal in Los Angeles. These people had come to Southern California from the East or Midwest and had transferred to Los Angeles specific expectations and a particular kind of knowledge: expectations about how a city should look and knowledge about landscape gardening, irrigation, and agriculture.⁸⁸ In particular, the idea of the green lawn was a notion that was imported to Los Angeles from the wet states in the United States (and originally from England) and, alongside the necessary irrigation equipment, profoundly remade the geographies of Southern California.⁸⁹ It was these migrants with their old knowledge who, in the LADWP outreach workers' eyes, had to be educated in water conservation.

However, these teaching efforts were not fully successful. Most migrants and settlers insisted on using water as they deemed necessary. This becomes clear when we analyze how consumption numbers changed over time. In the short period between 1920 and 1928, the average daily water consumption within city limits grew by 87 percent from 80 million gallons to 150 million gallons.⁹⁰ While this increase paralleled the explosion of population numbers between 1920 (576,673) and 1930 (1,238,048), it also signals that residents did not actually constrain their water use. Further evidence comes from the fact that the utility continued throughout the twentieth century to reissue water conservation campaigns almost every summer. In particular, teaching efforts intensified in the 1970s in the wake of

88. Harris Newmark, in his *Sixty Years in Southern California*, tells about the introduction of truck gardening in Los Angeles by an immigrant from Alsace named Andrew Briswalter. Newmark and Newmark, *Sixty Years in Southern California 1853–1913*, 124. On migrants and their knowledge, see Simone Lässig and Swen Steinberg, "Knowledge on the Move: New Approaches toward a History of Migrant Knowledge," *Geschichte und Gesellschaft* 43 (2017): 313–46.

89. As an example, see Imperial Land Company, *From Desert to Garden, From Worthlessness to Wealth. As Illustrated in the Imperial Settlements, San Diego County, Southern California*, (Los Angeles: Times-Mirror Printing and Binding House, [c1902]). To contextualize, see Virginia Scott Jenkins, *The Lawn: A History of an American Obsession* (Washington, DC: Smithsonian Institution Press, 1994); also important Kenneth T. Jackson, *Crabgrass Frontier: The Suburbanization of the United States* (New York: Oxford University Press, 1985), 54–61; Andrea Gaynor, "Lawnscapeing Perth: Water Supply, Gardens, and Scarcity, 1890–1925," *Journal of Urban History* 46, no. 1 (2020): 65.

90. *Costly Service—Low Rates* (Los Angeles: Department of Water and Power, September 1928), LADWP Records Center, WP05–45 (28).

environmental movements and broader sociocultural transformations,⁹¹ and they are still present in Los Angeles today.⁹² The fact that the LADWP's teaching did not really change people's consumption patterns leads us back to the contingent process of deliberating normal consumption.

From a historian's perspective, disputes about responsible consumption illustrate that the utility, city officials, engineers, and private businesses were sending different messages to city dwellers regarding their water consumption, contributing to the people's varying concepts of proper usage. As a result, householders nourished their own ideas of what amount of water they were entitled to use and what it meant for them to be city residents. This was intimately connected with knowledge.

First, there were tensions between water conservation efforts and the simultaneous national advertising campaigns for soap, chemical disinfectants, and washing machines in newspapers and magazines read by the middle class, teaching them new levels of hygiene and water use.⁹³ The first of its kind in Los Angeles, a 1916 exhibit presented "ideas in personal hygiene" and was a milestone in the promotion of specific levels of water use.⁹⁴ Organized by the Los Angeles Health Extension League, this exhibit contributed to familiarizing privileged residents with new knowledge of bodily hygiene. In previous years, newspapers and magazines had published ads promoting hygiene and water use. A *Los Angeles Times* article from 1903 advertised soap and water as "essential aids to a healthy and beautiful skin,"⁹⁵ while another exemplary article from 1910 distributed

91. See materials on the "Conservation Speaking Program," 1976–78, LADWP Records Center, WP05–55 (17).

92. For one of the more recent water saving campaigns in Los Angeles, see "Save the drop," <<http://savethedropla.com>> (accessed March 25, 2020). It would be intriguing to connect past water conservation efforts to potential lessons we could learn today. Even if this is not the prime concern of this article, it seems noteworthy that the rules put forward by the water bill insert quoted in the introduction are still relevant today. This points to the persistence of patterns of human behavior throughout history, and it reveals another way in which Los Angeles's present connects to its past.

