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Thirst: A Short History of Drinking Water

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THIRST: A SHORT HISTORY OF DRINKING WATER

James Salzman*

Introduction

Nestled in the Andes, the Bolivian city of Cochabamba lies in a fertile valley astride the banks of the Rocha River.[1] Bolivia is the poorest country in South America, with two-thirds of its population below the poverty line.[2] As in many developing countries, over 40% of Cochabamba's 800,000 residents lack access to a water supply network.[3] And even those that do have pipes cannot depend on reliable service. The poor often live in squatter settlements on the outskirts of town, relying for their drinking and domestic water supplies on private vendors. In a cruel irony, the poorest end up paying much more for their water than wealthier citizens connected to the city's water mains.[4]

As part of a nationwide project to improve provision of municipal services, the government of Bolivia launched a major privatization reform effort in the late 1990s.[5] Prompted by financial institutions such as the International Monetary Fund and World Bank, the Bolivian government actively sought out private investor management for Cochabamba's water and sewage services.[6] Treating drinking water as a priced good under private management, it was widely argued, would improve the water supply system infrastructure and delivery by injecting much-needed capital, greater efficiencies, and increased attention to customer needs.[7] A forty-year concession for water and wastewater services in Cochabamba was granted to an international private consortium headed by Bechtel and known as Aguas del Tunari.[8] In the national law passed to

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* Professor of Law & Nicholas Institute Professor of Environmental Policy, Duke University. This article is dedicated to Carol Rose, who taught me how to think about natural resources and much more. I am grateful for the valuable research assistance provided by Kelcey Patrick-Ferree and Jena Reger.

[1] Bolivia Web available at http://www.boliviaweb.com/cities/cbba.htm.

[2] Latin American Bureau: Bolivia available at http://www.latinamericabureau.org/?lid=1992.

[3] Erik B. Bluemel, *The Implications of Formulating a Human Right to Water*, 31 ECOLOGY L.Q. 957, 965 (2004).

[4] Elizabeth Peredo Beltran, *Water, Privatization and Conflict: Women from the Cochabamba Valley*, GLOBAL ISSUE PAPERS NO. 4, 13 (Apr. 2004). The water sold by vendors can cost ten times more than water from the water mains. William Finnegan, *Leasing the Rain,* THE NEW YORKER (April 8, 2002) at 43, xx [hereinafter New Yorker].

[5] Maria McFarland Sanchez-Moreno & Tracy Higgins, *Special Report: No Recourse: Transnational Corporations and the Protection of Economic, Social, and Cultural Rights in Bolivia*, 27 FORDHAM INT'L L.J. 1663, 1748 (2004).

[6] *Id.* at 1663.

[7] *Id.* at 1664. *See* Carol Rose, *Privatization and Democratization* (draft) (detailing the political and economic arguments for privatization).

[8] Erik J. Woodhouse, Note, *The "Guerra del Agua" and the Cochabamba Concession: Social Risk and Foreign Direct Investment in Public Infrastructure*, 39 STAN. J INT'L L. 295, 311 (2003). "Aguas del Tunari would take over the municipal water network and all the smaller systems-industrial, agricultural, and residential-in the metropolitan area, and would have exclusive rights to all the water in the district, even in the aquifer. The contract guaranteed the company a minimum fifteen-per-cent annual return on its

facilitate this transaction, water was declared the property of the state, available for licensing to private companies for distribution.[9]

To cover the costs of laying new pipe, digging a new reservoir and building a hydroelectric dam, Aguas del Tunari immediately raised the price of water and waste services charged to consumers, with some residents soon spending in excess of twenty percent of their household income on water.[10] Just four months after the privatization scheme commenced in 2000, protests began and soon mushroomed into street demonstrations and violence.[11] In the face of property damage approaching $20 million, dozens of injuries, and mass unrest, the government terminated the privatization concession and resumed control over the water supply system in Cochabamba.[12]

During the heady days of protest, grassroots organizations met and jointly issued the *Cochabamba Declaration.* Their view of the conflict was clear – drinking water should not be a market commodity. As the *Declaration* stated,[13]

> Water is a fundamental human right and a public trust to be guarded by all levels of government, therefore, it should not be commodified, privatized or traded for commercial purposes.

Similar protests over drinking water have played out in Paraguay, South Africa, the Philippines, and elsewhere.[14] Cochabamba, however, remains the best-known example and rallying point for opponents of water supply privatization in developing countries. According to the popular recounting of the story, the conflict in Cochabamba has transformed into a globalization morality play of rights versus markets, human need versus corporate greed. This simple dichotomy sounds in the *Declaration's* ringing prose and echoes in many other fora, from international statements to popular demands.[15]

While making for sharp rhetoric, this facile dichotomy of rights versus markets is terribly limited, shedding only a dim light on the powerful tensions unleashed on the

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investment, which would be adjusted annually to the consumer price index in the United States." New Yorker, *supra* note XX, at XX.

[9] MCFARLAND SANCHEZ-MORENO, *supra* note XX, at 1761.

[10] BLUEMEL, *supra* note XX, at 966. The local government made construction of an expensive reservoir and hydroelectric facility requirements of the contract.

[11] *Id.*

[12] WOODHOUSE, *supra* note XX, at 295.

[13] The Cochabamba Declaration, *available at* http://www.sierraclub.org/cac/water/human_right/.

[14] *See Paraguayan Government Concedes to Anti-Privatization Protesters*, WORLD MARKETS ANALYSIS, Aug. 20, 2004 (describing opposition to water privatization in Paraguay); *Latin American Fails to Deliver on Basic Needs,* NEW YORK TIMES, Feb. 22, 2005 at A1 (describing popular opposition to water privatization in Bolivia, Nicaragua, and Mexico); Neil Ford, *Tanzania: Water Concession Goes Down the Drain*, AFRICA BUSINESS, July 1, 2005 (describing controversy over and cancellation of water privatization contract in Dar es Salaam, Tanzania); *Water Companies in the Third World; No Easy Life*, THE ECONOMIST, Aug. 24, 2004 (describing problems surrounding water privatization in Shanghai, Jakarta, Buenos Aires, and Manila).

[15] *See* text surrounding note XX. As described later in this article, the clearest enunciation of the opposing international governmental policy was in the 1992 *Dublin Statement,* declaring that "water has an economic value in all its competing uses and should be recognized as an economic good." *See also* notes XX and YY.

streets in Bolivia. Nor should this be surprising, for drinking water is a dauntingly complex resource to manage. Indeed, the conflicts in Cochabamba are drawn from the pages of a much larger, much older story. From earliest times, human societies have faced the challenge of supplying adequate quality and quantities of drinking water. Whether limited by arid environments or urbanization, provision of clean drinking water is a prerequisite of any enduring society, but it is a multi-faceted task.

Drinking water is most obviously a *physical resource*, one of the few truly essential requirements for life. Regardless of the god you worship or the color of your skin, if you go without water for three days in an arid environment your life is in danger. And water's physical characteristics confound easy management.[16] Water is heavy – it is difficult to move uphill. Water is unwieldy – it cannot be packed or contained easily. And drinking water is fragile – it easily becomes contaminated and unfit for consumption.

Drinking water is also a *cultural resource*, of religious significance in many societies. A *social resource*, access to water reveals much about membership in society. A *political resource,* the provision of water to citizens can serve important communication purposes. And finally, when scarce, water can become an *economic resource*.

As the Cochabamba experience makes clear, managing and mediating these many facets of drinking water is no easy matter. Understanding a society's ability to provide clean drinking water to its citizens, examining how it recognizes the different natures of this vital resource, provides a unique prism on the society's organization, equity, and view of itself.

In seeking to understand better how societies manage such a critical resource, this article considers three questions.

- How have different societies thought about drinking water?
- How have different societies managed access to drinking water?
- How have these changed over time?

These questions are, of course, interrelated. How we think of water, whether as a sacred gift or a good for sale, both influences and is influenced by how we manage access to drinking water.[17] When management of drinking water fails to reflect popular

[16] As Carol Rose has often observed, water is difficult to manage with property doctrine, as well. *See* Carol M. Rose, *Canons of Property Talk, or, Blackstone's Anxiety*, 108 YALE L.J. 601, 611 (1998) (Blackstone focuses almost exclusively on land rights and ignores water due to its troubling place in the property hierarchy); Carol M. Rose, *A Dozen Propositions on Private Property, Public Rights, and the New Takings Legislation*, 53 WASH. & LEE L. REV. 265, 271 (1996) (flowing water cannot be designated as the property of one individual); Carol M. Rose, *Property as the Keystone Right?*, 71 NOTRE DAME L. REV. 329 (arguing that if water were our chief symbol for property instead of land, we might think of property rights in a quite different way).

[17] *See* Carol M. Rose, *Expanding the Choices for the Global Commons: Comparing Newfangled Tradable Allowance Schemes to Old-Fashioned Common Property Regimes*, 10 DUKE ENVTL. L. & POL'Y F. 45, 57-

conceptions and expectations, pressures for transition to a new management regime increase. And, as we saw in Cochabamba, when the new management regime fails to respect popular conceptions and expectations, it will fail.

Asking such questions may seem odd to an American environmental lawyer, for we tend to assume the presence of drinking water and focus on its quality rather than its natures as a resource; we tend to think in terms of quality rather than quantity. There is a vast literature on drinking water treatment, sources of water pollution, and drinking water standards, for example, yet relatively little on how we manage the resource, itself. To be sure, much thought has been dedicated to the problems of groundwater depletion and rivers that no longer run to the sea, but not because of drinking water concerns.[18] Compared to irrigation water, domestic use is a trickling afterthought.[19] And even within the category of domestic use, much less water is used for drinking than for clothes washing, baths/showers, toilet flushing, or watering the lawn.

In many parts of the world and for much of human history, however, drinking water quality has been only one of the basic challenges in managing this vital resource. While not an obvious issue to us in 21st century America, management of drinking water as a resource – who gets it, when they get it, and how much they get – matters a great deal.

This article synthesizes research to date from an ongoing book project on the history of drinking water.[20] In what is admittedly an early examination of a deep and complex subject, the article takes a case study approach. In the pages that follow, we will journey on a wide-ranging geographical and historical tour, briefly exploring drinking water management in societies across five continents from 5,000 years ago up through today. Along the route, we will find that something as seemingly simple as drinking water washes clear a society's views toward the role of government, norms, and the market.

Ancient and Indigenous Societies

Given the critical importance of drinking water to survival, it should come as no surprise that, throughout history, human society and economies have been predicated on ready access to sources of drinking water. Archaeological excavations find early human

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58 (1999) (treating potentially limited resources such as water in ways that prevent their untimely depletion in common property regimes) (hereinafter Rose Newfangled); Carol M. Rose, *Rethinking Environmental Controls: Management Strategies For Common Resources,* 1991 DUKE L.J. 1, 34, 38 (1991) (arguing that "our laws are not just our controllers, but our teachers. For better or worse, normative or hortatory lessons are embedded in our laws, and we need to think about the education they impart when we adopt legal institutions to manage resources.").

[18] *See generally* ROBERT GLENNON, WATER FOLLIES (YEAR); MARC REISNER, CADILLAC DESERT (YEAR).

[19] Agricultural irrigation accounts for over 80% of national water consumption. Domestic consumption accounts for 6%. EPA cite.

[20] The book will also contain chapters on drinking water and myth, water containers and ancient exploration, the rise of bottled water markets (from medieval holy relics to Perrier), drinking water and terrorism, technological fixes (bulk water shipments, desalination, etc.), watershed protection, and privatization conflicts in developing countries.

settlements located at sites with reliable sources of drinking water nearby.[21] The availability of water for drinking from springs, streams or lakes often meant that plants, animals and other critical goods would have been nearby, as well. Excavations from the Neolithic time have also found a striking correspondence between settlements and wells.[22] As societies developed from hunter/gatherer economies to more advanced grazing, the need for secure, abundant supplies of water became even more important.

