



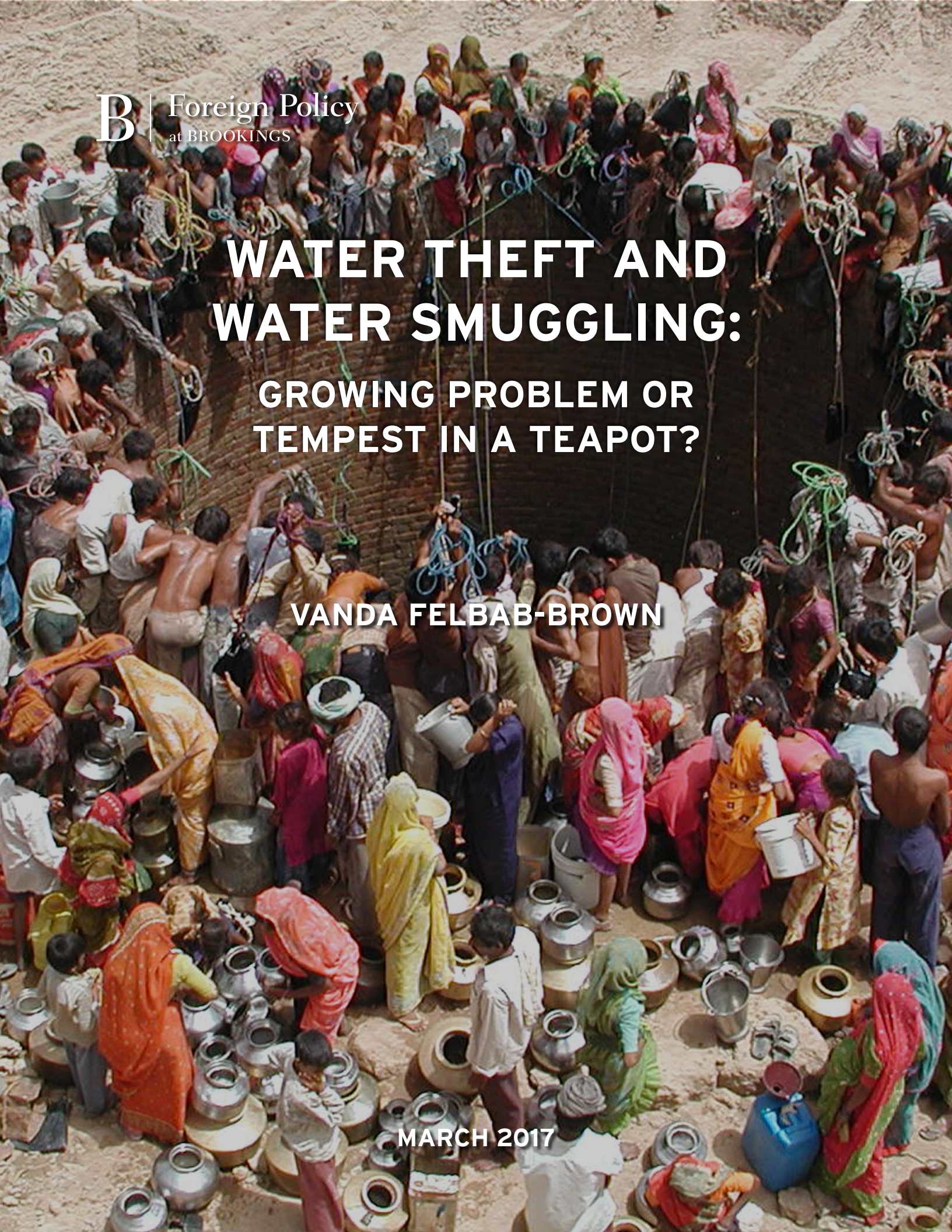
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WATER THEFT AND WATER SMUGGLING:

GROWING PROBLEM OR TEMPEST IN A TEAPOT?

VANDA FELBAB-BROWN

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INTRODUCTION

Fresh water is vital for human survival and health, the production of food and energy, industrial activity, and the functioning of the entire global economy, as well as for the survival of other animals, plants, and natural ecosystems. Water scarcity, whatever its cause—natural catastrophes, pollution, poor water management, or theft—can have grave consequences. In this paper, I examine the highly controversial and emerging topics of water theft and smuggling, and the policy failures that give rise to problematic illegal water markets around the world.

The controversy about water (theft)

The topic is highly controversial because there is no common definition as to what constitutes water theft and smuggling, or, for that matter, whether such phenomena exist at all. Increasingly, newspaper articles around the world, particularly in countries experiencing intense drought and water shortages, are highlighting water theft as a growing problem. Yet water experts, water-focused nongovernmental organizations (NGOs), governments, and communities do not agree whether there is any such a thing as water theft.

There are two broad schools of thought about the use of and access to water. One school defines water as a basic human right, and often opposes the pricing of water, particularly increases in prices. Another school of thought sees water as a commodity to which value needs to be assigned,¹ contending that, like electricity, it needs to be priced properly to maintain its sustainability and

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¹ For further on these two positions, see, for example, "Dry Facts," *The Economist*, November 5, 2016; and Helen Ding and Peter Veit, "3 Reasons Property Rights Are Essential for Healthy Ecosystems," *World Resources Institute*, September 28, 2016, <http://www.wri.org/blog/2016/09/3-reasons-property-rights-are-essential-healthy-ecosystems>.

efficient use. According to this premise, the concept of water theft is valid—theft being the appropriation of water without the required payment, or in violation of existing rules. The first school of thought, however, is deeply uncomfortable with the concepts and language of water theft and smuggling. While this school does see the unauthorized taking of water from a neighbor's tank as theft, it questions whether the unauthorized taking of water from a public source or the commons, such as river, can be called "theft," particularly if such behavior is driven by need. Rather, punitive enforcement of regulations against unauthorized use of water from common or public sources can constitute the denial of a human right. Thus, legislation and regulations concerning water use can be politically divisive and explosive, since these opposite views can be strongly held even within the same polity.

In-between positions do exist. Some water experts, for example, grant that access to water is a basic human right that should not be withheld from anyone. But they also maintain that having water brought from its source, treated for human consumption, and delivered to one's home is not a basic human right, and hence that it is appropriate to pay for the treatment and delivery of water. Accordingly, they argue that the unpaid taking of water is not *theft*, although it is an *illegal use of utility facilities*.² Other expert reports on water management are consistent with the notion that "free water is wasted water," and yet refrain from using terms such as water theft and instead use the milder wording of an overuse of water.³

Of course, in some jurisdictions, overuse can be perfectly legal, not involving any violation of law, while also being unsustainably inefficient and causing environmental degradation. In the Arab world, for example, water prices are kept artificially low and water is heavily subsidized—with the price of desalinated water being a mere 10 percent of the cost of production—which is a highly inefficient and problematic approach, but perfectly legal. Chinese industry uses 10 times more water per unit of production compared to the average in rich countries.⁴ In parched California, inadequate pricing of water results in the continued cultivation of water-intensive crops, such as avocados, once again highlighting that inefficiency can be perfectly legal.

In this paper, my analysis operates essentially within the framework of the school which holds that water theft is possible. Yes, access to water is a human right but that does not mean that it is a limitless right and that access to water should be uncontrolled and free. Just as access to food for survival is a human right,

² I am most grateful to the reviewers for their insights about these concepts.

³ Mohamed El-Ashry, Najib Saab, and Bashar Zeitoon, "Water: Sustainable Management of a Scarce Resource," *Arab Forum for Environment and Development*, 2010, vii, <http://www.afedonline.org/Report2010/pdf/AR/prefacear.pdf>.

⁴ "Dry Facts," *The Economist*, November 5, 2016, <http://www.economist.com/news/leaders/21709541-water-scarce-because-it-badly-managed-dry-facts>.

food is priced. If some population cannot afford to buy the food necessary for survival, they are appropriately entitled to food assistance. Similarly, water should be priced, and only access to a certain amount of water—the amount necessary for an individual’s healthy existence—should be supported with assistance to fulfill this human right. Access to water beyond the necessary minimum, such as for swimming pools, lawns, agriculture, or industrial purposes, should be appropriately priced and not defined as a basic human right. Moreover, even access to the minimum amount of water necessary for healthy human survival can and should entail restrictions on how individuals access the water. Violations of existing regulations and water allocations or accessing water through means that jeopardize water quality should not be allowed under the premise of exercising a basic human right. Clearly, stealing water from a neighbor’s household would be viewed by most as theft. Unauthorized taking of water from wetlands or rivers, for example, or by drilling unauthorized connections to water pipes, should also be viewed as theft.