93. On the rise of advertising in magazines and the role of soap, see Frank Luther Mott, *A History of American Magazines, 1885–1905* (Cambridge, MA: Harvard University Press, 1957); James D. Norris, *Advertising and the Transformation of American Society, 1865–1920* (New York: Greenwood Press, 1990).

94. "Exhibit Is for Race Betterment: Health and Welfare Show to Open Tomorrow," *Los Angeles Times*, February 27, 1916.

95. "Soap and Water Essential Aids to a Healthy and Beautiful Skin," *Los Angeles Times*, January 25, 1903.

recommendations regarding “practical hygiene.”⁹⁶ In the same vein, soap manufacturers advertised their products, targeting female householders in particular.⁹⁷ Addressing the upwardly aspirant middle class, soap advertisements taught readers that washing their hands and taking a bath would set them apart from lower classes.⁹⁸ Fels Naptha soap was said to “save woman’s life,”⁹⁹ while Sapolio soap, according to an 1888 jingle, would not only make housework easier, but would also bring back zest for life and love.¹⁰⁰ Around that time, bathroom fixture companies sought to sell their bathtubs and toilets to homeowners.¹⁰¹ An advertisement in *Cosmopolitan* promised “Your Home is made healthy, modern, and beautiful with an equipment of snowy ‘Standard’ Porcelain Enameled Ware.”¹⁰² Many ads connected efforts to be hygienic with new levels of middle-class domestic comfort.¹⁰³ They promoted a lifestyle that required large amounts of water.

Second, there were tensions prevailing between water conservation efforts and the contemporaneous publicity by the Chamber of Commerce and booster magazines, such as *Land of Sunshine* or later *Out West*, promoting tourism and settlement.¹⁰⁴ Settlement was further supported by popular culture books nudging readers to take the water they needed.¹⁰⁵ Even after migrants had settled in the region,

96. “Care of the Body: Suggestions for Preserving Health,” *Los Angeles Times*, May 1, 1910.

97. “For Laundry and Kitchen Use: Brewster’s Eureka Labor-Saving Laundry Soap,” University of Southern California, Los Angeles (henceforth: USC), Libraries, Special Collections, American Advertising Ephemera Collection, Box 1 (11).

98. “Sapolio” Advertisement, *The Ladies’ Home Journal*, January 1888. Special thanks to Merry Ovnick for referring me to some of the advertisements mentioned in this section.

99. “Saves Woman’s Life!,” *Woman’s Home Companion*, April 1905.

100. Quoted in Norris, *Advertising and the Transformation of American Society*, 66–67. The jingle appeared in *Overland Monthly*, December 1888.

101. *Bathrooms of Character* (Trenton NJ: The Trenton Potteries Company, 1922), 2, USC Libraries, Special Collections, American Advertising Ephemera Collection, Box 1 (14).

102. *Cosmopolitan*, November 1907.

103. Daniel Delis Hill, *Advertising to the American Woman 1900–1999* (Columbus: Ohio State University Press, 2002), 38–68.

104. As an example from the magazine’s first issue, see Fred L. Alles, “The Cost and Duty of Water,” *Land of Sunshine: A Southern California Magazine*, September 1894, 80–81.