Management of drinking water was central to urban planning in early settlements, as well. Thus one can find examples of sophisticated water management in virtually every archaeological excavation of ancient civilizations. Water storage basins with minimum storage capacities of 10,000-25,000 gallons of water have been excavated in the Mesa Verde region of the American Southwest.[23] Large collection and storage structures have been uncovered throughout the Maya Lowlands.[24] Though half a world away, cisterns and wells carved from the rock have been found in excavations at Ebla, in Syria, dating from 2350 B.C.[25] Even earlier water storage sites have been found at Jawa, in north-eastern Jordan, dating from the fourth millennium B.C.[26] Archaeologists suspect that such reservoirs were important features of town defenses, providing a secure supply of water in case of siege.[27] The massive cisterns at Masada, high above the arid Dead Sea, proved critical to the multi-year resistance against the Romans.[28]

The Minoan civilization in Crete had flushing toilets and domestic water as early as 1700 B.C., while tunnels directing water from reservoirs and plumbing have been identified from ancient sites in Iran, Palestine and Greece.[29] Perhaps the most impressive ancient water engineering in the Americas was constructed by the Incas at Machu Picchu, who faced the challenge of moving water from a distant spring to their capital, located at over 7,000 feet. Sloping canals delivered water through agricultural terraces to the Emperor's residence and then, through a series of 16 fountains, down the mountain slope to the city's residents.[30]

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[21] C.E.N. Bromehead, *The Early History of Water Supply,* 99 THE GEOGRAPHICAL JOURNAL 142 (March 1942) at 142; Robert Miller, *Water Use in Syria and Palestine from the Neolithic to the Bronze Age,* 11 WORLD ARCHAEOLOGY 331, 333 (Feb. 1980).

[22] Torsten Malmberg, *Water, Rhythm and Territoriality,* 66 GEOGRAFISKA ANNALER. SERIES B, HUMAN GEOGRAPHY 73, 76 (1984); Andrew Sherratt, *Water, Sail and Seasonality in Early Cereal Cultivation,* 11 WORLD ARCHAEOLOGY 313, 314 (Feb. 1980).

[23] Robert Wilshusen et al., *Prehistoric Reservoirs and Water Basins in the Mesa Verde Region: Intensification of Water Collection Strategies During the Great Pueblo Period*, 62 AMERICAN ANTIQUITY 664 (No. 2, 1997).

[24] Vernon L. Scarborough and Gary G. Gallopin, *A Water Storage Adaptation in the Maya Lowlands*, 251 SCIENCE 658 (Feb. 8, 1991).

[25] Miller, *supra* note XX, at 335-336.

[26] *See generally,* David Kennedy, *Water Supply and Use in the Southern Hauran, Jordan,* 22 J. of Field Archaeology 275 (Autumn 1995); Miller, *supra* note XX, at 335.

[27] Miller, *supra* note XX, at 335.

[28] Masada, *available at* http://mosaic.lk.net/g-masada.html.

[29] OECD, GLOBAL TRENDS IN URBAN WATER SUPPLY AND WASTE WATER FINANCING AND MANAGEMENT: CHANGING ROLES FOR THE PUBLIC AND PRIVATE SECTORS 15 (CCNM/ENV(2000)36/FINAL).

[30] Jeff L. Brown, *Water Supply and Drainage at Macchu Picchu, available at* www.waterhistory.org/histories/machu/.

While not a focus of my research, it is important to note that developments in water supply technologies have marched hand in hand with developments in sanitation and water treatment. Any time a community contains enough people to justify public works for drinking water supply, sanitation and water treatment necessarily become important urban issues, as well, to ensure source quality.[31] Sanskrit writings from approximately 2,000 B.C., for example, recommend water purification methods.[32] Pictures of water treatment devices have even been found in the tombs of the Egyptian pharaohs Amenophis II and Rameses II.[33]

As a scarce resource, it should come as no surprise that access to drinking water has been governed by rules from the earliest times. Indeed, rules establishing access to water in arid regions may very well have predated property regimes for land.[34] Particularly for nomadic peoples, ensuring available water was a precondition for grazing, not an afterthought.

There is much less anthropological scholarship on drinking water than on irrigation water, presumably because the much greater water required for agriculture made this the scarcer resource.[35] The available studies are nonetheless revealing. The following paragraphs briefly describe the scholarship I have found on traditional norms for access and use of drinking water. The case studies span four different continents. In each, despite differences in management details, water is regarded first and foremost as a common property resource, not as a commodity.

Traditional Jewish Water Law

The Old Testament is filled with references to springs and wells, their importance clearly evident from the fact that each was given a special name.[36] Jewish law regarding drinking water has been traced as far back as 3,000 B.C.[37] The basic rule was one of common property. As reflected in the later writings of the Talmud, "Rivers and Streams forming springs, these belong to every man."[38] Because water from natural sources such

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[31] Much as water is needed to supply water for domestic use, it is needed to *transport* waste water away from the site of use, as well.

[32] Kathy Jesperson, *Search for Clean Water Continues, available at* http://www.nesc.wvu.edu/ndwc/ndwc_DWH_1.html ("impure water should be purified by being boiled over a fire, or being heated in the sun, or by dipping a heated iron into it, or it may be purified by filtration through sand and coarse gravel and then allowed to cool.")

[33] Jesperson, *supra* note XX, at 2.

[34] Malmberg, *supra* note XX, at 77.

[35] Malmberg, *supra* note XX, at 77 ("Despite its indubitable importance water is sparsely treated in anthropological literature."). Personal Communication, Elinor Ostrom, April 29, 2005.

[36] Bromehead, *supra* note XX, at 142.

[37] Melanne Andromecca Civic, *A Comparative Analysis of the Israeli and Arab Water Law Traditions and Insights for Modern Water Sharing Agreement*, 26 DENV. J. INT'L L. & POL'Y 437 (1998).

[38] *As quoted in* Civic, *supra* note XX, at 440. *See also* Carol M. Rose, *Given-ness and Gift: Property and the Quest for Environmental Ethics*, 24 ENVTL. L. 1, 12 (1994) (describing that, from the "gift vision," "all gifts may be approached with a special kind of care and respect, and it is in this sense that the vision of the environment-as-gift might help to supply some norms of self-restraint int eh use of commons – using the gift, to be sure, but having enough respect not to waste or pollute it.".

as springs and streams was "provided by God," commodification of these waters would be tantamount to desecration – selling divine gifts.[39]

Many important sources of water came from wells, however, where human labor was necessary to gain access to the water. In these cases, drinking water was managed as a common resource, though not an open access resource. Within each community, Jewish law prioritized access according to use – highest priority to drinking water, then irrigation and grazing.[40] Importantly, however, the very highest priority access was granted to those in need, *regardless* of whether they belonged to the well's community of owners or not.[41] This so-called "Right of Thirst" is reflected in the text in Isaiah, "Let all you who thirst, come to the water!"[42] Such a policy might be termed a "Rawlsian straw," in that any traveler in an arid region could foresee a situation where he or she might need water from strangers for survival.[43] In satisfying the Right of Thirst, rules of access still applied, for villagers' necessary drinking requirements took priority over outsiders'.[44] But outsiders' thirst took precedence over local grazing and other uses.

Traditional Islamic Water Law

Islamic water law is quite similar to Jewish water law in both substance and significance. Indeed, the Arabic word for Islamic law, "Sharia," literally means the "way to water."[45] As the Koran relates,[46]

> Anyone who gives water to a living creature will be rewarded…To the man who refuses his surplus water, Allah will say: 'Today I refuse thee my favor, just as thou refused the surplus of something that thou hadst not made thyself.'

The Right of Thirst reinforced this message. Since water is a gift from God to all people, sharing water is a holy duty.[47] As with Jewish water law, norms governed water usage and users. Priority was given for drinking, then domestic needs, then agriculture and grazing, favoring needs in the community over outside users.[48] As one scholar has described, "access to water, at least for the purpose of human sustenance, is considered to

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[39] *Norms for Drinking Water Among Indigenous Populations in the Arid Middle East,* at 1-2.
[40] Civic, *supra* note XX, at 440. As Carol Rose describes, "Although the members of a commonly used hunting ground or fishery may treat the resource as a "commons" among themselves, with respect to the rest of the world that resource is a property… [C]ommon property regimes effectively pool access to resources, and for this reason these regimes are particularly adapted to managing risk." Rose Newfangled, *supra* note XX, at 48, 66.
[41] Civic, *supra* note XX, at 440. This is an example of what Carol Rose has called a "limited commons," commons with the community but property to outsiders. Carol Rose, *Romans, Roads, and Romantic Creations,* 66 SPG Law & Contemp. Probs. 89, 107-08 (2003).
[42] Isaiah 55:1.
[43] Cite Rawls veil of ignorance.
[44] Civic, *supra* note XX, at 440.
[45] *Available at* www.reference.com/browse/wiki/Sharia.
[46] *As quoted in* Civic, *supra* note XX, at 442.
[47] *Ibid.*
[48] *Ibid.*

be a right of all persons, within and without the community, and whether on private or publicly held property."[49]

Islamic water law was largely adopted into the legal code of the Ottoman Empire. It is still followed by Bedouin in the Negev, where "water to quench thirst, is an unalienable right, and may not be refused from any water source,"[50] and by the Berbers in Morocco, where drinking water for humans is "sacrosanct and neither may be denied anyone for any reason at any time."[51]

Zimbabwe Indigenous Water Law

Studies of communal lands in Zimbabwe have found remarkably persistent norms of drinking water management into the present. While wells and boreholes are often built today for private purposes, they are made available for communal drinking. As the most comprehensive study of drinking water for the region has concluded, "Cutting across all the different tenurial systems is the notion that no one should be denied access to safe drinking water."[52] Interestingly, the impetus for sharing is sanction-based rather than religious.[53] Field researchers report a general fear that denying water to someone could lead the drinking well to be poisoned – either literally through adding a poison or spiritually through witchcraft.[54] The net result is that drinking water remains a non-economic good, with no requirement of payment or gifts for access.

This is not to say, however, that it is an open access resource. There are clear norms to ensure water quality – such as prohibitions against doing laundry or making bricks near wells.[55] And, in times of scarcity, communities may restrict the amount of water gathered, banning, for example, the filling of large drums or restricting withdrawals to 20 liters per family.[56] Moreover, people must ask permission from the owner prior to using the well. If they gather too much water, use it for a different purpose than

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[49] Civic, *supra* note XX, at 439.
[50] Aaron T. Wolf, *Indigenous Approaches to Water Conflict Negotiations and Implications for International Waters,* 5 International Negotiation 357, 363 (2000).
[51] Wolf, *supra* note XX, at 363.
[52] Bill Derman, *Cultyres of Development and Indigenous Knowledge: The Erosion of Traditional Boundaries,* 50 AFRICA TODAY 67 (No. 2, 2003). As another anthropological study in Zimbabwe reported, "'If the borehole in Vhudzi village breaks down, how can we let them suffer? We allow them to fetch water form our borehole." Nontokozo Nemarundwe and Witness Kozanayi, *Institutional Arrangements for Water Resource Use: A Case Study from Southern Zimbabwe,* 29 J. OF SOUTHERN AFRICAN STUDIES 193 (March 2003).
[53] Rose Newfangled, *supra* note xx, at 67 ("CPRs have a great range of enforcement techniques, ranging from gossip to ostracism to violence").
[54] People did not seem to distinguish between the two. Derman, *supra* note XX, at xx.
[55] Nemarundwe and Kozanayi, *supra* note XX, at 202-204. *See also* G.O. Anoliefo et al., *Environmental Implications of the Erosion of Cultural Taboo Practices in Aska-South Local Government Area of Anambra State, Nigeria,* 16 J. OF AGRICULTURAL AND ENVIRONMENTAL ETHICS 281, 291 (2003) (describing the traditions of the Awka in Nigeria, "The cultural practices and taboos associated with the streams are still respected and the streams are still kept clean by the people... The cultural taboos did not allow persons to bath, wash clothes, or wash household materials in the same stream where people had to fetch drinking water.").
[56] Nemarundwe and Kozanayi, *supra* note XX, at 202-204.

requested, or are unhygienic near the well, then their access rights are limited. As one person described, "You go to someone you are in good books with."[57] Outright bans, however, are rare for fear of retribution. One well owner who denied access to his water found a dead dog floating in the well two days after locking the gates.[58]

Anthropologists have documented similar practices of sharing drinking water elsewhere in Southern Africa.[59] As a study of the Mhondoro (also in Zimbabwe) concluded,[60]

> The obligation to share extends to wells which are privately dug and on the functionally private land. Based on the practice of sharing it extends to boreholes constructed for principally commercial or dedicated use. The duty to share cuts across kinship and village borders. It was spelt out particularly clearly in drought periods. It is the view of most villagers that one risks having the water source poisoned if it is not shared.