I thus define water theft as any taking of water in violation of existing regulations. Such violations can include not paying the amount specified by local water regulations, such as by tampering with meters, tapping boreholes without necessary licenses, or installing unauthorized connections to water distribution systems. I define water *smuggling* as any transportation and distribution of water in violation of existing regulations. Thus, it is warranted to brand as criminal water enterprises those entities who commercially appropriate and distribute water in violation of existing regulations, such as by taking it from a river without permission—by law or by a specific license—from a water authority. The private distribution of water by itself does not constitute a violation of law, and indeed, private water markets may be necessary to ensure access to water by poor and marginalized populations. However, if the private water distributors fail to pay taxes on their water income, they are then at minimum informal water distributors. If they acquire the water they sell in violation of regulations, they should be treated as illegal water distributors. (Of course, a private distributor can have a license from the government to operate and pay taxes, yet still steal water from public resources, such as hydrants or rivers, in violation of existing laws).

The specifications in existing water laws—such as whether it is legal or not to take water from a public hydrant, whether it is necessary to disclose such acquisition of water and pay for it, whether it is legal to siphon water off from a river on public lands—vary widely among countries and even within countries. Thus, what is water theft in one jurisdiction may be perfectly legal in another, even a neighboring one. In some places but not others, for example, groundwater (the technical term for water that is *underground*) is considered a common resource from

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which all farmers can withdraw—sometimes very cheaply, or even for free. Although such a lack of pricing may have devastating environmental and water sustainability effects, it can be perfectly legal.

This paper is also controversial because I propose that water regulations should be seriously enforced, including through punitive means. The policing of water needs to become a part of the menu of tools that communities and policymakers have to ensure an adequate, equitable, and sustainable use of water for people, agriculture, industries, and natural ecosystems. Some water regulators and NGOs believe that adversarial approaches to water management, which policing, enforcement, and punitive approaches to water violations entail, are counterproductive and that the best water management emerges from nonconfrontational cooperation among a broad set of stakeholders. They question whether unauthorized water use should be called illegal and suggest that such an explosive label will prevent achieving buy-in from the relevant stakeholders. This lack of common language and conceptualization makes effective and sustainable water management all the more difficult. While not claiming to resolve these debates, I will be offering recommendations for how to incorporate enforcement approaches to water management in situations where they may be appropriate. I show that such situations currently exist and will become more frequent.

Although the paper is not globally exhaustive, I provide examples of (possible) water theft and smuggling from Asia, Africa, and Latin America, as well as Western Europe. I also provide contrasting comparisons from the United States and unpack the controversies as to whether what is oftentimes labeled as water theft in U.S. newspapers in fact legally constitutes an offense. Accordingly, I explore informal and illegal water markets in both urban and rural areas. I review the types of water theft and smuggling that have emerged, their scale and frequency, the threats they pose, and the benefits they sometimes bring to marginalized populations, not just to privileged and unaccountable actors. I further analyze the governance of illegal water markets and the structure of water smuggling groups and their political power and capital. In doing so, I also analyze the role of government water authorities in the perpetuation of illegal water markets, and the frequent government collusion in illegal water-related activities in various parts of the world, as well as the political constraints on rectifying the situation and adopting better policies. The concluding section features policy implications and my recommendations.

Background on the state of water in the world

The global distribution of water does not conveniently match local supply with demand. China has less water than Canada, yet 40 times as many people. Moreover, vast portions of China's surface water, such as of the Yellow River water system, have

been destroyed by industrial and agricultural pollution as well as overuse. Thirteen Arab countries are among the world's 19 most water-scarce nations. Eight of them are already experiencing severe water scarcity per capita, with precipitation across the Arab world expected to decline by 25 percent and evaporation to increase by 25 percent by the end of the 21st century.⁵ Recently, even water-rich countries such as Brazil, have grappled with droughts and water scarcity. Moreover, in both water-rich and water-poor countries, access to water is highly unequal in both rural and urban areas. The pricing of water also varies widely around the world. Denmark has the world's most expensive drinking water and users shoulder the entire bill themselves. In contrast, among developed countries, Singapore has some of the world's cheapest water relative to GDP per capita.⁶

In 2015, 650 million people worldwide lacked access to safe drinking water.⁷ Although a very large number, this constitutes a vast improvement over the past decade. In 2004, 1 billion people lacked access to safe drinking water and 2 billion lacked access to safe sanitation.⁸ In its Sustainable Development Goals (SDGs), the international community adopted very ambitious and multifaceted objectives regarding the expansion of access to water and sanitation by 2030. Specifically, SDG 6 called for universal and equitable access to safe and affordable drinking water for all; adequate and equitable sanitation and hygiene for all, and an end to open defecation; improving water quality, reducing pollution, eliminating dumping, and minimizing the release of hazardous chemicals and materials; increasing water-use efficiency, ensuring water sustainability, and reducing the number of people who suffer from water scarcity; implementing integrated water resources management across all levels, including transboundary; and by 2020, protecting and restoring water-related ecosystems.⁹

Nonetheless, despite the improvements and the ambitious conceptualization of the SDG on water, various countries in the world are becoming water-stressed as a result of global warming and desertification driven by other causes, such as deforestation, population growth, and poor water management.

⁵ *Ibid.*

⁶ Charles Fishman, "Don't Let Water Be the Problem: If Iran and the United States Can Cooperate on Water Issues, Anyone Can," *Foreign Policy*, July-August 2015. <http://foreignpolicy.com/2015/07/20/starving-for-answers-food-water-united-nations/>. See also Charles Fishman, *The Big Thirst: The Secret Life and Turbulent Future of Water* (New York: Free Press, 2011).

⁷ World Health Organization/UNICEF, "25 Years' Progress on Sanitation and Drinking Water: 2015 Update and MDG Assessment" (Geneva: World Health Organization, 2015), http://www.wssinfo.org/fileadmin/user_upload/resources/JMP-Update-report-2015-English.pdf.

⁸ Janelle Plummer, "Water and Corruption: A Destructive Partnership," in *Global Corruption Report 2008: Corruption in the Water Sector*, Transparency International (Cambridge: Cambridge University Press, 2008), 3.

⁹ United Nations General Assembly, Resolution 70/1, "Transforming Our World: The 2030 Agenda for Sustainable Development," September 25, 2015, 15-16, http://www.un.org/ga/search/view_doc.asp?symbol=A/RES/70/1&Lang=E.

Already, a quarter of Africa's population is experiencing chronic water stress. By 2025, 3 billion people could live in water-stressed countries, including countries of high poverty and large population growth.¹⁰ As the world's population quadrupled over the past 100 years, water consumption has increased sevenfold. Water scarcity is pervasive not only in sub-Saharan Africa and the Middle East, but also in South Asia, China, Australia, Mexico, and the western United States.

The United Nations and many experts set the minimum water requirement per person at 50 liters per day. The assumption is that a person drinks two to three liters, and the rest goes to cooking, washing, and sanitation, such as flushing toilets. In severely water stressed countries, people will often not be able to access this minimum amount. In the United States, on the other hand, the average water use per person is between 400 and 600 liters a day, more than any other country.¹¹ Much of the use by Americans is rather profligate, such as letting the water faucet run while they brush their teeth. Indeed, per capita water consumption in Europe is less than half of that in the U.S.

Agriculture uses 70 percent of the surface water, such as from rivers or lakes, and from groundwater that is consumed globally.¹² In combination with high-yield grains and fertilization, irrigating farmland can lift people out of poverty, but it can also massively deplete water resources.¹³ A frequently quoted statistic is that it takes 140 liters of water to make a cup of coffee, with the vast majority of the water being spent on growing the coffee plant.¹⁴ Although this number and the very concept of the so-called water footprint of agricultural crops has been criticized (both for underestimating and overestimating the water impact of agriculture and failing to distinguish between different sources of water, their quality, and thus their impact in growing countries),¹⁵ it nonetheless captures how much water agriculture can consume and the frequent invisibility of water in food production. If one accepts the concept of a water footprint, then a kilogram of wheat requires 1,300 liters

10 United Nations Development Program (UNDP), *Human Development Report 2006 -- Beyond Scarcity: Power, Poverty, and the Global Water Crisis* (New York: Palgrave Macmillan, 2006).