105. In Mary Austin’s famous *The Land of Little Rain*, a study of Southern California’s desert ecology and its people, there is an essay titled “Other Water Borders,” in which the first sentence reads: “It is the proper destiny of every considerable stream in the West to become an irrigating ditch.” Mary Hunter Austin, *The Land of Little Rain* (Boston: Houghton Mifflin Company, 1903), 225. A seminal work of environmental writing, Austin’s book takes a critical stance toward the manipulation of water in an arid region.

boosters encouraged them to use as much water as necessary to keep the city green. A prominent example was the vacant lot movement. Emerging in the early years of the twentieth century, this movement called on property owners to clean their vacant lots. It was initiated by the Los Angeles Realty Board, another booster organization.¹⁰⁶ The Realty Board complained that vacant lots were “dumping-ground[s] for all sorts of rubbish” and “a real menace to the neighborhoods in which they are situated.” Even though council members were skeptical in the first place, the vacant lot movement developed into a major campaign urging residents to use as much water as they needed.¹⁰⁷ In 1917, the LADWP’s communication division even published several articles about granting free water to vacant-lot gardeners.¹⁰⁸ This was part of the federal campaign to get homeowners and communities to make every acre of land productive during the First World War.¹⁰⁹ Another LADWP campaign targeted women and their irrigation practices in their home gardens. Distributing knowledge on how to plant flower gardens, it endorsed specific irrigation schemes to maximize crop growth and pushed women not to save on water.¹¹⁰ There was also a large body of more general advice literature for homeowners, disseminating knowledge on how to irrigate plants and vegetables effectively.¹¹¹ However, encouraging them to irrigate their lands came with unintended side effects: while the utility individualized public services, it also limited its own water conservation programs. The *Public Service Bulletin* openly admitted in 1918 that high-level irrigation by vacant lot gardeners was a contributing factor to water shortages.¹¹²

The LADWP’s teaching efforts were geared toward disseminating knowledge about how to use water in the home economically.

106. “Clean the Vacant Lots,” *Los Angeles Times*, August 15, 1903.

107. See also LACA Records Center, Box C-4, Folder “Vacant Lots, Special Committee on Cleaning, 1904.”

108. “Water: City Grants Free Water to Vacant Lot Gardeners,” *Public Service Bulletin*, May 1917, Vol. I, No. 2, LADWP Records Center.

109. “The Aqueduct in Peace and War,” *Public Service Bulletin*, June 1917, Vol. 1, No. 3, LADWP Records Center.

110. “Irrigation of the Home Garden,” *Public Service Bulletin*, May 1917, Vol. I, No. 2, LADWP Records Center. On a side note, contrasts with LADWP’s more recent water pedagogies are particularly apparent with regard to this document. See also footnote 92.

111. *Ibid.*

112. “Practice Conservation,” (1918).

However, they were clearly in tension with attempts to foster public hygiene and promote the city to prospective tourists and settlers. A third point of irritation for (white and wealthy) urban dwellers was the massive infrastructure built at that time, which was supposed to bring water from a distance to Los Angeles. Large infrastructural projects, such as the Los Angeles Aqueduct and the Metropolitan Water District's Colorado River Aqueduct, which was completed in 1941, were quite present in the everyday lives of city dwellers. This was bound up with the financing of the construction of these large technological systems through bond issues on the ballot.¹¹³ These bond issues linked the urban environment with property owners' tax bills, and they constantly led affluent residents to care about this city-building technology. To counteract their resistance, the LADWP's communication division took great pride in reminding customers of the importance of this infrastructure for Los Angeles. The number of brochures and leaflets dealing with the Los Angeles Aqueduct as a great feat of engineering is legion.¹¹⁴ In these years, the aqueduct was widely extolled as a matter of civic pride, supporting Los Angeles's self-stylization as modern and progressive. How deeply the city's middle class was involved with Los Angeles's water infrastructure is further demonstrated by the fact that some residents even collected personal reminiscences of their encounters with the aqueduct. In 1915, just two years after the Los Angeles Aqueduct was completed, two friends drove north from Hollywood by car to see where their water came from. One of them photographed their trip and collected the images in a photo album.¹¹⁵ Of course, not everyone owned a car and went to the aqueduct. However, it is safe to say that water infrastructure in Los Angeles was a big thread of discussion among most