Bihar Indian Water Law

Studies of the Bihar in the northeast region of India reveal some fascinating differences in drinking water management. Because of the complex social hierarchy, priority of access and management is much more carefully proscribed than in other cultures along social caste lines. As a researcher has written,[61]

> Water is believed to be a medium that transmits pollution when in contact with a person who himself is in a 'state of pollution.' Hence, the upper and lower castes are expected to maintain distinctness of water sources as the lower castes, especially the "harijans," are believed to have the potential of transmitting pollution by sharing sources… The group of community members who actually have ownership and/or access to a public source depends primarily upon caste and differs in accordance with their social affiliations.

As a result, only upper castes may make use of sacred source waters.[62] The rule of sharing, however, is widely observed and those in need must be given access to water. A divine gift for all of mankind, sharing water is viewed as a spiritual act of generosity –

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[57] *Ibid.*
[58] *Ibid.*
[59] *See* Malmberg, *supra* note XX, at 79. ("This accords well with the customs of Hottentots and other pastoralists in South Africa, where at least until recently any person who dug a well or cleared a spring made this his property, and all those who wished to use it had to ask for his permission as long as he stayed at and guarded the water. But he was obligated to see that no stranger in need was denied access to it.")
[60] Pinimidzai Sithole, *Environmental Cultures of Development and Indigenous Knowledge: The Erosion of Traditional Boundaries in Conserving Wetlands in rural Zimbabwe*, IASCP 10th Biennial Conference, *available at* http://dlc.dlib.indiana.edu/archive/00001490/00/Sithole_Environmental_040526_Paper148.pdf.
[61] Nandita Singh, *Water management traditions in Rural India: Valuing the unvalued*, 18th European Conference on Modern South Asian Studies (July 2004) available at http://www.sasnet.lu.se/EASASpapers/21NanditaSingh.pdf.
[62] Singh, *supra* note XX, at xx ("Access to sacred sources is more or less reserved for the upper castes such as Brahmins, Rajput and Bhumihar. The entry and exit rules are strictly adhered to and any infringement is generally unexpected primarily because of the supernatural sanctions associated with such infringement.")

one of the seven kinds of wealth (the '*saptasantanas*').[63] At times of water scarcity, even access to an upper caste well is allowed.[64]

This social differentiation also plays out in water management. Upper castes are responsible for maintaining the water sources and assign manual labor to the lower castes.[65] Basic norms for source use, however, are similar to those found in other cultures. Rules for ensuring source water quality are detailed. The water must be approached barefoot, so that shoes do not pollute the source; containers must be properly cleaned before gathering water; no bathing or washing is allowed near the source; etc.[66]

Australian Aboriginal Water Law

In Australia, the driest inhabited continent, the need for rules over access to drinking water is self-evident and aboriginal groups' norms track very closely those we have already observed. Given the scarcity of water, no distinction is drawn between water for drinking and other purposes.[67] Most water sources are sacred parts of the dreamscape. As a result, defecating or starting a fire near a water hole were vitally serious offenses, giving those responsible for the water the right to punish these transgressions by death (though, in practice, this ultimate sanction was usually negotiated away).[68] Knowledge of water sources was vital to a group's survival (a truly critical example of intellectual property).

Given the variability of rainfall, sharing has played a key role in water management. Researchers describe the dominant access system as "always ask."[69] While not an open access resource, in practice those requesting water would be given permission to drink. Indeed, as one aboriginal expert has written, "the knowledge that those with plenty today will be supplicants themselves in the future… [means that] Sharing is encoded and embedded within all social relations: trade, marriage, ceremony and others. The code is reciprocity. Not only is the precept 'always ask' essential; so too is the fact that people are almost never refused."[70]

This brief survey of drinking water management in ancient and indigenous cultures suggests three main points. First, in many societies drinking water has not been viewed as a commercial good. It is too important a resource, too connected with divine beneficence and social identity to be treated as an item for barter. While admittedly incomplete, my review of anthropological literature on drinking water has not yet come

[63] Singh, *supra* note XX, at xx.
[64] Singh, *supra* note XX, at xx.
[65] Singh, *supra* note XX, at 7 (distinguishing between the "user community" and "user groups").
[66] Singh, *supra* note XX, at xx.
[67] Personal Communication, Deborah Rose, Australian National University, May 15, 2005.
[68] *Ibid.*
[69] Deborah Rose, *Fresh Water Rights and Biophilia: Indigenous Australian Perspectives* 3 (draft).
[70] *Ibid*.

across *any* ancient or indigenous societies where drinking water access was primarily determined by economic relations.[71]

Second, the rules governing drinking water management vary from culture to culture, but from the examples I have found in the literature there's a common twist. Whether expressed through the Right of Thirst in Jewish and Islamic law, as sharing norms in India, Africa, or as "always ask" in Australia, access to drinking water in times of need seems to be a basic right. As a recent study concluded, "a culture of free access to water was dominant in most countries during ancient times."[72] And third, aspects of these water management regimes can endure for long periods, continuing even today in some societies, including the United States.[73]

Clearly, then, access to water in ancient and indigenous cultures was not premised on economic relations. So when did the transition to commodification of water start to occur? There is no better place to look than ancient Rome.

Rome

Rome is the first great city defined by its management of drinking water. Irrigation reached new heights in the Hanging Gardens of Babylon, and while the cisterns and storage basins of Mesapotamian cultures were impressive feats of engineering, they cannot compare with the graceful aqueducts that carried clean water to the great Roman cities. Aqueducts were among the most magnificent structures of the ancient world and some proudly survive today. The water fountains that continue to define the splendor of Rome were important parts of the city's drinking water provision over 2,000 years ago. Rome is also the first major city we know of that managed drinking water as a priced resource.

While aqueducts play a critical part in the story of Roman drinking water, that was not their original purpose.[74] Because of Rome's high water table, there was plentiful

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[71] *See* Carol M. Rose, *Given-ness and Gift: Property and the Quest for Environmental Ethics*, 24 ENVTL. L. 1, 25-30 (1994) (describing indigenous cultures' uses of "nature's gift as common property"); *see also* Johannes M. Renger, *Institutional, Communal and Individual Ownership or Possession of Arable Land in Ancient Mesopatamia,* 71, Chi.-Kent L. Rev. 269, 302 ("we do not know of any field tax, water tax, or other dues that could be connected with the use of water rights during the Old Babylonian period").

[72] Jose Campos and Ticiana Studart, *An Historical Perspective on the Administration of Water in Brazil*, 25 WATER INTERNATIONAL 148 (March 2000). This presents an interesting contrast to the more traditional story of exclusion. As Carol Rose describes, at the intermediate stage of property evolution, "a group or tribe may jointly take over the resource – such as a hunting area, or a set of common fields – and reserve access to its own members, perhaps allocating this internal access according to a set of informal customary arrangements." Carol M. Rose, *Energy and Efficiency in the Realignment of Common-Law Water Rights,* 19 J. L. STUD. 261, 262 (1990).

[73] Consider, for example, the water law example of the "Absolute Right" rule in contemporary U.S. riparian rights common law (creating an exception to the reasonableness doctrine for domestic use) and the utility law example of the "Duty to Serve" (requiring utilities to serve all customers in their territories). *Cite* water treatise; Jim Rossi, *The Common Law "Duty To Serve" and Protection of Consumers in an Age of Competitive Retail Public Utility Restructuring,*51 VAND. L.REV. 1233 (1998).

[74] A. TREVOR HODGE, ROMAN AQUEDUCTS AND WATER SUPPLY 5 (1992).

water available from local wells and springs.[75] The great water engineer of Rome, Frontinus, makes this clear at the very beginning of his treatise of water management, *De Aquis Urbis Romae,* when he states that "the Romans were satisfied with such waters as they drew from the Tiber, from wells, or from springs. Esteem for Springs still continues."[76] The main reason for construction of the aqueducts was not hygienic but social. Bath houses were an integral part of Roman society and they required large volumes of water.[77] Over time, however, as the city's population grew the water of the Tiber became increasingly polluted, particularly because the city's main sewer, the *Cloaca Maxima,* flowed directly into it.[78] The ready availability of a reliable source of clean water from the aqueducts spurred demands for its water to be used for drinking, fountains, gardens, and even public toilets.[79]

Rome's first aqueduct, the *Appia*, was built in 312 B.C.[80] In all, eleven aqueducts were constructed over approximately 550 years.[81] The *Marcia* was the third aqueduct, built in 144 B.C., and much larger than its predecessors.[82] Brought into the city at a great height, the *Marcia's* waters were distributed throughout the city by gravity and its sweet waters were primarily used for drinking water.[83]

Aqueduct water was piped into large catch basins and then into storage reservoirs known as *castella*.[84] From these, three piping systems branched out, each dedicated to a different use. One set of pipes was used for the city's basins and fountains (*usus publici*); the second set was dedicated to private uses (*privati*); and the last set to bath houses (*balneae*).[85] A priority system ensured that public needs were served first, then private uses, than baths.[86] Almost half of the Marcia aqueduct's water, prized for its drinking quality, went to private uses and roughly a quarter went to the city's public basins, known as *lacus*.[87]

The *lacus* were used by citizens for gathering water for domestic use. Importantly for our purposes, the water in the *lacus* was free for the taking.[88] Most residents of Rome

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[75] HARRY B. EVANS, WATER DISTRIBUTION IN ANCIENT ROME: THE EVIDENCE OF FRONTINUS 135 (1994).
[76] Frontinus, *as quoted* in Evans, *supra* note XX, at 13.
[77] Hodge, *supra* note xx, at 6; Evans, *supra* note XX, at 15.
[78] Matthew Keith Malott, *Nomine Caesaris: An Examination of the Propagandistic Functions of the Aqueducts of Rome During the Early Empire* (Classical Association of Canada Essays, 2004) *available at* http://www.usask.ca/classics/cac/essays/04Malott.html.
[79] Hodge, *supra* note xx, at 6.
[80] Evans, *supra* note xx, at 136.
[81] O.F. ROBINSON, ANCIENT ROME: CITY PLANNING AND ADMINISTRATION 98 (1992). Severus Alexander, reigning from 222-235 A.D., built the eleventh aqueduct.
[82] EVANS, *supra* note xx, at 136-37.
[83] *Id*. at 140. Only one more aqueduct, the *Aqua Tepula,* was built during the Republic. New aqueducts were built in the first century A.D., one bearing the name of the emperor, the *Aqua Claudius,* and the other, the *Anio Novus,* doubled the supply of water delivered to the city. *Id*. at 137-139.
[84] *Id*. at 7-8.
[85] *Id*. at 7.
[86] *Id.* at 17.
[87] *Id*. at 92. When all aqueduct water is considered, 38.6% went to private consumers and 13.4% went to lacus. Id. at 141.
[88] *Id*. at 11; Nova at 4-5.

collected their water in this way and the *lacus* provided communal meeting places, much as wells continue to do in many rural societies.[89] Excavations in Pompeii have uncovered their spacing of about 150 feet from one another throughout the city.[90]

Not everyone chose to collect their water from public sources, however, and Roman water finances depended on this demand for private water.[91] Indeed, it is estimated that 40% of all the water delivered within Rome went to private buildings, and not all of this was for baths.[92] A special water tax, known as a *vectigal*, was charged for people who had pipes running from the main system to their houses or baths.[93] Because the aqueduct was free-flowing and the distribution system worked by gravity, the water was always running.[94] Thus the tax was assessed by the size of the supply pipe nozzle rather than the amount consumed.[95]

Piped delivery of water to a private residence was a status symbol, and a common luxury of senators.[96] It was clearly of considerable value, as well, because a major black market arose in what Frontinus called "puncturing" – attaching secret pipes to main lines

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[89] Hansen, *supra* note XX, at 3.