11 Michael Specter, "The Last Drop," *The New Yorker*, October 23, 2006, <http://www.newyorker.com/magazine/2006/10/23/the-last-drop-2>.

12 UNDP, *Human Development Report 2006 - Beyond Scarcity: Power, Poverty, and the Global Water Crisis* (New York: Palgrave Macmillan, 2006).

13 For more on water and agriculture, see, for example, Frank Rijsberman, "Water for Food," in *Global Corruption Report 2008: Corruption in the Water Sector*, Transparency International (Cambridge: Cambridge University Press, 2008), 67-82.

14 A.K. Chapagain and A.Y. Hoekstra, "The Water Footprint of Coffee and Tea Consumption in the Netherlands," *Ecological Economics* 64 (2007): 109-18.

15 See, for example, Paul Hicks, "Coffee's Water Footprint Needs to Be Revised," (Baltimore: Catholic Relief Services, 2016), <http://coffeelands.crs.org/2016/04/coffees-water-footprint-needs-to-be-revised/>; and Hank Campbell, "Remember That '140 Liters of Water in My Cup of Coffee' Theory? Here's Why Virtual Water Is Bogus," *Science 2.0*, March 21, 2008, http://www.science20.com/science_2_0/remember_that_140_liters_of_water_in_my_cup_of_coffee_theory_heres_why_its_bogus.

of water to produce and 1 kilogram of beef 15,000 liters.¹⁶ In India, the proliferation of pumps, wells, and subsidized energy led to the proliferation of wells for agriculture and the depletion of surface and groundwater. While 40 years ago, there were 2 million wells, a decade ago there were 23 million wells, and that number has continued to expand.¹⁷ The depletion of water, coupled with intense urbanization and the growth of urban slums, has increased illegal water sourcing (water theft) and water smuggling.

In many parts of the world, intense competition over water resources is underway. This competition is likely to significantly intensify as a result of population growth, urbanization, increased living standards, overuse of water, environmental degradation, and climate change. As surface water is depleted or becomes polluted, groundwater is turned to as the next source. Groundwater can be managed well. In the 1990s, the state of Arizona established a “groundwater bank” as a protection against river water shortages. Since then, the state refills the groundwater basins with water from the Colorado River and stores the water for times of shortage. Arizona also allows California and Nevada to use the groundwater basin as a bank for storage. Nevada would take Arizona’s Colorado River water from Lake Mead and the Arizona groundwater bank would pump groundwater from adjacent basins into the Central Arizona Project aqueduct and deliver it to Arizona users. Similarly, cities buy Colorado River water and then either through injection or infiltration (the process by which surface water enters the soil system) replenish groundwater system. Nevada also has its own groundwater bank.

At times, groundwater use can be highly problematic. In both developed and developing countries, groundwater can become rapidly overused and depleted, facilitated by the widespread availability of cheap drills, pumps, and inexpensive energy supplies. In parts of India, northern China, Yemen, and Mexico, water tables have been falling significantly and water extraction from at least a quarter of aquifers exceeds sustainable levels.¹⁸

Indeed, the regulation of groundwater is even more complex and exhibits more frequent regulatory failure than the regulation of surface water. Since groundwater is less visible, and credible estimates of aquifer size, replenishment, and depletion are frequently lacking,¹⁹ problems of free-riding, buck-passing, overuse, and water theft and smuggling only increase in intensity.²⁰

16 Mohamed El-Ashry, Najib Saab, and Bashar Zeitoon, “Water: Sustainable Management of a Scarce Resource,” *Arab Forum for Environment and Development*, 2010, viii, <http://www.afedonline.org/Report2010/pdf/AR/prefacear.pdf>.

17 Michael Specter, “The Last Drop,” *The New Yorker*, October 23, 2006, 3.

18 *Ibid.*

19 See, for example, Andy Gouldson, Elena Lopez-Gunn, Jamie Van Alstine, Yvonne Rees, Miles Davies, and Vijay Krishnarayan, “New Alternative and Complementary Environmental Policy Instruments and the Implementation of the Water Framework Directive,” *European Environment* 18, no. 6 (2008): 359-70.

20 Thomas Dietz, Nives Dolsak, Elinor Ostrom, and Paul Stern, “The Drama of the

Since use of groundwater is often financed privately, such as by farmers, businesses, and industries, rather than the government, it tends to be vastly underreported. And yet underground water resources are often connected in complex ways to surface water, such as in rivers. If one belongs to the school of thought that does not define limitless unpriced access to water as a human right, then water theft and smuggling can and do occur from both surface and underground water sources, often on a massive scale. Already, approximately one-fifth of the world's aquifers are overexploited.²¹

The purpose of water regulation is to ensure long-term water sustainability and compatibility of water use across society, by all actors, and among competing uses, such as drinking, agriculture, industry, and energy, as well as to ensure the preservation or biodiversity of natural ecosystems. Strict legal compliance of course does not guarantee the sustainable and efficient use of water. If the regulatory system is inadequate, all kinds of deficiencies can pervade water use.²² Nor does strict legality of water distribution necessarily signify equitable access to water. Indeed, in many parts of the world, the poor and marginalized, particularly in urban spaces, can only access water through private or extralegal distribution systems. In developing countries, customary water use, such as for access to grazing, cultivation, and drinking, may be fully unauthorized and, in fact, illegal—even as it is vital to the survival of rural and pastoralist populations.

However, without legal compliance, it is difficult to devise an effective regulatory system since insufficient pricing and cost-avoidance can, and often do, lead to overuse and depletion and eventually result in the degradation of water treatment and supply facilities. All these problems compound the lack of water access for the poor and marginalized, ultimately drying up even their informal, and sometimes outright illegal, water sourcing and distribution. Assigning property rights and pricing water is insufficient if enforcement is absent or inadequate. Though cross-border water smuggling has so far not materialized on any large scale, it could become prevalent in the future, with all of its political, conflict, and geostrategic implications.

In the next section, I review the various threats that water theft and unsustainable use generate. Following that, I examine the varied forms of what could be called water theft and the incidence, scope, and size of water smuggling. I also describe the many and highly varied actors involved in the informal and illegal activity and analyze how control over water and illegal water markets

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Commons," in *The Drama of the Commons*, eds. Elinor Ostrom, Thomas Dietz, Nives Dolsak, Paul Stern, Susan Stonich, and Elke Webers (Washington, DC: National Academy Press, 2002), 1-35.

²¹ "Liquidity Crisis," *The Economist*, November 5, 2016.

²² Lucia De Stefano and Elena Lopez-Gunn, "Unauthorized Groundwater Use: Institutional, Social and Ethical Considerations," *Water Policy*, 14 (2012): 147-160.

creates political capital and power for both formal government and informal powerbrokers.

THE THREATS POSED BY WATER THEFT AND UNSUSTAINABLE USE

Water theft and smuggling, just like unregulated or poorly-regulated use of water,²³ can threaten the *water security* of licensed users. But it also ultimately threatens the water security of unlicensed users and users who violate regulations, leading to *scarcity*, and thus to rationing, increased prices, and potentially insufficient availability. In the worst situations, this can lead to a lack of water even for drinking. Many cities in India²⁴ and Pakistan, for example, only have running water for several hours a day, similar to their lack of electricity.

The first and often most affected are the world's poorest and most marginalized populations. Typically, slum residents around the world lack access to potable water. Many households are not hooked up to public water distribution systems, and they need to rely on informal or outright illegal sources and actors for water distribution. These informal and illegal distribution systems are often inadequate and are provided at very high prices, with the paradoxical effect that the world's poorest and most marginalized who most intensely lack water also often pay far more for it than the affluent and the middle class. In El Salvador, Jamaica, and Nicaragua, the poorest households often spend more than 10 percent of their income on water, while in the United States, such households spend only 3 percent.²⁵ In some of the world's most water-distressed countries, such as Yemen and in Africa, even the most basic water use—for subsistence, cooking, and hygiene—becomes unaffordable for the poor and largest segments of the population. Furthermore, many segments of this population are at a particularly high risk given that conflict-affected communities and refugees are most vulnerable to water scarcity.