113. "Bonds Carried by About Five to One: Water Question Happily Settled—Opposition Defeated in Every Precinct in the City," *Los Angeles Times*, August 29, 1901; "Our Water Supply Must Not Fail: Vote 'Yes' on Water Bond Issues June 2nd Election," 1925, LADWP Records Center, WP05-14 (6); "Water & Power Are Vital Necessities of Life, Growth & Prosperity: Vote 'Yes' on Water and Power Bonds August 31st, 1926," LADWP Records Center, WP05-14 (7); Los Angeles Department of Water and Power, "Water for Los Angeles" (pamphlet), June 1991.

114. As examples, *Water Wheels of Progress: An Account of Los Angeles and Its Water Supply from 1781-1939* (Los Angeles: Bureau of Water Works and Supply, 1939), LADWP Records Center, WP05-45 (23); *Water and Power 1902-1952: Five Decades that Transformed Los Angeles* (Los Angeles: Department of Water and Power, 1953), Los Angeles Public Library.

115. Julius G. Oliver, *The Los Angeles Aqueduct: Itinerary of the Water of Los Angeles Aqueduct from Its Source to 1837 Canyon Drive 260 Miles* (Los Angeles 1917), Huntington Library, photCL 442.

middle-class people.¹¹⁶ The residents concluded that there was plenty of water in the city. As a result, they did not understand why they should save water.

Archival evidence suggests that the members of the white and middle class in Los Angeles developed their own ideas of responsible consumption, which contributed to knowledge “from below” about the use of infrastructure. An interesting case study related to these alternative ways of knowing how much water they needed is the meter question. It was in the course of the late 1880s and early 1890s that the public in Los Angeles began to regard water meters as a suitable means of water conservation.¹¹⁷ Yielding to the arguments of William Mulholland, who was an outspoken proponent of the meter system, the city council passed an ordinance in 1902 providing for the installation of meters in the city, but this process was slow to gain momentum;¹¹⁸ in other American cities, the metering of private homes happened more quickly.¹¹⁹ This had to do with residents’ anxieties that meters would be too expensive or that water bills would rise. In the end, the highly controversial installation of water meters caused a backlash from groups opposing water conservation. While the utility’s outreach workers urged consumers to save water by constraining household consumption, Charles Howland, a citizen of Los Angeles, sued the municipal water board in 1902 because a water meter was installed on his property and he was billed according to his metered consumption. The *Los Angeles Times* reported that his bill had been increased from a \$2.60 flat rate to a \$7.85 meter rate.¹²⁰ He argued that “he didn’t waste any water before the meter was put in; he just used water enough.”¹²¹

Howland’s case was anything but exceptional. In August 1902, the *Los Angeles Times* chronicled a similar court case in which a citizen

116. LADWP also employed architecture as a means of advertising. Stuart W. Leslie, “‘The Romance of Water and Power’: Architecture as Advertising,” *Southern California Quarterly* 99, no. 3 (2017): 290–328.

117. George Read, “Metering of Los Angeles,” *Journal (American Water Works Association)* 9, no. 3 (1922): 426–35.

118. On the debates about meters in Los Angeles, see “Water Waste and Meters,” *Los Angeles Times*, August 16, 1903; “Saving of Water Uppermost Theme,” *Los Angeles Times*, July 30, 1904.

119. Melosi, *The Sanitary City*, 126.

120. “Wants His Water Meter Taken Off: Charles Howland Sues the Local Water Board,” *Los Angeles Times*, July 31, 1902.