[90] Nova, *Watering Ancient Rome*, *available at* http://www.pbs.org/wgbh/nova/lostempires/roman/watering2.html.

[91] J. G. LANDELS, ENGINEERING IN THE ANCIENT WORLD 49 (2000). HODGE, *supra* note xx, at 120 ("The *lacus* must have been as significant a social institution as the mediaeval village well, and it is small wonder that people of sensitivity, and sufficient financial means, preferred to pay for a private supply.").

[92] EVANS, *supra* note XX, at 141.

[93] LANDELS, *supra* note XX, at 34.

[94] The amount of water delivered to a Roman household in a day has been estimated as the equivalent of a modern household in Ottawa's use over two months. Evans, *supra* note XX, at 19. By contrast, those relying on water from *lacus* have been estimated to use roughly one quarter of what an American household uses per day. Hansen, *supra* note XX, at 6. An additional benefit of the free-flowing water was effective sanitation – constant flushing of sewers to dilute and remove solid waste. Evans, *supra* note XX, at 18.

[95] HODGE, *supra* note xx, at 3.

[96] Werner Eck's study of 288 private pipe owners in Rome found that 47% were Senators and 16% were of Senatorial order. *As cited in* Christer Bruun, *The Water Supply of Ancient Rome: A Study of Roman Imperial Administration* 77 (1991). Not all private users were required to pay the *vectigal*, since one could also receive a special dispensation from the Emperor.

While wealthy Romans may have drunk more wine than water, the Romans did drink water on its own and could be as picky as some are about bottled water today. *See generally,* TOM STANDAGE, A HISTORY OF THE WORLD IN SIX GLASSES (2005). "Just like Romans today, they were connoisseurs. They actually ranked them." Nova, *supra* note xx, at 2. Pliny, for example, wrote extensively on the qualities for judging drinking water.

> Drinking water had to be cool and wholesome, that is transparent, clean, odourless, and without flavourings. Pliny further observed that well water was only wholesome if it had been kept in motion and came from a water vein in the ground. Well water that had seeped through the sides of the well did not meet his criteria. The emperor Nero drank the highest quality water: it was boiled first, then poured in a glass and cooled in snow.

GERDA DE KLEIJN, THE WATER SUPPLY OF ANCIENT ROME: CITY AREA, WATER, AND POPULATION 87 (2001). There is far more to be said on this subject, but it is only tangential to our topic of interest and will have to wait until my book chapter on the rise of bottled water.

in order to draw water illicitly into private residences.[97] This became such a problem that a section of the Roman law code was dedicated specifically to this type of offense, made punishable by a 100,000 sesterces fine.[98]

Aqueduct construction was obviously a major public works project, funded primarily by the emperor and private donations.[99] The funds raised by the *vectigal* were used to cover the costs of system maintenance.[100] The net effect of this water financing scheme gave Roman drinking water a dual nature.

To the wealthy Roman, water in the house (whether for drinking, an ornamental fountain, or domestic uses) effectively was a priced good.[101] To the average Roman resident, however, drinking water in the city was available by right, as free for the taking as water from the Tiber. Each source relied on different rationing strategies for a scarce commodity – use of *lacus* water was limited by the physical effort of carrying water from the basin to the home, use of water in the home was limited by the cost of paying the *vectigal.*[102] *Lacus* water was, in modern parlance, a completely subsidized municipal service, but it was perceived as much more than that, for water supply had an implicitly political message. Consider that, in the time of Emperor Augustus, the number of *lacus* increased dramatically, from 91 to almost 600.[103] And many of these were magnificently

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[97] *See* RABUN TAYLOR, PUBLIC NEEDS AND PRIVATE PLEASURES: WATER DISTRIBUTION, THE TIBER RIVER AND THE URBAN DEVELOPMENT OF ANCIENT ROME 73-74 (2000). Hansen describes the practice as so widespread that excavations revealed "extensive areas in various places where secret pipes run under the pavement all over the city." Hansen, *supra* note XX, at 4. While water in free-flowing rivers was treated by Roman law as an open access resource so long as navigability was not hindered, "the right to take water from an artificial *rivus* was strictly circumscribed in order to protect the volume of water due to it rightful beneficiaries." Taylor, *supra* note XX, at 65.

[98] The law provides:

> Whosoever after this law is passed shall knowingly and with malice pierce, break, or oversee the piercing or breaking of, or make worse, the channels, conduits, arcades, pipes, pipelets, *castella*, or basins of the public waters that are conducted to the city, such that those waters or any part of them should be less able to go, fall, flow, arrive, or be conducted into the city of Rome, or such that it cannot emerge, be distributed, be divided, or be directed into *castella* or basins in the city of Rome and in those places or structures that are, or shall be, the city's area of continuous habitation, [or] in those gardens, estates, or places to whose owners, possessors, or usufructuaries water has been, or shall have been, granted or bestowed—he shall pay damages of 100,000 sesterces to the people of Rome."

Taylor, *supra* note XX, at 73 (*quoting* Frontinus, *quoting* the *lex Quinctia*)

[99] FRONTINUS' LEGACY: ESSAYS ON FRONTINUS' *DE AQUIS URBIS ROMAE* 86 (Deane R. Blackman & Trevor A. Hodge eds., 2001) [hereinafter FRONTINUS' LEGACY]. An inscription found in Apamea, Syria, thanks C. Julius Agrippa, a former ruler for having "got built a good number of miles…of the aqueduct." *As quoted in* Evans, *supra* note XX, at 8.

[100] LANDELS, *supra* note 20, at 49; Evans, *supra* note XX, at 9.

[101] Strictly speaking, of course, water was free in both private homes and the *lacus*. It was only the service of water delivery that was priced. As a practical matter, however, this is a semantic distinction. Romans who wanted drinking water at home needed to pay for it and would have regarded it as a priced good.

[102] *See* Victor Flatt, *Let Us Drink Our Fill*, XX Yale J. of Law and Humanities XX, XX (2006) (discussing segmentation of the water market).

[103] Malott, *supra* note xx, at 6.

decorated with 300 bronze and marble statues and 400 marble columns.[104] These ornate water masterpieces strengthened the tradition of majestic fountains we still associate with Rome. But why were they built?

Classical scholars suggest these impressive public works were intended, first and foremost, as political statements, to remind the common people that they received their water from imperial beneficence in the name of the Emperor, *Aqua Nomine Caesaris*. As Malott has written, following the overthrow of the Republic,[105]

> By forcing the Roman people to remember that their water came from aqueducts, and by making sure they could always observe this mechanism which was piously given to the people out of the state's pocket, they succeeded in obliterating the importance of those natural water resources which had supplied Rome very effectively and sufficiently for centuries…The early emperors combated this dwindling sense of civic duty by using the aqueducts' propagandistic power to replace self-interest in the state with dependence on the state, which proved to be much more effective in the end…
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> [It is hard to] believe that the addition of 500 public fountains was truly a necessity [for drinking water supply], especially since wells and springs were apparently still frequently used. However, by totally revamping the water system and making it more conspicuous and lavishly decorated, Augustus, and then Claudius after him, wanted to make the people forget that the older aqueducts survived from a time when the Emperor had no power. He wanted to erase the history of the aqueducts before him and suggest that they were his personal possession, and that although they were a free public service, the people still received their water by his generosity and permission.

These beautiful fountains and basins provided water and a clear justification of regime change. The Romans' right to water was acknowledged, ensured, and enhanced in the name of Caesar.

The Roman story, then, provides within the same city fundamentally different visions of drinking water – as a public good provided by right through imperial beneficence, on the one hand, and as a private good for domestic consumption, on the other. Yet the two depended upon one another, for it was the treatment of drinking water as a priced good that enabled cross-subsidization to ensure its public nature. In order to assess how transferable this model proved with the rise of modern cities, we next turn to New York.

New York City

Ever since Peter Minuit's celebrated purchase of Manhattan Island from the natives for beads and trinkets in 1626, the settlement has faced challenges of ensuring adequate drinking water.[106] While New York is obviously surrounded by large rivers,

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[104] *Ibid*.
[105] Malott, *supra* note XX, at 5-6.
[106] Michael C. Finnegan, *New York City's Watershed Agreement: A Lesson in Sharing Responsibility*, 14 PACE ENVTL. L. REV. 577, 586 (1997).

they open on the ocean and are too salty for drinking.[107] The first Europeans to live in Manhattan, the Dutch settlers of New Amsterdam, relied on basic technologies to provide drinking water – collecting rainwater in cisterns and digging shallow wells.[108] Most of the settlement's water came from a spring-fed, deep freshwater pond covering 70 acres in lower Manhattan, known as the "Kalch-Hook."[109] Interestingly, much of the fresh water was used not for direct drinking but, instead, for brewing beer or cooking.[110] The wells in New Amsterdam were private.[111] Although there were plans in 1660 to build a public well, the famed regional governor, Peter Stuyvesant, refused to approve the funding.[112] This proved remarkably short-sighted, however, for when British warships sailed up the Hudson in 1664 the Dutch defense was brief.[113] Besieged in a fort, the Dutch realized to their chagrin that the fort had no wells and therefore no water sources.[114] Following a quick surrender, which kept the town's commercial prospects intact, Stuyvesant justified the loss to his employers as not a particularly serious matter since the lack of fresh water on the island made it impossible to defend and easy to regain.[115]

No surprise, then, that one of the first acts of the new British masters, after renaming the city New Yorke, was construction of public wells in the city.[116] Begun in 1667, these would remain a primary source of water for New Yorkers well into the 19th century.[117] While regarded as public works projects, few public monies were actually spent. People living on the street where a well had been sited were told to undertake construction on their own.[118] The plan went nowhere, though, with only one brackish well completed.[119] In 1686, construction of eight wells finally got underway through a combination of public funding and financial assessments of families who would be serviced by the well.[120] People refusing to pay the assessment were threatened with forced sales of goods to make up the shortfall.[121] Local residents were charged with ensuring proper maintenance; indeed, some of the wells later became known by the names of these overseers.[122]

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[107] GERARD T. KOEPPEL, WATER FOR GOTHAM: A HISTORY 7-8 (2000).
[108] Finnegan, *supra* note 30, at 586.
[109] CHARLES H. WEIDNER, WATER FOR A CITY: A HISTORY OF NEW YORK CITY'S PROBLEM FROM THE BEGINNING TO THE DELAWARE SYSTEM 15 (1974). The pond was located just east of where Broadway now cuts between Chambers and Canal Streets.
[110] Koeppel, *supra* note xx, at 13.
[111] *Id*. Water quality apparently was not a major concern. In a complaint filed by a brewer and carpenter complaining that a newly established tannery would spoil their well water, "Official New Amsterdam was unmoved: 'as others have been allowed to make a tannery behind their house and lot,' Verveelen and Borden and their wells deserved no special protection. Thus, with government approval, the corruption of the town's natural water supply was permitted to advance." Koeppel, *supra* note xx, at 15.
[112] *Id*. at 15.
[113] *Id*.
[114] *Id*.
[115] *Id*. at 15-16.
[116] *Id*. at 17.
[117] *Id*. at 17-18.
[118] *Id*. at 18.
[119] *Id*. at 18-19.
[120] *Id*.
[121] *Id*.
[122] *Id*. at 19.