Overuse of water—whether through the lack of regulation and its enforcement, or through illegal appropriation of water—also *undermines water quality*, compounding the salinization and intrusion of pollutants into water sources. Such water degradation does not come only from improper use of surface water. Drilling deeper and deeper to access underground water sources can equally tap polluted water. In Mexico's Guanajuato state, a prime

23 Other illegal economies and practices, such as illegal logging, or poor regulation of and corruption in other natural resources like forestry can also critically undermine water sustainability. See, for example, Michael Burnham and Nathaniel Gronewold, "Corruption, Mismanagement Strangle Vital Kenyan Watershed," *The New York Times*, May 17, 2010, <http://www.nytimes.com/gwire/2010/05/17/17greenwire-corruption-mismanagement-strangle-vital-kenyan-21141.html?pagewanted=all>.

24 See, for example, Anjal Prakash, "The Periurban Water Security Problem: A Case Study of Hyderabad in Southern India," *Water Policy*, 16, no. 3 (June 2014): 454-69.

25 UNDP, *Human Development Report 2006 - Beyond Scarcity: Power, Poverty, and the Global Water Crisis* (New York: Palgrave Macmillan, 2006).

agricultural area, the unpaid overuse of water by agricultural businesses and small farmers alike has produced such water scarcity that deep underground water polluted with arsenic and fluoride is now regularly used by the poor for drinking, and likely also by businesses for agriculture.²⁶ Yet it is the agricultural farms that are the big users; they consume some 82 percent of all water in the region and do not pay for it.

In turn, poor water quality and high pollution levels can cause a variety of serious and potentially deadly *diseases*, whether cholera or typhoid or other longer-term illnesses. Water scarcity and the lack of access to clean water also greatly increase infant mortality and are linked to poverty in multiple complex ways. Indeed, water scarcity disproportionately affects women in developing countries. In South Asia and Africa, women often have to travel great distances and spend a lot of time acquiring water even as water smuggling and illegal water sourcing outfits are almost exclusively the domain of men.

The resulting inability of countries or cities to collect payments for water use, including as a result of large-scale delinquency and massive water theft and smuggling, means that there are *inadequate resources for repairing, updating, and enlarging water distribution systems and for finding measures to cope with scarcity*. Thus in many cities, water pipeline networks are often more than a century old and designed for much smaller populations, leading roughly one quarter of the world's cities to suffer from water stress.²⁷ For example, Karachi, Pakistan's metropolis of 20 million, requires 1.1 billion gallons of water every day.²⁸ Quite apart from the large theft and smuggling of water in the city described below, the water distribution system is designed to carry only half of that demand at best. Meanwhile, the city continues to experience population growth of 4.5 percent per year, adding further demands on its dysfunctional water distribution system. Yet only one quarter of Karachi's residents pay their water bills.²⁹ In Mumbai, the corrosion and dilapidation of the water distribution system has periodically resulted in the contamination of the water and the growth of bacteria in the pipelines. Moreover, the costs of repairs can be enormous; in the United States, where pipes are also old and billions of gallons of water disappear every day through leaks, repairing water and wastewater systems could cost \$1.3 trillion or more.³⁰ Indeed, the

26 Elisabeth Malkin, "Big Mexican Farms Suck Up Water, Leaving Villages High and Dry," *The New York Times*, May 20, 2016, https://www.nytimes.com/2016/05/20/world/americas/mexico-water-farms-drought.html?_r=0.

27 "Liquidity Crisis," *The Economist*, November 5, 2016.

28 Sabrina Toppa, "Dry Dams, Leaky Pipes and Tanker Mafias - Karachi's Water Crisis," *The Guardian*, June 28, 2016, <https://www.theguardian.com/global-development-professionals-network/2016/jun/28/karachi-pakistan-water-crisis>.

29 *Ibid.*

30 Michael Webber, "Our Water System: What a Waste," *The New York Times*, March 22, 2016, <https://www.nytimes.com/2016/03/22/opinion/our-water-system-what-a-waste.html>. See also Michael Webber, *Thirst for Power: Energy, Water and Human Survival* (New Haven: Yale University Press, 2016).

need to upgrade the water infrastructure of urban areas is not limited to the developing world. For instance, Chicago, the third most populous city in the U.S., to this day relies on wooden pipes to carry water to its population.

Unpaid, illegal, or underpaid and unregulated overuse of water for agriculture is one of the biggest causes of water scarcity. Subsequently, however, water scarcity negatively affects agriculture and *undermines food security* by compromising both crop production and grazing. Similarly, industries regularly overuse water and fail to pay for their water consumption, thus engaging in water theft. In addition, subsequent water shortages may severely affect these and other industries, thus triggering even larger *negative economic effects*.

Water degradation and depletion through unsustainable use and water theft can compromise the sustainability of entire ecosystems, generating a cascade of *bad environmental effects*. As water is depleted, wetlands dry up, forests die, and biodiversity collapses. Biodiversity reflects local habitats, with water-rich areas, such as wetlands and rainforests, having far greater biodiversity than water-poor habitats. As a forest dies (or is logged out), further undesirable hydrological effects take place, with more water evaporating and soil erosion increasing. Illegal use and overuse of groundwater also negatively affect surface water and can fundamentally and perniciously alter the complex dynamics between surface and groundwater.

Theft- and mismanagement-induced water scarcity and the vagaries of water smuggling can also lead to *political, social, and communal strife, riots, and instability*. The Muttahida Qaumi Movement Pakistan (MQM) political party that has ruled Karachi for much of the past three decades has regularly used water scarcity to pressure political opponents and instigate political riots, even as it has been the MQM's administration of the city for almost three decades that is responsible for inadequate water distribution networks.³¹

Over the past decade and half, water scarcity and disruption of legal and illegal water supplies have regularly sparked riots in Mumbai. During one such incident in March 1999, the so-called water mafia (as Indians refer to illegal distributors of water in water tanks) took advantage of the water shortage, which had been induced by blocked roads and railways, and increased prices tenfold.³² The poor were thus squeezed twice: suffering from the water shortage *and* the exorbitant prices that they had to pay to illegal water distributors. At the same time, and tragically, Mumbai's engineering strategy has consistently privileged supplying the city over adequately sourcing rural areas near Mumbai. This in turn generates increased migration from rural areas

31 Author's interviews with leaders of various political parties in Karachi, including MQM, about water scarcity, strife, and its political manipulation in Karachi. Karachi, Pakistan, May 2016.

32 G. Sovani and K. Lokhandwala, "Water-Starved Bhayandar Residents Take to the Streets," *Bombay Times*, March 4, 1999.

into Mumbai's slums, and exacerbates the extent of water smuggling to the slums areas—whether from rural sources or the illegal tapping of distribution systems within the city.³³

Furthermore, and unconscionably, cutting off water has been used as a means of *political pressure and extortion*, and not merely during wars. In India's state of Haryana, protestors from the Jat caste disrupted water supply to Delhi, the capital city of 18 million people, in February 2016 as a pressure mechanism to demand their inclusion in the country's caste-based affirmative action program for accessing government jobs. At the same time, the Jat also dominated illegal water distribution within Delhi, where at least one quarter of households lack connections to public water distribution systems.³⁴ Such extortion-motivated disruption of basic infrastructure has been a regular, and sadly effective, feature of India's politics for decades. Such conflict over water can become politically explosive if it takes place along ethnic and religious lines, with minority and marginalized groups deprived of equal access to water.

Disputes over water can also be an element of *interstate conflict*, or perhaps even its trigger. Confrontations have permeated the Middle East, with state-level damming and diversion of rivers pitting Turkey, the upstream country, against Syria and Iraq, and Israel against Palestine, among others. In South Asia, where conflictual attitudes over water are prevalent,³⁵ India fears losing access to sufficient water and being vulnerable to China's power plays as a result of China's damming of the major waterways that originate in China before flowing into India. Pakistan, a country with intense and growing water scarcity like India, similarly fears that India and Afghanistan will cut it off from access to water from the Indus, which originates in India, and from the Kabul River, which starts in Afghanistan. As the population of South Asia is projected to rise to 2.22 billion in 2040 (from 1.68 billion in 2010), conflicts over water between industry and agriculture—within communities and across borders—will only increase.