121. *Ibid.*

named George Weeks appeared “before the Board of Water Commissioners with an objection to paying meter rates for his water, when his neighbors were still paying the flat rate.”¹²² Ultimately, Weeks’s appeal was successful, and the utility’s engineers removed the meter from his premises. These episodes reveal that knowledge about rational consumption was contested in turn-of-the-century Los Angeles. Primary sources also show that property owners were especially suspicious when it came to meter men visiting their premises to read the meters. A report sent to the meter department at the Southern California Edison Company noted, “In nearly every case[,] it is necessary for him [the meter man] to explain to the people his purpose in testing the meter.”¹²³ Some residents even went as far as to demolish their water meters because they feared rising water bills.¹²⁴ Like so many others, they favored ideas of what they considered responsible water usage that differed from those of social reformers, council members, and the utility’s communication division. This was due to their alternative and changeable knowledge base about irrigation and household consumption.

To some degree, these different ideas about proper water consumption point to the underlying tensions between individual and public priorities. Residents’ expectations about individual freedom and self-reliance co-existed with their expectations regarding a stable and centrally organized water provision.¹²⁵ Back in the 1890s, when a private monopoly managed Los Angeles’s water, property owners filed petitions with the city council protesting against water rates or the poor condition of water mains, they argued from a position of self-confidence as consumers with rights to efficient public services.¹²⁶ One can even observe “a growing sense of entitlement and consumer

122. “Return to Flat Rate Secured by Consumer,” *Los Angeles Times*, August 12, 1902.

123. Letter from B. F. Pearson to W. L. Frost, August 26, 1909, Huntington Library, Southern California Edison Records, Box 39 (11).

124. “Meters Demolished by Angry Patrons,” *Los Angeles Times*, December 15, 1917.

125. On a similar contemporaneous attempt of balancing individual rights and the public good, see Bessie D. Stoddart, “Recreative Centers of Los Angeles, California,” *The Annals of the American Academy of Political and Social Science* 35, no. 2 (March 1910): 218–19. These tensions even have conceptual equivalence for today. Donald M. Berwick, “The Moral Determinants of Health,” *JAMA*, June 12, 2020.

126. About protests against water rates, see Petition to the City Council, February 8, 1892, LACA, Box B-7, Vol. 95; about protests against the poor condition of water mains causing stagnating water in front of premises, see Petition to the City Council, October 17, 1891, LACA, Box B-7, Vol. 81.

awareness” in these years that was new in the history of consumption, as Frank Trentmann argues.¹²⁷ In a petition dated August 17, 1891, a landlord considered his water rate “exorbitant” and his water supply “inferior.” He asked the council for permission to attach a water supply to an outside ditch “or that his water supply may be increased and of better quality.”¹²⁸ Questions of water quality, as well as questions of low water pressure and interruptions at night, were frequently addressed by property owners in their petitions to the council. In a lengthy letter to the council, a resident claimed that the city water was “wholly unfit for domestic use.”¹²⁹ It is unclear whether he was referring to contamination or intermittent water supplies. Remarkably, the low water pressure causing intermittent supplies was a major problem in Los Angeles at the time.¹³⁰ The fact, however, that property owners stressed that they were worried about the poor state of water infrastructure in the public realm connects to their vital role in the advent of the municipal water in 1902, the development of Los Angeles, and their own knowledge of normal consumption. Even the *Los Angeles Times* reported about a group of residents in South Pasadena who demanded an inquiry “to determine the responsibility for the scarcity of water during the recent hot spell, when a portion of the city was entirely shut off for several hours.”¹³¹ As dependency on access to tap water had been effected in most neighborhoods by 1910, these petitions reveal the rise of the self-confident consumer and an emerging “entitlement thinking” in the late nineteenth century—thinking that the LADWP would have to take into account.¹³²

How much water urban dwellers were entitled to use was disputed in Los Angeles in the early decade of the twentieth century. This came from the fact that various bodies of knowledge circulated in this dynamic town—knowledge about the proper use of indoor water

127. Frank Trentmann and Vanessa Taylor, “From Users to Consumers: Water Politics in Nineteenth-Century London,” in *The Making of the Consumer: Knowledge, Power and Identity in the Modern World*, ed. Frank Trentmann (Oxford: Berg, 2006), 53–79, 65.