Long into the 18th century, most New Yorkers relied on these wells and the "Collect" (the anglicized pronunciation of the Kalch-hook[123]) for free drinking water.[124] During this period, however, urbanization continued and further industrial and population growth were clearly in store. Sanitation, an ever-present problem in British cities, was becoming unmanageable.[125] Peter Kalm, a Swedish botanist visiting New York in 1748, in a remark Rodney Dangerfield would have loved, observed that the well water was so terrible horses from out of town refused to drink it.[126] Others noted that well water had become so brackish and hard that soap would not dissolve.[127] The Collect, once the best source of drinking water on Manhattan, had become polluted from the tanneries and slaughterhouses on its banks.[128] It was described by a writer of the day as a "very sink and common sewer."[129]

To those with an entrepreneurial spirit, the poor maintenance of the public wells and the increasingly disgusting state of the Collect posed not a problem but a business opportunity. People with means began to purchase water from springs outside of town and deeper wells.[130] Water sold from these sources became known as "Tea Water" and was either fetched by slaves or bought from "Tea Water Men" who purchased water directly from the pump owners and then carted it throughout the city for sale in buckets and barrels.[131] By the middle of the 18th century, presaging the rise of branded bottled water two hundred years later, sale of Tea Water had become the best source of good drinking water in New York and different pumps were favored over others.[132] Indeed, a cottage industry developed around a pump operated by the Hardenbrooks family, popularly known as the "Tea Water Pump," which apparently was the Perrier of its time.[133] Not everyone could afford to purchase Tea Water, of course, and the public wells remained in use.[134]

The limitations of public wells and the Collect to provide clean water, growing dependence on Tea Water sales, and general concern over the availability of water to fight fires made clear the need for a serious re-thinking of New York's water supply.[135] Thus, in 1774 the city approved an ambitious plan for a steam engine-powered

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[123] Weidner, *supra* note xx, at 15.
[124] Koeppel, *supra* note xx, at 36. In 1695, Dr. Benjamin Bullivant described "many publique wells enclosed & Covered in ye Streetes...[which were] Nasty & unregarded." *As quoted* in Koeppel, *supra* note xx, at 21.
[125] *See id.* at 21-27.
[126] *Id*. at 27.
[127] *Id*. at 26.
[128] *Id*. at 36.
[129] Finnegan, *supra* note xx, at 587.
[130] Koeppel, *supra* note xx, at 28.
[131] *See id*. at 28-36.
[132] *Id*.
[133] *Id*. at 28.
[134] *Id*. at 32, 36. *But see* Koeppel, *supra* note xx, at 36 ("An observer estimated in 1774 that 3,000 houses received water from Tea Water Men, "meaning that every house in the city was taking at least some of its water from the pump.").
[135] *Id*.

waterworks that would pump water throughout the city in aqueducts similar to those of Rome.[136] To fund the public works, the city issued "Water Works Money," the first paper money issued by an American city.[137] Construction commenced but the timing could not have been worse.[138] As the colonies descended into the Revolutionary War, the British occupied the city and destroyed the waterworks construction.[139]

Following the Revolutionary War, water supply plans in the city stumbled along for over 15 years.[140] Plans were proposed for public waterworks and carefully studied, but none funded.[141] Water from the Tea Water Pump was of increasingly poor quality, nor did the public wells provide an attractive option.[142] A yellow fever epidemic struck New York in 1795 and many blamed the disease on the city's foul water and fouler streets.[143] Tea Water price was also a major concern. As a letter to the *New York Gazette* decried in 1798, "I pay for Tea Water Only About Six Pounds Per Annum; which, I think a great tax for one small opinion."[144] With citizens and business leaders demanding action, the city turned to privatization.[145]

In an alliance that would seem unthinkable years later, Aaron Burr joined with Alexander Hamilton and other prominent politicians of the day to drive through a public/private solution.[146] In an argument that would echo 200 years later in privatization debates, "Hamilton used his considerable influence to persuade the City Council that the municipality should not build its own water works because it could not raise sufficient capital through loans and taxes."[147] Burr then hurried a bill through the state legislature in three days. Authorized by the New York state legislature and the New York City Council, the Manhattan Company, as the new organization would be called, was mandated in its corporate charter to provide New York City with clean drinking water.[148]

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[136] *Id*. at 44.
[137] *Id*. The money featured an illustration of the steam engine that would pump the water surrounded by fountains.
[138] *Id.* at 44-46.
[139] *Id.* at 49.
[140] *See id*. at 53-72.
[141] *Id.*
[142] *Id*. at 66. "Despite increased spending on the wells, their product remained unsavory. The rapidly increasing population stressed the wells' supplies, street paving and new buildings prevented rain from entering the groundwater, and inadequate sanitation ensured that whatever moisture did seep down was harmful to the supply. Efforts to seek good water at greater depths with new technology were unavailing as well." *Id.* at 59.
[143] Finnegan, *supra* note XX, at 587.
[144] Blake, *supra* note XX, at 45. By the 1790s, the Tea Water Pump was the dominant source of New York drinking water, with daily sales of 20,000 gallons or more. According to a French visitor, the Tea Water Pump was leased "for a thousand dollars a year and operated by two horses driven by a child; the water was sold for sixteen cents a barrel to twenty-four Tea Water men who distributed it by horse-drawn cart to every house in the city at ninety-six cents a bucket." Koeppel, *supra* note XX, at 54.
[145] Koeppel, *supra* note XX, at 72. Another motivation for the business community was the concern that other cities, particularly Philadelphia, were making better progress in building water works. Finnegan, *supra* note XX, at 587-588.
[146] *Id.* at 76.
[147] Finnegan, *supra* note XX, at 588.
[148] *Id.* at 86.

The assumption seems to have been that water would be piped in from the Bronx River, since the water sources on Manhattan Island were now regarded as undrinkable.[149] But Aaron Burr had more than water supply on his mind. He directed only 10% of the Manhattan Company's $2 million assets toward investments in water works, relying on the Collect as the water source.[150] The remainder was invested more profitably in local businesses.[151] The company did the bare minimum to maintain its charter, laying only 23 miles of pipe in its first 32 years.[152] Over time, this drinking water company gave up all pretence and developed into the powerful Chase Manhattan Bank.[153]

While few people actually received Manhattan Company water, the company defended its monopoly power over water provision and, as the Manhattan Company's portfolio grew, Tea Water pumps were driven out of business.[154] New Yorkers were thus forced to rely on the increasingly-revolting Collect Pond and local wells.[155] People with money turned to imported soda water and well water mixed with liquor.[156] As a historian of the era has described,[157]

> As for New Yorkers, drinking no more Tea Water and scant Manhattan, it was once again back to street wells and carted spring water. New York had entered the first American century with less good water than the Dutch had bequeathed to the English.

It took a series of disasters for the government to finally address water supply head on. In 1828 a large fire caused extensive property damage and a severe cholera epidemic in 1832 killed 3,500 people in New York but only 900 in Philadelphia, which enjoyed reliable public water supply and streets washed down daily.[158] Mounting concerns over disease and inadequate water sources to fight fires forced the city's Common Council to revisit the challenge of providing reliable supplies of clean drinking water.[159] Following the recommendations of a state-appointed commission, a permanent Board of Water Commissioners was created and authorized to raise infrastructure capital and condemn land in order to supply water to the city.[160] Surprising even today, the condemnation authority extended beyond the boundaries of the city, for the water source

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[149] Koeppel, *supra* note XX, at 72.
[150] *Id*. at 86.
[151] *Id*.
[152] Finnegan, *supra* note XX, at 589.
[153] *Id*. at 91. "By 1804, the Bank of the Manhattan Company was firmly established as one of the nation's most powerful and influential financial institutions, tethered to the single obligation of providing 'pure and wholesome water.'" Koeppel, *supra* note XX, at 101.
[154] *Id*. at 101.
[155] *Id*.
[156] *Id*. at 121-122. Alexander Hamilton commented that a companion of his who "would drink nothing but water" resulted in "copious and insipid" conversation. Koeppel, *supra* note XX, at 34.
[157] Koeppel, *supra* note XX, at 101.
[158] Finnegan, *supra* note XX, at 590. Philadelphia developed the country's first municipal waterworks, largely in response to a terrible epidemic of yellow fever in 1793, forcing over 23,000 people to flee the city. The water system was completed in 1801. SAM BASS WARNER, JR., THE PRIVATE CITY: PHILADELPHIA IN THREE PERIODS OF ITS GROWTH 102-104 (1987).
[159] Finnegan, *supra* note XX, at 590.
[160] *Id*.

lay upstream of New York in Croton.[161] By 1838, condemnation of 35 acres of land in the Croton watershed had been completed.[162] The Croton Reservoir was a massive project, supplying 95 million gallons daily, yet only satisfied the city's water needs for a decade.[163] The city then looked even farther north, to the Catskills and Delaware watersheds.

The story of New York's drinking water provides an instructive contrast with Rome. From its early days, New York's drinking water came from private wells, public wells, and the Collect. Faced with declining water quality, water became commodified with the rise of Tea Water. Following the failure to provide public infrastructure after the Revolutionary War, the private supply of drinking water reached its logical next step with responsibility for management of New York's *entire* drinking water supply system granted to the Manhattan Company. Only when the company notably failed to provide even the most basic services for drinking water or fire protection did the city step in and occupy the field.

Construction of the reservoir in Croton marked the end for significant private provision of drinking water for New Yorkers, since it displaced the Manhattan Company. Interestingly, however, it did not mark the end of water as an unpriced good, for with construction of the Croton Reservoir and the Croton Aqueduct came installation in New York of so-called "Croton Hydrants."[164] These fire and street hydrants provided water free of charge and proved very popular. As a history of Croton water relates, "Two years after it opened, Croton was primarily a *public* amenity of great fountains and thousands of fire and free street hydrants; most homeowners and landlords had little inclination to install the costly service pipe."[165] This changed over the next 25 years as private pipes became more common,[166] but the net result bore a fascinatingly strong resemblance to the Roman system of cross-subsidization from private pipes to *lacus* at the time of Caesar.