At the same time, the presence of too much water can also be a tool of conflict, such as when the Islamic State (ISIS) threatened to drown local Iraqi populations in the vicinity of a Euphrates dam and deprive water from others. By closing eight of the dam's 10 gates, ISIS flooded the land upstream and gravely curtailed water distribution to Iraq's downstream southern provinces. But fearing that their stronghold of Falluja at the time would also be flooded, they ultimately opened the gates.³⁶

33 Matthew Gandy, "Landscapes of Disaster: Water, Modernity, and Urban Fragmentation in Mumbai," *Environment and Planning A* 40 (2008): 118.

34 Aman Sethi, "India's Water Wars," *The New York Times*, March 1, 2016, <https://www.nytimes.com/2016/03/02/opinion/indias-water-wars.html>.

35 Gareth Price et al., "Attitudes to Water in South Asia," (London: Chatham House, June 2014), https://www.chathamhouse.org/sites/files/chathamhouse/field/field_document/20140627WaterSouthAsia.pdf.

36 "Iraq Insurgents Use Water as Weapon after Seizing Dam," *Reuters*, April 11, 2014, <http://www.reuters.com/article/us-iraq-security-idUSBREA3A0Q020140411>.

Of course, the issue is more complex than upstream countries or communities trying to exercise unfair hegemony over downstream countries and communities. In much of the world, water scarcity is induced by poor domestic water management. In India, the provision of subsidized or free electricity that induces many rural communities to pump groundwater and drill deeper and deeper to access it leads to unsustainable use. Yet populist politics make it difficult to raise the price of water and electricity. Local Indian politicians often claim to be combating corruption in the water sector even as they promise free water and continue to subsidize diesel and electricity for water pumps. Nepal, the most water-secure country in South Asia, does not have the capacity to store its water and suffers severe water shortages during the dry season. Bangladesh equally fails to store and distribute its flood rains, even though, despite being a downstream country, it has more water per person than India, Pakistan, and Afghanistan.³⁷

In the future, such water issues could spark major interstate violence. Already, it has given rise to cross-border communal clashes, such as in 1999 between Mali and Mauritania over access to communal water holes.³⁸ And there may be increased interstate water smuggling, perhaps even with state collusion. Already, Pakistan and India have some of the world's most extensive and developed domestic water smuggling networks, with various degrees of state collusion, and much of the smuggling along with other contraband takes place across state borders in South Asia.

Optimistically, the water scarcity problem can stimulate technological innovation for more efficient use, such as more cost-effective desalination of seawater. Or the scarcity can give rise to, or exacerbate, water theft and water smuggling, and compound unsustainable use.

THE SIZE AND SCOPE OF WATER THEFT AND ITS MANY FORMS AND CONTROVERSIES

According to the World Bank, some 48.6 million cubic meters of drinkable water escape daily from official supply networks, enough to provide water for 200 million people. In developing countries, such water loss amounts to some 30 to 50 percent of all treated water.³⁹

In both Karachi and Delhi, such water leakages from old water pipes and outright water theft amounts to water loss of some

According to the World Bank, some 48.6 million cubic meters of drinkable water escape daily from official supply networks, enough to provide water for 200 million people. In developing countries, such water loss amounts to some 30 to 50 percent of all treated water.

37 Gareth Price et al., "Attitudes to Water in South Asia," (London: Chatham House, June 2014), ix, https://www.chathamhouse.org/sites/files/chathamhouse/field/field_document/20140627WaterSouthAsia.pdf.

38 See, for example, Sandra Postel and Aaron Wolf, "Dehydrating Conflict," *Foreign Policy*, November 18, 2011, <http://foreignpolicy.com/2009/11/18/dehydrating-conflict/>.

39 Bill Kingdom, Roland Liemberger, and Philippe Marin, "The Challenge of Reducing Non-Revenue Water (NRW) in Developing Countries," (Washington, DC: World Bank, December 2006), <http://siteresources.worldbank.org/INTWSS/Resources/WSS8fin4.pdf>.

30 to 35 percent in each city. Water mafia networks divert water through illegal pipelines by drilling holes into official pipelines or setting up illegal hookups to water canals. They also illegally drain surface water from rivers, supplying slum communities unconnected to an official water supply. In India, such communities are supposed to be provided with legal water by water-authority-supplied trucks. In New Delhi, some 800 tankers are operated by the city's water board. They are supposed to provide mostly free or heavily subsidized water to those who are not connected to a public system. Yet the trucks often do not arrive, especially with an adequate supply of water, unless they receive bribes and get to charge much higher prices than those set by the government. Another 2,000 private water operators also distribute water in the city—some operating with licenses and in compliance with water regulations, others illegally. In Karachi, water mafias also illegally tap into water hydrants and set up illegal wells and pipelines for industries. They fill up trucks and sell the water to industries and large businesses—some 70 percent of the stolen water!—as well as to the poor, at inflated prices. Illegal traders who operate 30 to 40 tankers earn as much as \$16,000 a day.⁴⁰

Supplied by the polluted but still water-rich rivers of the Yamuna, Ganges, and Sutlej, Delhi should theoretically get more water per capita than Paris or Geneva.⁴¹ Yet between 40 and 60 percent of the water supply is lost due to leakages, theft, and smuggling.⁴² Only 37 percent of those connected to the formal water system pay their water bills, with losses amounting to \$1 billion between 2009 and 2012.⁴³ Water is also diverted and illegally sourced from all three rivers as well as from illegally-tapped groundwater. Illegal water tankers, and those licensed by the government but violating regulations, deliver some 300 to 500 million gallons (1.1 to 1.0 billion liters) of illegally-sourced water daily, making the unauthorized business worth millions of dollars. And of course, the vast majority of the water on the black market is not decontaminated or treated for human use. Similarly in Mumbai, between 40 and 60 percent of water is lost through illegal diversion, including illegal connections and leakage according to the World Bank.⁴⁴ Across India, some 76 million people lack access to safe water, making India the country with the largest number of people so affected in terms of absolute numbers. However, Papua New Guinea leads as the country with the greatest percentage of

40 "Karachi's 'Water Mafia' Sucking City's Pipelines Dry," *Al Jazeera*, September 10, 2015, <http://www.aljazeera.com/news/2015/09/karachi-water-mafia-sucking-city-pipelines-dry-150910062202773.html>.

41 Sai Manish, "Black Market for Water Expands in Delhi," *The New York Times*, September 18, 2013, <https://india.blogs.nytimes.com/2013/09/18/black-market-for-water-expands-in-delhi/>.

42 Aman Sethi, "Midnight Marauders," *Foreign Policy*, July/August 2015, 55-65.

43 *Ibid.*

44 World Bank, "India - Water Supply and Waste Water Services in Bombay: First, Second and Third Bombay Water Supply and Sewerage Projects," World Bank Independent Evaluation Group, <http://Inweb90.worldbank.org/oed/oeddoclib.nsf/DocUNIDViewForJavaSearch/OC21174E191C96F4852567F5005D38EF>.

its population—60 percent—lacking access to safe water. In fact, India actually does not even crack the world's top ten countries in terms of the proportion of its population without access to clean water.

In the South African city of Durban, some 35 percent of water is stolen or provided through illegal or unpaid connections.⁴⁵ At a country-wide level, such water loss is estimated to be 37 percent.⁴⁶ In Liberia's capital of Monrovia, inadequate and deficient official water pipelines are further tapped by illegal water providers commonly referred to as Push-Push Boys, who sell the water at higher prices in the city as well as on its outskirts.⁴⁷ At least 75 percent of Monrovia's daily water supply of 6 million gallons is thus lost to theft and leaky pipes.⁴⁸ Angola's meager water distribution system is similarly compromised—and supplemented—by illegal water smuggling.⁴⁹ In Tanzania's Dar es Salaam, 57 percent of the city's water supply is lost due to theft and leaks, amounting to a loss of some 171 million liters out of a daily supply of 300 million liters.⁵⁰ The daily demand for water in the city of four million residents stands at 515 million liters per day, resulting in a minimum shortage of 215 million liters per day if all of the stolen water is sold in the city and not in other markets, and if other leakage is also small, both of which are unlikely scenarios. Like in many other parts of the world, water theft and smuggling are not limited to the poor and marginalized. In Uganda's capital city of Kampala, for example, the vast majority of arrested water thieves (1,170 persons between 2014 and 2015) who arranged for illegal water connections and tampered with and bypassed meters were affluent residents and business owners, including owners of malls, hotels, and car washing services.⁵¹ That does not mean that the poor in Kampala do not illegally source water; they do. But since they are not connected to a formal network, and therefore do not have a meter to illegally alter, they are less visible to water management authorities.