128. Petition to the City Council, August 17, 1891, LACA, Box B-7, Vol. 81.

129. Petition to the City Council, January 16, 1891, LACA, Box B-6, Vol. 78.

130. See petition of the Los Angeles City Water Company to the City Council, complaining about the flushing of sewers at daytime, “depriving many sections of the City of a reasonable supply of water for domestic use, during those hours,” August 3, 1891, LACA, Box B-7, Vol. 80.

131. “Inquiry Is Urged: South Pasadena Citizens Want to Know About the Shutting Off of Water Recently,” *Los Angeles Times*, May 9, 1910.

132. On similar developments in London, see Clifford, *West Ham and the River Lea*, 72–94.

infrastructure, about turf watering, or about personal hygiene routines. What people in Los Angeles regarded as validated knowledge was diverse and local, as well as subject to temporal and spatial variations. It is exactly this fluidity, hybridity, and contestation that make a history-of-knowledge perspective telling for an understanding of how urban residents adapted to having water supplies and technologies in their everyday lives.

CONCLUSION: SOME CONCEPTUAL IMPLICATIONS FOR THE HISTORIOGRAPHY OF INFRASTRUCTURE AND KNOWLEDGE

This article offers an account of how urban dwellers in progressive-era Los Angeles integrated water taps, bathtubs, and toilets into their everyday routines and how knowledge contributed to this appropriation of technology. Historically, its focus is on the time “when old technologies were new”—when water mains were constructed and water taps, toilets, and meters installed.¹³³ These seemingly mundane technologies pushed deeply into residents’ lives, changing how they performed their daily hygiene, consumed water, and built their homes. As Los Angeles flourished in a semiarid region in which water was (and is) a scarce resource, discourse about appropriate levels of water use was prevalent. The water conservation programs of the late twentieth and early twenty-first centuries, therefore, have a long prehistory. From their very beginning, they functioned as an elaborate power technique in the urban realm, regulating people’s consumption patterns, governing their everyday habits, and influencing their class, race, and gender identities. Nonetheless, urban dwellers often proved to be headstrong, tenacious, and independent in using water as they needed. As a result, this study demonstrates that class, race, and gender identities were formed in the local sites of homes and neighborhoods, as well as through the interaction with quotidian technological artifacts, such as water meters and toilet fixtures.

Proposing that the history of knowledge offers important questions and tools that enable us to analyze the use of these technologies, the article surveys three fields of knowledge: hygiene, maintenance, and conservation. Conceptually, the article helps establish the intersection of the histories of practical knowledge and domestic

133. Carolyn Marvin, *When Old Technologies Were New: Thinking about Communications in the Late Nineteenth Century* (Oxford: Oxford University Press, 1988).

infrastructure as a fruitful field of inquiry. Adapting to having new infrastructure in the household, people required specific bodies of knowledge. This knowledge was derived from manuals, mailers, and general advice literature, but it was also developed in the experiential interaction with devices through observation, imitation, and trial and error. Knowledge was mutually produced by a vast number of actors: the utility's publicity departments, meter men, municipal health authorities, council members, newspaper editors, middle-class reformers, property owners, working-class immigrants, and female householders. It is also remarkable that knowledge never took any definite or normal forms. Rather, knowledge remained dynamic, contingent, and local. The contested and contingent history of knowledge can therefore serve as a useful lens through which to research the myriad ways that people used water infrastructure in their everyday lives. Furthermore, the history of knowledge about using technologies can shed light on processes of inclusion and exclusion and the mediation of citizenship in Los Angeles and beyond.