London

The story of drinking water in London shares many similarities with New York's reliance on private suppliers. Through the Middle Ages, Londoners gathered drinking water from local springs, wells and the Thames River (the Romans never built aqueducts for London).[167] In the 13th century, a connection known as the Great Conduit was built from springs at Tybourne to cisterns in the city and provided a source of clean drinking

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[161] *Id*. at 591.
[162] *Id*. at 592-93.
[163] *Id*. at 593-594.
[164] Koeppel, *supra* note xx, at 279. Philadelphia had also provided hydrants for the city's poor when constructing its system three decades earlier. Warner, *supra* note XX, at 104-105.
[165] *Id*. at 287.
[166] In both New York and Philadelphia, once free water (from hydrants) and priced water (piped into homes) became available, it took several decades for piped water to become dominant. Old habits of water gathering die hard. The greatest attraction for piping water into the home likely was not drinking water but, rather, the convenience of domestic uses such as toilets (aptly named "water closets"), washing and bathing. *Id*. at 287.
[167] *London: The Greatest City: Medieval London, at* http://www.channel4.com/history/microsites/H/history/i-m/london2.html.

water, which apparently was sold by leasing official tankards to people for drawing water. The poor relied on the unsanitary and foul-smelling Thames and merchants even tried to charge for that. A 1417 city ordinance forbade owners of wharves and stairs on the Thames from charging for access to the river.[168]

During the sixteenth century, with the rise of England's first industrial revolution, the city was unwilling to spend money on public works and relied instead on private commerce for water supply.[169] Competition arose and by the early 19th century the water supply was in the hands of nine private companies.[170] When a terrible cholera outbreak occurred in 1840 (which John Snow linked back to a single contaminated water source and thus founded the field of epidemiology), unlike in New York the government did not take over supply responsibilities. Instead, in the Metropolis Water Act of 1852, private water suppliers became regulated entities, required to provide piping into private residences, provide continuous rather than intermittent service, and filter their water, among other duties.[171] Following Royal Commissions, municipal water supply did not arrive until passage of the Metropolis Water Act in 1902, which created the Metropolitan Water Board that took over the operational assets of the eight water companies servicing London.[172]

In a fascinating parallel to the Roman *lacus* and Croton Hydrants, London also provided for free water but did so through charitable acts. During the 19th century, the Quakers founded and later a group of nobility operated the Metropolitan Drinking Fountain Association.[173] This philanthropic society built free public fountains and watering troughs throughout the city.[174] The motivation seems to have been two-fold – in part as a public service for those too poor to purchase drinking water and in large part as

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[168] *Available at,* http://www.trytel.com/~tristan/towns/florilegium/community/cmfabr24.html.
[169] *Water-Related Infrastructure in Medieval London, at* http://www.waterhistory.org/histories/london/.
[170] Howard Malchow, *Free Water: The Public Drinking Fountain Movement and Victorian London,* 4 LONDON JOURNAL 181, 182 (1978). Those unable to purchase water faced an unappealing alternative. As a character in Smollett's 1771 novel, *Humphrey Clinker,* graphically complained,

> If I would drink water, I must quaff the mawkish contents of an open aqueduct, exposed to all manner of defilement, or swallow that which comes from the River Thames, impregnated with all the filth of London and Westminister. Human excrement is the least offensive part of the concrete which is composed of all the drugs, minerals and poisons used in mechanics and manufactures, enriched with the scourings of all the wash tubs, kennels, and common sewers within the bills of mortality.

As quoted in ROBERT WARD, LONDON'S NEW RIVER 176 (2003).
[171] ROBERT WARD, LONDON'S NEW RIVER 176 (2003); JOHN GRAHAM-LEIGH, LONDON'S WATER WARS 98 (2000). These requirements were less daunting than might first appear. Continuous rather than intermitten service, for example, was only required "if four-fifths of the customers on a main asked for it in writing and if at least that number had waste-saving apparatus approved by the water company. [And the piping requirement was only necessary if] sufficient householders applied whose rents would cover at least 10% of the costs of laying the pipes and who would undertake to remain connected for at least three years, and also provided that no other company already supplied the district. This last provision had the effect of continuing its virtual immunity from competition." *Id.* at 181.
[172] Leigh*, supra* note XX, at 105.
[173] Malchow, *supra* note XX, at 187.
[174] *Id*. at 188.

a strategy of the temperance movement.[175] Thus it is no coincidence that many of the fountains were located next to popular pubs, making the point that people could slake their thirst for free with refreshing water rather than paying to drink beer or spirits.

Drinking Water in the Developing World

New York and London's shift to municipal water provision provide examples of transition moments, where the management of drinking water changes in a short period of time. As we saw with the Cochabamba experience, such transitions can prove difficult to manage yet they are currently playing out in conflicts over the privatization of municipal water supply in developing countries. This section traces the origin of these conflicts and is followed by a concluding section that considers lessons to be learned from societies' management of drinking water.

The facts of drinking water in the developing world are both straightforward and daunting. Over one billion people do not have access to even a basic water supply.[176] Well over two billion people lack adequate sanitation.[177] As a result, approximately half of the developing world inhabitants suffer from illnesses caused by contaminated water supplies.[178] Many environment ministers consider this the single greatest threat to their people.[179]

To understand the problem of drinking water in much of the developing world, one must consciously step outside our daily experience. In developed countries, with rare exception we don't even think about drinking water. It is plentiful, clean and easily available. Nor do we give a second thought to the quality or quantity of drinking water. We simply turn on the tap to take a drink or open a bottle of water. Water supply is seen as a government or corporate responsibility.

The contrast with developing countries could not be starker. Neither water quality nor quantity can be assumed. Because water supply infrastructure is not provided in the poorest urban or in many rural areas, obtaining water is regarded as an individual or domestic responsibility. In contrast to the ease of turning on a faucet, lack of infrastructure means a high labor input as someone from the household (generally women and girls) must collect each day's water, whether from a communal pond or well, a tanker, or kiosk. Less than half of the population in Africa lives within a 15-minute walk of a safe drinking water source.[180] The largest study of water gathering in East Africa found that women spent on average 17.5 hours per week gathering water in Senegal and

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[175] *Id*. at 184.
[176] PETER GLEICK, THE WORLD'S WATER, 2004-2005 at 2 (2005).
[177] *Ibid*.
[178] Water Partners International, *Water-related Disease Facts,* available at http://water.org/crisis/disease.htm.
[179] William Reilly, former EPA Adminstrator, Personal communication, Sept. 21, 2005.
[180] John Thompson et al., *Waiting at the tap: changes in urban water use in East Africa of three decades*, 12 ENVIRONMENT AND URBANIZATION 37, xx (Oct. 2000) (hereinafter Thompson).

15.3 hours weekly in Mozambique.[181] The daily average for water gathering in 1997 across East Africa was 91.7 minutes daily, triple the time spent three decades earlier.[182]

Where communal or free water sources are too far away or contaminated, the poor purchase their water from street vendors or tanker trucks.[183] Forty percent of those surveyed in the East African study used water vendors.[184] These prices are always higher than the price of water from municipal supply systems, often twelve to twenty times as much, with the tragic irony of the poorest in society paying the most for their water.[185]

The resulting social and economic impacts are immense. With a significant proportion of women's time and family income dedicated to domestic water supply, opportunity for activities such as education or other employment get squeezed. It is no exaggeration to say that introduction of piped water can transform the social and economic fabric of a community.[186] Yet the trend is worsening. From 1950-1985, the percent of the world's urban population doubled.[187] The UN estimates that now over half of all people on earth live in urban rather than rural settings.[188] As a result of growing urbanization, the number of clean communal water sources is decreasing as water and sanitation are put under increasing pressure.[189]

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[181] *Id.* at xx.
[182] *Id.* at 48.
[183] Karen Bakker, *Archipelagos and networks: urbanization and water privatization in the South*, 169 THE GEOGRAPHICAL JOURNAL 328, 333 (Dec. 2003) (hereinafter Bakker). *See generally* TOVA MARIA SOLO, INDEPENDENT WATER ENTREPRENEURS IN LATIN AMERICA - THE OTHER PRIVATE SECTOR IN WATER SERVICES (World Bank 2003) (reviewing water small-scale water providers in Paraguay, Argentina, Colombia, Guatemala, Peru, and Bolivia); BERNARD COLLIGNON AND MARC VEZINA, INDEPENDENT WATER AND SANITATION PROVIDERS IN AFRICAN CITIES (World Bank 2000) (reviewing small-scale water providers in ten-countries in Africa).
[184] Thompson, *supra* note xx, at 46
[185] Cite. The vendors, however, are not easily profiting, either. As this excerpt from the *Boston Globe* describes,

> Many in this country of 20 million rely on 'water tankers' run by deliverers such as Francis Kwesi. The 24-year old sits on his tanker, waiting for just a few customers. He's one of thousands of water haulers in Ghana, but he said suppliers have raised prices and he's facing a tough decision. "If you raise your price, customers will tell you no, they won't buy water from you. You are standing there from morning until evening, and you will not move," he said, as fellow drivers nodded in agreement. "It's very hard for a young boy like me to get my daily bread," Kwesi said, adding that it's difficult to make more than $1 a day."

A Drinking Water Crisis Divides Ghana: Privatization Seen Shutting out Poor, BOSTON GLOBE*,* Feb. 9, 2003 at A14.
[186] World Bank.
[187] Bakker, *supra* note xx, at 334.
[188] OECD, *supra* note xx, at 7.
[189] And even those with access to piped water cannot count on adequate service. Consider the state of water supply in Delhi, India.

> There are few water meters, and those that are installed soon break down, because they need constant, 24-hour pressure to function. Large parts of the city, especially the slums, get water for only a few minutes a day. Illegal tapping into groundwater is widespread, so the water table is falling fast.

Private Passions THE ECONOMIST*,* July 19, 2003.

In recognition of these pressing issues, the governments of the world committed one of the eight Millennium Development Goals to drinking water. By 2015, the UN has pledged to "reduce by half the proportion of people without sustainable access to safe drinking water."[190] Given the poor state of water provision in the developing world and the small likelihood of debt-burdened governments making significant public monies available for infrastructure any time soon, what can be done?

This very question was explicitly considered in the 1980s, designated by the international community as the *International Drinking Water Supply and Sanitation Decade*. At the beginning of the decade, the central role of the state in water provision had been taken as a given. By the time 1990 came, however, the influence of Reagan and Thatcher policies was being felt across the globe in a fundamental reconsideration of the state's proper role in the economy, and water was no exception. Rather than the solution to water supply problems, the state had come to be seen as the problem and the private sector, many argued, needed to be part of the solution.

Estimates of the capital investment needed for adequate water infrastructure and sanitation over the next twenty-five years approach $100 billion per year.[191] As noted above, the weak financial resources of developing country governments prevent them from absorbing the costs of water provision upgrades. The private sector, by contrast, could mobilize the large capital needed for the infrastructure to ensure greater access to safe water. Moreover, echoing many of the privatization arguments sounded in debates over telecommunication, prisons, education, and other service fields, private sector management could make the services less vulnerable to local politics, encourage further private investment, ensure more efficient management, and reduce potential for fraud and corruption.[192] At the heart of all these arguments lies the assumption of state failure.

The privatization arguments go beyond private management, however, to the nature of drinking water itself. The failure to treat water as a scarce commodity, it was argued, only ensures its inefficient distribution and use. A basic axiom of resource economics is that we over-consume goods that are underpriced. Since the market is more efficient than governments at allocating scarce goods, it follows, market prices should be charged for water.[193] The plight of the poor described above actually reinforced this argument. The fact that the very poor do pay for water, and pay quite a bit in relative terms, suggested both that they could and would pay for piped water. Thus the principle of "full cost recovery" – charging a price to cover costs and profit – seemed both possible and desirable.[194]

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[190] *Available at* http://www.un.org/millenniumgoals/.
[191] cite
[192] Rose Democrarization, *supra* note xx, at xx.
[193] Colonialism, *supra* note xx, at 2.
[194] Bakker, *supra* note xx, at 2.

These arguments became official international policy with adoption in 1992 of the *Dublin Statement*. The *Statement* served as the first major recognition of water as a market commodity, declaring that

> water has an economic value in all its competing uses and should be recognized as an economic good.[195]

This strategy was adopted in policies of international financial institutions, particularly in the Structural Adjustment Programs pursued by the IMF and World Bank in debtor countries. In a number of countries, including Bolivia, privatization of water supply systems was made a prominent lending condition.[196]

Spurred by the *Dublin Statement* and facilitated by international financial institutions, there has been an unprecedented expansion of private sector participation in water supply over the last two decades.[197] The global water service market has been estimated at over $250 billion and growing at an annual 6% rate.[198] Water supply services have been privatized across the globe, from the United Kingdom, Poland and Morocco to Argentina, Indonesia and the Philippines.[199] "Privatization," of course, can mean many things and these arrangement have ranged from outright privatization of water supply infrastructure to public/private partnerships, management contracts, leases, etc.[200]

Municipal water supply generally operates as a natural monopoly. Large-scale delivery of water requires large-scale infrastructure. The initial sunk costs can be massive, not to mention the continuing costs of maintenance and upgrade. This creates a significant barrier to entry for competition but requires amortization periods that can run several decades. A return on investment also requires general economic, political and social stability over that period and, in many developing countries, this is far from a given.[201] Hence the difficult challenge – privatization may hold its greatest social potential in developing countries because it can inject needed capital, yet it is in precisely such settings where investment environments are least certain.