In Jamaica, at least one-third of total water use, amounting to more than \$400 million per year, has been stolen by residents in both affluent and poor communities.⁵² This loss includes unpaid water bills, sometimes for years on end, as well as destroying

45 The Water Project, "Water in Crisis - South Africa," The Water Project, <https://thewaterproject.org/water-crisis/water-in-crisis-south-africa>.

46 "Communities Urged to Stop Illegal Water Connections," *South African Government News Agency*, March 19, 2014, <http://www.sanews.gov.za/south-africa/communities-urged-stop-illegal-water-connections>.

47 Winston Parley, "Liberia: 1.2 Million Residents Suffer Water Theft," *The New Dawn*, March 22, 2013.

48 "Liberia: LWSC Losing 75 Percent of Water Supply to Theft, Faults," *AllAfrica.com*, October 22, 2015, <http://allafrica.com/stories/201510231686.html>.

49 "Angola: EPAL to Reinforce Fight against Water Smuggling in 2014," *AllAfrica.com*, January 6, 2014, <http://allafrica.com/stories/201401062040.html>.

50 "Firm Crackdown on Illegal Water Connections," *Tanzania Daily News*, May 12, 2015.

51 "Water Thieves Fined Shs 3.8 Billion," *The Observer*, October 7, 2015.

52 "Water Theft by Rich and Poor Jamaicans Crippling NWC," *The Jamaican Observer*, April 11, 2011, http://www.jamaicaobserver.com/news/Water-theft-by-rich-and-poor-Jamaicans-crippling-NWC_8618091.

or tampering with meters. When officials of the National Water Commission actually discontinue the supply of water to some of those who notoriously do not pay their bills, the businesses and households often arrange for illegal reconnection to the official water supply while continuing to not pay for their water use.

Yet while tampering with meters to avoid paying for water might seem like a rather straight-forward form of water theft, the issue can be highly controversial. In South Africa, one of the world's first countries to introduce legislation on the human right to water, many organizations have risen to oppose metering systems for water use, arguing that the metering and cutoffs from water when households fail to pay their water bills are violations of their human rights. In the case of *Mazibulo versus City of Johannesburg*, South Africa's highest court upheld the claim of the female plaintiffs that cutoffs for unpaid bills violated their right to water and put the households in jeopardy.⁵³

In Brazil, sometimes referred to as the "Saudi Arabia of water" because it contains one-eighth of the world's fresh water and a large number of huge dams, some 37 percent of water is lost, with at least half of that stolen by commercial establishments and households through frauds and theft, known as "gatos." Such theft is particularly pervasive in São Paulo, which in 2015 suffered acute drought, water shortages, and rationing—described by Brazilian water specialists as an "unprecedented water crisis in one of the world's great industrial cities" (though of course major cities in India and Pakistan grapple with such crises on a regular basis).⁵⁴ Rather than systematically cracking down on water pilfering, São Paulo and Brazil have focused on building more dams and drawing up grandiose engineering projects to supply more water to the city from surrounding regions. That is also the standard response in India and Pakistan. And like in South Asia, Brazil's water theft is part of a far broader problem of illegal infrastructure access, such as through illegal electricity connections and telephone and cable TV hookups. In fact, despite the drought, there continues to be widespread social acceptance of such forms of theft that are not limited to slum areas, as long as one does not get caught.⁵⁵

In Jordan, water theft and smuggling have also been pervasive—not surprising for a water-poor desert country. Water theft and smuggling proliferated after 1997 when, in response to acute water depletion in aquifers and growing water salinity, the Jordanian government banned the drilling of wells. In reaction

53 See, for example, Andrea Geriak and Margaret Wilder, "Exploring the Textured Landscape of Water Insecurity and the Human Right to Water," *Environment* 54, no. 2 (March-April 2012): 4-17.

54 Simon Romero, "Taps Start to Run Dry in Brazil's Largest City," *The New York Times*, February 16, 2015, <https://www.nytimes.com/2015/02/17/world/americas/drought-pushes-sao-paulo-brazil-toward-water-crisis.html>.

55 Andréa Novais, "Stealing Infrastructure Access in Brazil," *The Brazil Business*, April 30, 2012, <http://thebrazilbusiness.com/article/stealing-infrastructure-access-in-brazil>.

to these regulations, unsustainable water use morphed into outright illegal, but equally unsustainable, water use. Today, illegally-sourced water is smuggled in pipes to irrigate farms or transported in trucks and sold,⁵⁶ and such illegal activity is blamed for a staggering 70 percent of water loss.⁵⁷ Unsurprisingly, then, between 2013 and the summer of 2016, Jordanian authorities dismantled some 24,500 illegal water taps and pipes, seized 780 illegal wells, and confiscated 41 drilling rigs.

In short, water theft takes many forms—depending on what violation of existing regulations takes place. Its most elementary form is the use of water without paying the bill for it. Many users simply do not pay their bills for years or even decades, and the water authority is unable or unwilling to cut off their supply. Using water beyond a set quota—whether from permitted boreholes, public water hydrants, or illegal taps by licensed or unlicensed users—is another form of water theft. So is under-reporting the use of water, whether from unregistered private wells or by tampering with water meters. In Mumbai, many hotels, businesses, and upscale establishments as well as middle-class households operate illegal wells or illegal booster pumps. Water theft and smuggling are thus hardly confined to poor urban or rural areas.

Nor are water crimes, including theft and smuggling, merely a problem for developing or poor countries. In some parts of southern Europe, the volume of water consumed illegally is equivalent to the volume of water consumed legally, meaning that 50 percent of water is illegally used by 50 percent of users.⁵⁸ In Malta in 2007, unlicensed groundwater use even surpassed authorized and legal water use.⁵⁹ In Spain, some 510,000 illegal wells were found in 2005, amounting to the theft of as much as 45 percent of all water pumped from aquifers per year.⁶⁰ This illegal use of water has led to encroachment on and degradation of protected land as well as rezoning and land grabs.

However, ascertaining what is and is not legal appropriation of water can be challenging. For example, during California's recent drought, many newspaper articles referred to the stealing of

56 Hana Namrouqa, "Nationwide Crackdown on Water Theft Continues," *The Jordan Times*, January 25, 2014, <http://www.jordantimes.com/news/local/nationwide-crackdown-water-theft-continues>.

57 Hana Namrouqa, "Over 24,500 Illegal Fixture Removed from Water Mains Since 2013," *The Jordan Times*, August 17, 2016, <http://www.jordantimes.com/news/local/over-24500-illegal-fixtures-removed-water-mains-2013%E2%80%99>. On water issues in the Middle East, see also Steven Solomon, *Water: The Epic Struggle for Wealth, Power and Civilization* (New York: Harper Collins, 2011).

58 European Academies Science Advisory Council (EASAC), "Groundwater in the Southern Member States of the European Union" (Halle, Germany: German National Academy of Sciences, 2010), http://www.easac.eu/fileadmin/PDF_s/reports_statements/Easac_Groundwater_WebVersion.pdf.

59 "Bid to Crack Down on Borehole Drilling," *The Times of Malta*, September 7, 2008.

60 World Wildlife Fund (WWF), "Illegal Use of Water in Spain: Causes, Effects, and Solutions" (Madrid, Spain: WWF/Adena, 2006), http://awsassets.wwf.es/downloads/uso_ilegal_del_agua_mayo06.pdf.

water from public hydrants and fire departments, alleging that “thieves” stole thousands of gallons of water in a few days and illegally filled up entire water trucks.⁶¹ But was that always water theft? The ordinances and regulations around hydrant use vary widely among California’s communities. Some communities allow their residents to use water from public hydrants for free. The biggest concern for water management authorities can be that without a proper hydrant valve, connecting a private line can rupture the public line. In some communities, individuals and companies can simply walk into a water utility and get a proper hydrant valve for their private use. The community does not charge anything for the valve and is in fact grateful that the individual or company made the effort to acquire the proper valve. Other communities do require the water from hydrants to be metered. In that case, if an individual or company acquires the water from a public hydrant without metering it, it is a violation of the regulation and by the definition used in this paper, it would constitute water theft. Metering water from public hydrants is oftentimes adopted in communities that have come to prioritize water conservation and that have tiered rates for water use, i.e., escalating, as opposed to flat, prices for water use at certain levels.

Other cases of alleged water theft in California include so-called “straight piping,” or the use of small pipes to bypass city meters. Again, if the community requires that all water use be metered, including from hydrants and public lines, then straight piping would constitute theft of water. However, overall, there are again substantial differences among communities in California and throughout the United States as to whether a private line can be attached to a public water line. If communities do not meter water use—and many do not—and just charge a flat monthly fee for water use, then attaching a private water line to a public one might not be a violation of the existing regulation and hence not theft of water. In that case, the biggest concern for a public utility may be the potential of the private water line to contaminate the public water supply.

As the drought tightened its grip on California, acquisition of water from public sources increased. However, these actions oftentimes did not constitute water theft, even by the definition used in this paper. Still, seeing that in 2014 the water loss from the California Aqueduct grew to some 10 percent from the regular 3 to 4 percent, water utility officials suspected that people were siphoning off a substantial portion of the water.⁶²

61 Rheana Murray, “Water Wars: Californians Stealing from Hydrants amid Drought,” ABC News, September 3, 2014, <http://abcnews.go.com/US/californians-stealing-water-hydrants-amid-drought/story?id=25229146>. See also Kristin Bender, “Water Thefts on the Rise in Drought-Stricken California,” *The Associated Press*, February 23, 2015.
62 Seth Nidever, “Water on the Black Market?” *The Hanford Sentinel*, August 29, 2014, http://hanfordsentinel.com/news/in_focus/california_drought/water-on-the-black-market/article_62bcdb24-4afd-5804-b129-09e01659d6d8.html.

In some cases, farming extensively relies on illegal water supply. Such situations are common in South Asia, but have they have also occurred in the United States at various times, as newspapers and even police officials have charged. In California and Oregon, legal and illegal cultivation of marijuana require very large amounts of water. It takes about 450 gallons (1710 liters) of water to bring a single cannabis plant to harvest indoors, and about twice that much outdoors, several times greater than the daily water consumption of an individual in the U.S. Both legal and illegal cultivators thus often seek to use water from sources other than metered taps. In California's Siskiyou County alone, illegal marijuana cultivators are estimated to expend about 1.5 to 2 million gallons (5.7 to 7.6 million liters) of unpaid water a day.⁶³ Since California produces some 60 percent of the marijuana consumed in the United States, the impact of the legal and illegal pot industry on the state's water is very high. In the Emerald Triangle of Mendocino, Humboldt, and Trinity counties, ecologically-important water streams, on which threatened steelhead and salmon depend, are being diverted to supply the cultivation of marijuana, with some 24 streams going dry last year due to the marijuana-cultivation-driven diversion and drought.⁶⁴ In many ways, the marijuana industry behaves as poorly toward California's water as other types of agricultural production.⁶⁵

But while these practices are clearly undesirable from a water conservation and broader environmental conservation perspective, does taking water from rivers, as marijuana cultivators often do, constitute water theft? Once again, it depends on local water regulations, and often it does not constitute a violation. Even when the federal government owns public lands, such as protected areas, it does not own the rivers, lakes, and other kinds of surface water on those public lands. The U.S. Constitution defines water as a retained right. In most of the Western U.S., rivers and surface water are regulated under a so-called prior appropriation system, which means that no one, not even the state, has ownership and control of the water until it is appropriated, impounded, and rights are allocated. Before that, surface water remains subject to control and regulation by various levels of government, but that does not necessarily preclude people from taking it. In some cases, but not always, rivers can have in-stream flow protection for fish, mandating how much water must remain in the river and thus limiting how much total water can be taken out. In California, surface water rights are unique; they combine riparian laws and appropriation laws.

63 "Sheriff's Update: Cannabis Cultivation Enforcement Continues," *Siskiyou Daily News*, August 12, 2016. See also "California Marijuana Grow Stole Reservation Water," *The Associated Press*, August 29, 2014.

64 Brittany Patterson and Debra Khan, "California: Marijuana's Environmental Damage and Illegal Water Use Begin to Rouse a Drought-Stricken State," *Climate Wire*, September 16, 2015, <http://www.eenews.net/stories/1060024744>.

65 See, for example, Kate Galbraith, "Threatened Smelt Touches Off Battles in California's Endless Water Wars," *The New York Times*, February 14, 2015, https://www.nytimes.com/2015/02/15/us/threatened-smelt-touches-off-battles-in-californias-endless-water-wars.html?_r=0.

Riparian water laws allow a landowner to extract any water that flows through his land or is below his land. These rights may not be lost through prolonged non-use. Laws governing water use in California thus become a complicated tangle of regulations, making adjudication a challenge. Moreover, those who arrived in California before 1914 enjoy senior rights. Since any water saved by senior rights irrigators passes to junior rights holders, there is little incentive for senior water right holders to conserve water.

Groundwater has traditionally been treated legally like oil and gas—under the “rule of capture.” Established long before concepts such as endangered species emerged, the traditional rule of capture establishes that landowners can take as many wild animals that travel across their land as they want, but they are not permitted to take those animals from the property of another landowner without permission. Similarly, landowners may drill out as much oil from wells under their property as they want, even if the extraction will deplete the oil underneath the property of a neighbor. In fact, the act of drilling for and extracting oil causes fresh oil to migrate into the drilled areas, meaning that the only way to ensure that one’s oil will not be lost to a neighbor is to drill and extract on one’s own land as fast as possible. Increasingly, there is recognition that treating groundwater under this traditional rule of capture or even California’s riparian laws is inadequate and can undermine long-term water sustainability and natural ecosystems. However, the existence of many powerful constituencies with a stake in the state’s water laws has made legal reform initiatives highly contested.

In short, if marijuana growers are taking water from rivers on public lands to which no one has been accorded a prior water right, they are not engaging in theft.⁶⁶ If they are siphoning off water from someone who has a water right in a specific area, it would constitute theft, as defined in this paper.

However, even when a violation of someone’s pre-existing water right takes place, many water experts still shy away from the term water theft for two reasons. First, water laws, like some other environmental laws in the United States, are administrative, not criminal laws. Consequently, hearings on potential violations of water use take place before California’s State Resources Control Board, not in a court. Thus, unlike journalistic accounts, and even this paper, U.S. official documents do not talk about “theft,” “stealing,” “smuggling,” or even “misappropriation” of water. Unlike in criminal law, the administrative law language, including about water use, tends to be neutral, colorless, and devoid of terms such as “violation” or “wrongdoing.”

[W]ater laws, like some other environmental laws in the United States, are administrative, not criminal laws.

⁶⁶ I am deeply grateful to the anonymous reviewers for their many insights and clarifications of the water laws in California and the United States. Any remaining mistakes are, of course, fully and solely mine.

Second, and specifically with reference to California's drought, many water experts argue that the water shortages were the result of many factors, including the inability of the northern and southern regions of the state to work together to redress water shortages in the south. Some experts maintain that desperation, not just a desire to avoid payment, was driving many to acquire water in extra-legal ways, and therefore feel that classifying their water acquisition as theft and smuggling is too harsh.⁶⁷ The controversy is reminiscent of debates about whether very poor populations should be called criminals if they illegally cultivate coca for cocaine or poppy for heroin or poach wild animals, whether for subsistence or international wildlife trafficking. I have written extensively about the coca and poaching issues, and often emphasized the needs of such poor populations driven by a lack of options.⁶⁸ Yes, they violate laws and engage in criminal behavior that has severe negative repercussions for others. However, the state's appropriate response is often not punishment but rather providing legal alternatives for their livelihoods. Recognizing that laws are being violated in the case of water appropriation is a crucial and necessary step. But whether and how the violator is punished should depend on the motivation of individuals or businesses for violating the law—survival versus enrichment beyond survival—and the scale of the violation, such as the difference between an individual taking water for his or her household drinking needs, versus an industry illegally avoiding payment for water on a massive scale. On the other hand, to insist that any appropriation of water is legal and appropriate, and to avoid assigning wrongdoing, can critically undermine the ability to develop sustainable water use.