Seeking a competitive return on investments in developing countries, privatization has often been followed by efforts at full cost recovery. The immediate problem that can arise is one of inequity. If water access is based on ability-to-pay rather than willingness-

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[195] The Dublin Statement on Water and Sustainable Development*, available at* http://www.wmo.ch/web/homs/documents/english/icwedece.html.
[196] *New Yorker*, *supra* note xx, at xx.
[197] The term, "privatization," has become shorthand for a number of different property transitions, ranging from what Carol Rose has termed "recognition" and "deregulation" to "divestment" (which occurred in Cochabamba) and "enablement." Rose Democratization, *supra* note xx, at 4.
[198] Gleick, *supra* note xx, at 45.
[199] New Yorker, *supra* note xx, at xx.
[200] Gleick, *supra* note xx, at 48.
[201] Investment in developing countries is described as suffering from "the three lows, low investment, low service standards, and low cost recovery." Bakker, *supra* note xx, at xx.

to-pay, then what are the implications for poor and marginalized communities?[202] Does changing the management regime effectively deny them access to adequate clean drinking water?

Alert to these concerns and as part of the larger anti-globalization wave, a vocal movement has arisen to challenge the growing pressure for water privatization. Its primary demand lies in recognition of a right to water. We saw such a demand expressed in the Introduction to this article in the grassroots *Cochabamba Declaration* and its statement that "Water is a fundamental human right and a public trust." The Council of Canadians has been one of the most vocal NGOs, similarly proclaiming on its website that "Water is a public trust; it belongs to everyone. No one should have the right to appropriate it or profit from it at someone else's expense. Yet that's what corporations and investors want to do."[203] While less strident, similar calls for a human right to water may be found in over a dozen international documents.[204] As a statement of formal international governmental policy, the right to water has been presented most clearly in General Comment 15, adopted in 2002 by the United Nations Committee on Economic, Social and Cultural Rights. The contrast with the *Dublin Declaration* could not be clearer.[205]

> The human right to water entitles everyone to sufficient, safe, acceptable, physically accessible and affordable water for personal and domestic uses… The price and availability of water should not be solely determined by market forces, as would occur under an economic framework based on "full cost recovery."

Fleshing out the proper scope of a human right to water, or whether it even exists under customary international law, lies beyond the scope of this paper.[206] For our

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[202] As Carol Rose has described about privatization more generally, "[p]opular fears are very real that privatization of these enterprises can lead not to the diffusion of power, but rather to the aggrandizement of monopoly power in private hands, and to the victimization of ordinary people." Rose Democratization, *supra* note xx, at 27

[203] http://www.canadians.org. *See also* the Water Observatory Project at http://www.waterobservatory.org/. *See also* Rose Gift, *supra* note XX, at 28, where, in discussing the debate over property rights approaches to environmental protection, she observes that "A substantial portion of the environmental community has resisted such forays into property concepts, perhaps because they are presented as appeals to self-interest, and involve the classical economic move of harnessing private interest to the general wealth."

While not an exact parallel, the arguments of anti-privatization advocates also echo Carol Rose's analysis of "inherently public property." Carol M. Rose, *Takings, Public Trust, Unhappy Truths, and Helpless Giants: A Review of Professor Joseph Sax's Defense of the Environment Through Academic Scholarship*, 25 Ecol. L.Q. 351, 259 (1998).

[204] Gleick, *supra* note xx, at 206 (table listing "international documents, treaties, declarations, and standards recognizing the right to water and related forms of health and human development").

[205] General Comment No. 15: The right to water (2002), *available at* www.unhchr.ch/html/menu2/6/gc15.doc.

[206] General Comment 15 goes on to argue that this right imposes three related obligations: "obligations to respect, obligations to protect and obligations to fulfil." As one commentator has described,

> The obligation to respect prohibits actions that undermine the right, including such activities as pollution from State-owned facilities. Obligations to protect the right to water require that States implement permitting procedures or other regulatory systems to control private-actor behavior that might interfere with the right to water. Control of private-actor behavior is required both when

purposes, it is enough to recognize that the enormous challenge of improving developing country water supplies remains unmet while vigorous accusations and equally strident defenses of water privatization continue to rage. Five years since the celebrated uprising in Cochabamba, its residents still suffer from severe deficiencies in water supply and distribution while Aguas del Tunari, the spurned consortium, pursues a $25 million claim against the Bolivian government in international arbitration.[207]

Conclusion

The popular recounting of Cochabamba and its fiery *Declaration* fit neatly into the rhetoric of the globalization debates, as does the earlier *Dublin Statement.*[208] Rights-based and market-based access to drinking water are depicted as antithetical, while arguments revolve over whether access to water should be publicly or privately managed. If our survey of drinking water management in different societies has shown anything, however, it's that this framing is both simplistic and distinctly *ahistorical*. While making for powerful rhetoric, treating drinking water management as a binary conflict of rights versus markets, of public versus private management, forces a false choice.

A rights-based water management regime is clearly not a new idea. The Right to Thirst in Jewish and Islamic Law, sharing norms in Africa and India, and the "always ask" custom among aborigines all depend on a universal norm of access to drinking water by right in times of need. The *Aqua Nomine Caesar* practice in ancient Rome of free water was rights-based, as well – a right of provision guaranteed by the Emperor.

Treating drinking water supply as a priced resource is by no means a new idea, either. The *vectigal,* a tax on the private consumption of water, funded operation of the Roman water system for centuries. Private water vendors underpinned much of New York and London's water supply through the 19th century, and now supplies London once more.

Nor, finally, are these two identities mutually exclusive. In Rome, water by right and by purchase co-existed; indeed the two openly depended upon one another through cross-subsidization – the *vectigal* largely funded the *lacus*. Though different in detail, a strikingly similar arrangement of private and public drinking water reappeared two millennia later in the form of the Croton Hydrants in New York and open hydrants in Philadelphia. From a historic vantage, then, we see a range of management regimes for drinking water – some rights-based, some payment-based, and some hybrid. Indeed, the

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> those actors are polluting as well as when they operate links in the water-supply chain. Obligations to fulfill the right to water include a responsibility to facilitate enjoyment of the right, promotion of the right through education measures, and provision of the right where individuals or groups cannot realize their right due to insufficient personal means.

Bluemel, *supra* note xx, at 973.

[207] New Yorker, *supra* note xx, at xx.

[208] For the importance of telling stories in framing the contours of rights, *see* Rose Rethinking, *supra* note XX, at 33 ("narratives are a way of bridging gaps, creating a community and persuading the members of that community to take certain steps in common").

cases of Rome and New York show that markets can actually be used to *ensure* fulfillment of rights. This is a fundamental argument used by current proponents of privatization and, in historical terms, they have a point.

Moving beyond the simplistic discourse of rights versus markets, it is striking how little attention has been paid to the natures of drinking water, itself. Drinking water has served as a physical resource, *and* an economic resource, *and* a social resource far more often than any one of these alone. Yet much of the current debate seems to assume the necessity of choosing one identity to the exclusion of others. Managing access to drinking water necessarily requires management across multiple dimensions – expressly recognizing the natures of the natural resource.[209]

When viewed from the broader vantage of natural resource management, the complex stability of the Roman drinking water system, the oldest example we know, becomes much clearer. Drinking water was consciously managed as a physical resource (the aqueduct and distribution system within Rome), a social resource (free water in the communal gathering places of the *lacus*), an economic resource (charging the *vectigal* to underwrite maintenance costs), and a political resource (as a justification of imperial rule). Considering how the different natures of drinking water were deliberately managed reveals much more than asking whether access to Roman drinking water was by market or by right.

Considering the facets of drinking water also frames the Cochabamba story in a different light. There were many issues underpinning the unrest in Cochabamba, but the fundamental problem surely did not lie in treating access to water as a market transaction instead of by right. Water was not free before the uprising in Cochabamba and it is not free now. By granting an exclusive water concession to Aguas del Tinas and requiring that water withdrawals be licensed by the state, the government was perceived as effectively enclosing the "water-commons." Contemporary accounts suggest that fears over possible metering of water from rain barrels, streams, and wells played a far greater

[209] In his comments on this article, Richard Lazarus takes issue with treating drinking water as a resource, arguing that this makes no more sense than distinguishing between water based on whether it is in groundwater, surface water, or in wetlands. Richard Lazarus, *Crystals and Mud in Nature*, XX Yale J. of Law and Humanities XX (2006). As a physical matter, this obviously is true – water is water – but in an analytical sense it strikes me as misguided. If this article shows anything, it is that time and again throughout human history societies have both considered and managed drinking water effectively as a unique resource. The Right of Thirst clearly demonstrates that water used for drinking is *different* than water used for irrigation or grazing. Drinking water has its own norms, management strategies, and social meanings. The legal result is one of nested regimes for water, all interacting with one another. Rules and customs for the use of drinking water are clearly linked to norms governing the use of water for irrigation, instream flow, navigation, etc.

Part of our disagreement over whether drinking water should be termed a natural resource may be semantic, but the significance and analytical power of considering drinking water on its own terms is important whether one calls it a resource or use. Victor Flatt makes a similar point, observing that "there is a distinction between water that is used for drinking and survival, and water that is used as a market input; that in effect, we might be talking about two different resources, albeit ones that are physically identical." Flatt, *supra* note xx, at yy.

role in people taking to the streets than rising water bills.[210] This failure to consider the popular conceptions of the resource access proved fatal. By treating drinking water as a *purely* economic resource and focusing on pricing, Aguas del Tinas ignored water's significant natures as a social and common resource. The mass demonstrations did call for a return to previous water rates but, more fundamentally, a return to previous entitlements.

Indeed, when viewed through the refracting prism of natural resource management, the core question of drinking water management separates not only into how the *different facets* of the drinking water resource are managed but, more generally, *why* we see certain types of drinking water management regimes in some societies but not in others, and *how* these evolve over time.

These are big question and, given the limited number of case studies supporting my research to date, making broad conclusions is still premature.[211] As this project matures into a book, incorporating additional case studies on management of drinking water across time and across the globe (particularly looking at Asian examples), no doubt the following paragraphs below will change. But sketching in light strokes, we can begin to draw some tentative and interesting hypotheses.

The case studies suggest that human societies seem to rely on three basic types of management regimes for drinking water – common pool resource management, decentralized private sale, and public management.[212] The first, and likely the earliest, is *common pool resource management*. These regimes are found throughout ancient history and in some indigenous cultures today. All seem to occur in rural rather than urban settings.[213] They are stable, satisfying the basic requirements for effective common property regimes – rules for whom can have access, when they can have access, and how much they can have, as well as efficient monitoring and sanctioning mechanisms.[214]

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[210] New Yorker *supra* note xx, at xx; Rose Democratization *supra* note xx, at xx. To be sure, the rapid rise in water prices, caused largely by the local politicians' demand that Agues del Tinas build a costly new dam, didn't help matters. But as the title to the *New Yorker* article describing the conflict, "Leasing the Rain," made clear, more was at stake than water bills.

[211] As Carol Rose aptly cautioned in her article about Roman property doctrines, "Anything that I say here should be taken, as the Romans said, *cum grano salis.*" Carol M. Rose, *Romans, Roads, and Romantic Creators: Traditions of Public Property in the Information Age*, 66 LAW & CONTEMP. PROBS. 89, 91 (2003).

[212] By contrast, as a resource grows scarcer, the "commonly told natural history of property rights" provides three stages of (1) plenty, (2) common-property arrangements, and (3) "full-blown individualized property rights." Rose Water Rights, *supra* note xx, at 263.

[213] "[C]ertain group factors are very helpful in overcoming such problems [of communal property management] – especially relatively small numbers in a group, kinship or other intense relationships such as religion, and/or interactions among group members on wide numbers of fronts. Such factors make it possible for group members to monitor one another closely and with relatively low costs, and therewith to form mutually trusting relationships and shared behavioral norms; trust and norms in turn allow people to overcome commons problems…" Rose Drama, *supra* note xx, at 238.

[214] ELINOR OSTROM, GOVERNING THE COMMONS: THE EVOLUTION OF INSTITUTIONS FOR COLLECTIVE ACTION (1990). "There are great bodies of law about common property, and they revolve around an ethic of moderation, proportionality, prudence, and responsibility to the others who are entitled to share in the common resource." Rose Roads, *supra* note xx, at 27.

While there may well be exceptions I have not yet uncovered, these regimes all seem to share a norm based on the Right of Thirst. In essence, water must be shared with those in dire need, even if outside the community or social caste. In arid environments, of course, it is not hard to see why this practice would be universally recognized – one should provide water to the parched because next time you may be the one in need.

So long as the external environment remains stable, such management regimes can stay in place for long periods of time.[215] As pressures from urbanization and population grow, on the one hand, or improved extraction technologies and new industrial or agricultural demands increase, on the other, the drinking water resource becomes scarcer in quantity, quality, or both.[216] In these circumstances, we see the emergence of the second basic management regime – *decentralized water sale* – to satisfy unmet needs. Transition to this second regime has clearly occurred in East Africa, where fully 40% of the population now relies on private water vendors for supply.

Decentralized water sale, however, is more often a complementary rather than exclusive approach.[217] Sale of Tea Water served the needs of many in New York but so, too, did water from the Collect (open access regime) and street wells (public provision). Once private water sale commences, it seems to endure alongside other management regimes rather than supplant them. The United States now has more public management of water supplies than ever before, yet sales of bottled water are shooting through the roof.

The third type of management regime is *public management*. This can take the form of low-capital provision, such as the construction and maintenance of public wells in New York from British settlement through the 19th century. The pressure for such a regime is obvious – the need to provide potable water to citizens. Costs to public authorities are low, particularly if maintenance responsibilities can be passed on to local users.

The transition to high-capital provision, by contrast, is more complicated. The histories of New York and London show persistent reluctance by the government to invest in significant waterworks, preferring to rely on less expensive (to the public purse) and more expedient private solutions. When such transitions do occur, they seem to be driven by widespread recognition of obvious failure. Calls for municipal provision in New York first arose prior to the Revolutionary War over general dissatisfaction with public wells, the Collect, and Tea Water. City control over the waterworks did not finally

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[215] "[G]roup control may have a much more lasting pattern and much greater stability is the resource in question ahs the characteristics of a public good." Rose Water Rights, *supra* note xx, at 295.

[216] As Carol Rose has noted, common property regimes "may not be geared to learning about *new* resource problems, particularly those induced by human ingenuity and human demand; there are far too many examples of CPRs that simply fail to respond to new levels of demand…" Rose Newfangled, *supra* note xx, at 69.

[217] "The larger moral is that there is no universal presumption that systems of private individual rights must necessarily dominate systems of collective ownership. Much depends on the underlying nature of the resource and the uses to which it can be put under existing and evolving technology." Rose Water Rights, *supra* note xx, at 266-267.

come, however, until the undeniable failure of the Manhattan Company and the cholera epidemic of 1832 (much as the Philadelphia system had been built following the disastrous yellow fever epidemic three decades earlier). Focusing solely on drinking water as the primary impetus for transition, however, likely misses part of the story, since significant pressure for municipal water provision also came from concerns over fire and the need to have reliable, pressurized water sources throughout the city.[218]

The debate over public versus private management has, in many respects, mirrored the rights versus markets conflict and been similarly unhelpful. Skeptics are right to doubt whether purely private markets can adequately address the different natures of drinking water, but purely private markets are far and few between. Public management remains the dominant source of drinking water today and takes a wide range of forms, whether through municipally-owned waterworks, regulated private water utilities, or public/private ventures. Indeed, roughly 95% of municipal water around the globe is currently provided by public entities.[219] In practice, privatization generally means *publicly-enabled* private provision. It is exceedingly rare for a government to hand over the keys of any natural monopoly to a private party, much less for drinking water. Put simply, the fact of public or private water management does not, in itself, tell us whether access to water will be based on full cost recovery rates, targeted subsidies, or some other scheme nor, as a result, whether the different natures of water will be adequately addressed.[220] Thus the privatization question turns on how water supply should be supervised and how the transition should be managed.

An intriguing and potentially important aspect of the history of drinking water has been the remarkable resilience of the Right of Thirst. For a norm to endure across so many different cultures over such a long period of time suggests that it needs to be a core aspect of privatization efforts. Despite the vociferous anti-privatization rhetoric, one can point to many success stories of water privatization around the globe, and many of these seem to make provision for an implicit Right of Thirst.[221] In Chile, for example, the

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[218] *See Scott E. Masten, Prospects for Private Water Provision in Developing Countries: Lessons from 19th-Century America* xx (draft), "The role of waterworks in firefighting was also a major theme. First, water demands for firefighting meant that waterworks had to be much larger than otherwise, raising the fixed costs of water systems…Fire insurance companies as early as 1800 made provision for centralized water systems in their rates… In Houston, pressure for a municipal takeover of the city's private waterworks erupted in 1886 after a fire destroyed an important cotton seed mill 'while firemen stood by helplessly because the hydrants were dry.'"

[219] cite

[220] Carol Rose makes the same point in regard to commons management. "[P]rivate and governmental managers often use techniques that are quite similar in content… The public/private divide, taken alone, misses the substantive content of these various techniques or strategies, whereas the focus of this Article is precisely on those substantive characteristics of management, regardless of whether the managers themselves are public or private." Rose Rethinking, *supra* note xx, at 8-9.

[221] Carol Rose describes a 2003 study of privatization in Latin America finding that,

> in fact, privatized firms are generally more efficient than their state-managed predecessors, and that they generally offer better services to all social levels. This study also found that the failed privatizations are most often attributable to political interference, to corruption and lack of transparency, and in the case of "natural monopolies," to weak governmental capacity to provide the necessary post-privatization regulatory structure.

private water supplier relies on cross-subsidization to provide the equivalent of food stamps for the poor to obtain adequate water, and the system seems to work well.[222]

It is entirely fitting that this article appears in a journal dedicated to Carol Rose's scholarship. Among her many contributions to the field of environmental law, perhaps the most important has been the importance of stories and revealing the deeper tales *within* commonly accepted stories.[223] Whether exposing the comedy within the tragedy of the commons,[224] revealing the hidden trails left by the development of property rights,[225] or charting the relative strengths of environmental control instruments,[226] Carol's core message has been that simple stories explaining social arrangements may be useful, but are often limited, incomplete, or even misleading. Her work reminds us of the need to move away from simplistic dichotomies such as rights versus markets, or public versus private management. Drinking water is a fundamental yet surprisingly complex resource to manage, and striking the appropriate balance among its many natures is surely difficult. But, just as surely, each nature must be consciously appreciated and managed.

Rose Democratization *supra* note xx, at 27. *See also* Sebastian Galiani et al., WATER FOR LIFE: THE IMPACT OF THE PRIVATIZATION OF WATER SERVICES ON CHILD MORTALITY (Center for Research on Economic Development and Policy Reform, Stanford University, Stanford, August 2002) (finding that privatization of water services in Argentina coincided with a fall in child mortality of 5 to 7 percent in areas served and dropped 24% after privatization in the poorest areas surveyed); George Clarke et al., *Has Private Participation in Water and Sewerage Improved Coverage? Empirical Evidence from Latin America* (World Bank 2003) (finding that privatization of water and sewage in Argentina, Bolivia, and Brazil increased connection rates for the poorest households).

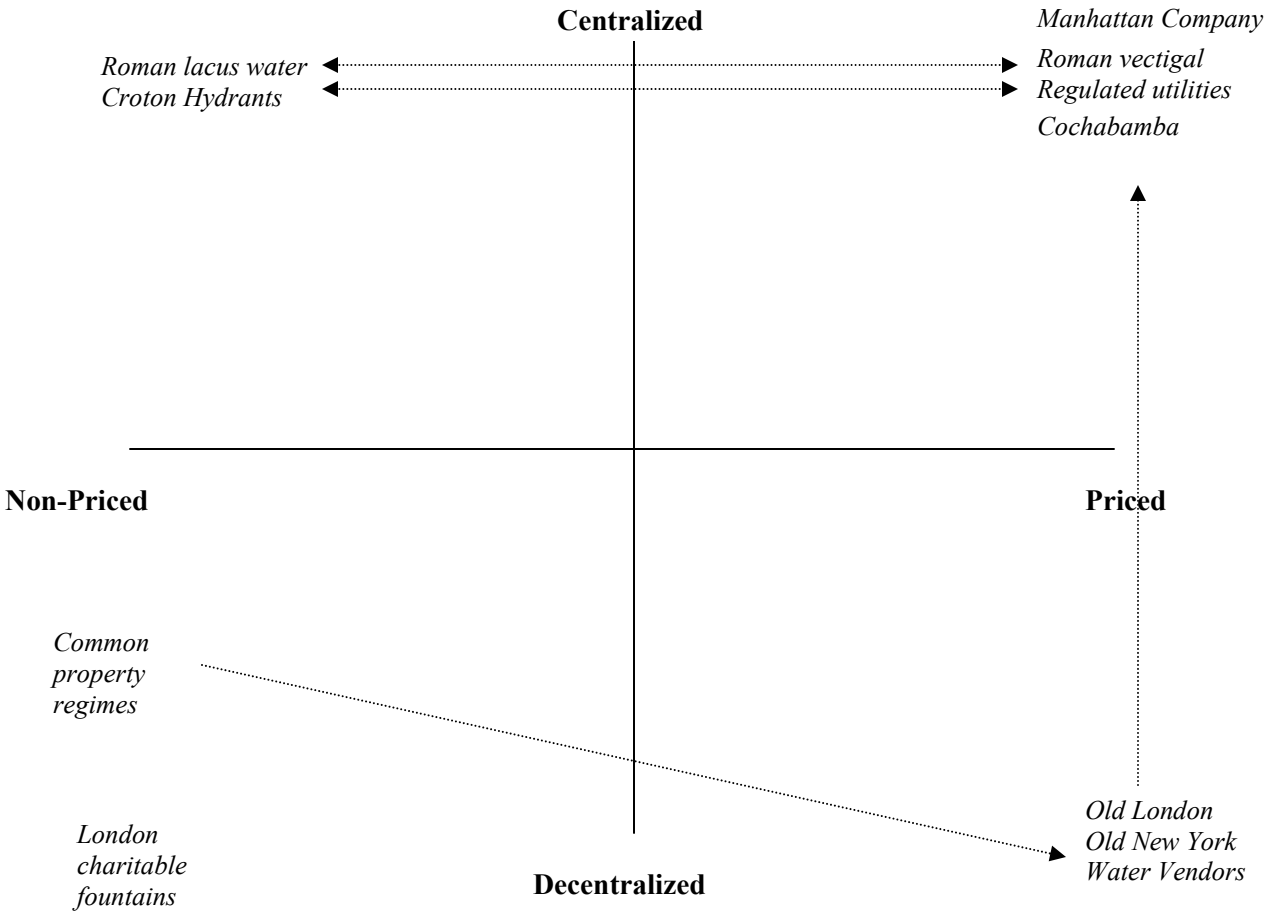
[222] Barlow and Clarke at 217.

[223] *See* Carol M. Rose, *Property as Storytelling:Perspectives From Game Theory, Narrative Theoty, Feminist Theory,* 2 YALE J. OF LAW & HUMANITIES 37 (1990).

[224] *See* Rose Comedy, *supra* note xx.

[225] *See* Rose Water Rights, *supra* note xx.

[226] *See* Rose Controls, *supra* note xx.


Centralized
Manhattan Company
Roman lacus water
Croton Hydrants
Roman vectigal
Regulated utilities
Cochabamba
Non-Priced
Priced
Common property regimes
Old London
Old New York
Water Vendors
London charitable fountains
Decentralized