THE ACTORS INVOLVED IN WATER THEFT AND SMUGGLING

In many parts of the world, especially slums, but also even more prosperous parts of urban areas, water theft can become highly elaborate. In addition to involving illegal hydrants, wells, and taps, in cities such as Medellín, Rio de Janeiro, Tijuana, Karachi, and Mumbai, it can involve miles-long illegal pipelines as well as the siphoning of water from all kinds of sources, such as rivers, canals, wells, or official water pipelines, and their subsequent distribution in illegal water tankers. Not all suppliers of water to the urban poor are illegal actors or source water outright illegally. Some are merely informal actors acting without paying appropriate taxes.⁶⁹

⁶⁷ Based on correspondence with reviewers.

⁶⁸ See, for example, Vanda Felbab-Brown, *The Extinction Market: Wildlife Trafficking and How to Counter It* (London: Hurst, 2017, forthcoming); and Vanda Felbab-Brown, *Shooting Up: Counterinsurgency and the War on Drugs* (Washington, DC: The Brookings Institution, 2010).

⁶⁹ See also Marianne Kjellén and Gordon McGranahan, "Informal Water Vendors and the Urban Poor" (London: International Institute for Environment and Development, 2006), <http://pubs.iied.org/pdfs/10529IIED.pdf>.

Nonetheless, as organized markets of illegally-sourced and smuggled water emerge, criminal actors also quickly step into the vacuums left by states that fail or are unwilling to supply water to their populations. Nigeria's key business hub, Lagos, serves as a telling example. Initial British colonial efforts to deliver better public health and sanitation services in the city and tackle diseases such as malaria gradually gave way to a policy of segregating wealthy and healthy enclaves from the rest of the city's population.⁷⁰ The consequence was that at the time of independence in the 1960s, Lagos had only 10 percent of the city's dwellings connected to municipal water, with the rest of the city relying on polluted creeks, shared taps, and wells. For sewage, the situation was even worse; essentially, there was no functioning system at all.⁷¹ The post-independence Nigerian governments not only failed to improve the situation, but allowed it to deteriorate significantly. Thus four decades later, by the mid-2000s, only 5 percent of the city's households were connected to piped water and less than 1 percent (only top-income residents and hotels) were connected to a closed sewer system.⁷² The rest of city has had to rely on private sellers, some of whom are legal and legitimate, while others operate illegally. Many poor residents are fully dependent on water tankers, "water mafias," and other illegal providers, such as local "area boys" who sell water of questionable quality and provenance in plastic bags, and through illegal boreholes and hookups. Thus, slum dwellers must either use dirty water or very expensive water from illegal private dealers at highly fluctuating prices, thereby threatening already precarious household budgets.⁷³

In Nairobi's Mathare slum, yet another of Africa's largest and poorest urban settlements, legal water pipelines have not been set up. Instead, water is pumped into the slum's neighborhoods through illegal pipelines connected to the city's official water distribution system. That stolen water, however, is not free—it is operated by organized, if illegal, vendors. Similar to India where residents often speak about a "water mafia," slum residents refer to the distributors as "water cartels." Although they are hardly as organized as a cartel in an economic sense, they nonetheless often sell the illegal water at prices eight times as high as the official price, making it unaffordable for the poorest, such as the unemployed.⁷⁴ Similar illegal water distributors

70 Ayodeji Olukoju, "Infrastructure Development and Urban Facilities in Lagos, 1861-2000" (Ibadan, Nigeria: Institut Français de Recherche en Afrique, 2003); and Ayodeji Olukoju, "Population Pressure, Housing and Sanitation in West Africa's Premier Port-City: Lagos, 1900-1939," *The Great Circle* 15, no. 2 (1993): 91-106.

71 Matthew Gandy, "Planning, Anti-Planning and the Infrastructure Crisis Facing Metropolitan Lagos," *Urban Studies* 43, no. 2 (February 2006): 371-396; and Babatunde Abraham William and Annemarie Hauck Walsh, *Urban Government for Metropolitan Lagos* (New York: Praeger, 1968), 99.

72 B. Expunobi, "Poor or Pure Water," *Daily Champion*, March 22, 2001; and O. Sulaimon, "War against Water Scarcity," *Daily Champion*, May 15, 2000.

73 Matthew Gandy, "Planning, Anti-Planning and the Infrastructure Crisis Facing Metropolitan Lagos," *Urban Studies* 43, no. 2 (February 2006): 371-396.

74 "Kenya: The Fight for Water - A Valuable Slum Commodity," *IRIN*, August 14, 2007.

operate in Kenya's other large cities, such as Mombasa.⁷⁵ In rural spaces also, water can be illegally tapped and delivered through illegal pipelines over considerable distances. For instance, in Kenya's Makueni, Machakos, and Kajiado counties, local farmers illegally tap water pipelines, causing intense water shortages in local towns.⁷⁶

Pakistan's Karachi and India's major cities, such as Delhi and Mumbai, exhibit some of the most organized water theft and smuggling markets. In Pakistan, a significant portion of water is already stolen through illegal connections before it reaches the city, en route from the Keenjhar Lake, some 120 km northeast of the city, and the Hub Dam, some 60 km northwest. After years of drought, overuse, and water theft, the dam now stands only a few feet above the so-called "dead level," whereas at its maximum capacity it would be 63 feet above the dead level.⁷⁷ Both canals are also extensively pervaded by illegal water connections for agricultural use. At various times, paramilitary forces have been deployed to destroy the illegal connections, confiscate the diesel engines that operate them, and arrest some (usually low-level) culprits. But the illegal hookups get quickly repaired and restored. In the city itself, illegal water operators erect illegal hydrants. The number of the illegal water hydrants—usually some 125—is six times higher than the number of the city's legal hydrants. Yet 20 legal hydrants are clearly an insufficient number for a city of 20 million residents and growing. The illegal hydrants are located mostly in the very affluent neighborhoods of the city, such as Clifton and the Defense Housing Authority.⁷⁸ Even owners of legal hydrants use the water in violation of regulations, often conspiring with officials of the Karachi Water and Sewerage Board (KWSB) to withdraw more water than allotted, and often selling the water to high-rises and commercial and industrial users. In fact, the original illegal water barons believed to have set up the first illegal water hydrants in the city in about 1995—Taj Muhammad Kohistani and Ajab Khan—are widely believed to have been sponsored by industrialists for their commercial operations. These days, illegal water suppliers drill connections into the legal pipes and run illegal ones for lengthy distances to the city's industry operators. According to some estimates, 80 percent of the 3,000 industrial units in the city's Sindh Industrial and Trading Estate (SITE) get water from a mix of legal and illegal supply.⁷⁹

Delhi delivers 207 million gallons (786.6 million liters) less water per day than its population of 17 million needs, creating multiple opportunities for water smuggling mafia to operate. The water theft only exacerbates the water shortages and dependence of

75 Brian Otieno, "Kenya: Mombasa Water Firm to Probe Illegal Cartels," *The Star*, June 30, 2014.

76 Evelyn Mutanu, "Kenya: Emali Rep Protests Illegal Use of Water Pipe," *The Star*, September 11, 2013.

77 Moosa Kaleem and Maqbool Ahmed, "The Scramble for Karachi's Scarce Water Resources," *The Dawn*, September 10, 2014.

78 Author's interviews with representatives of Karachi's political parties, police officials, and journalists, Karachi, May 2016.

79 Moosa Kaleem and Maqbool Ahmed, "The Scramble for Karachi's Scarce Water Resources," *The Dawn*, September 10, 2014.

local populations on illegal distribution of water, strengthening pernicious feedback loops. Vast slums and illegal settlement colonies—including Delhi’s largest, Sangam Vihar—are not connected to water pipelines and mostly lack public wells and hydrants. The colonies’ illegal status and lack of land titles mean that they are mostly ineligible for the extension of formal infrastructure. Even areas that are connected to the public water system only receive water for a few hours a day. Into the void step private providers and racketeers who deliver water at inflated prices, operate illegal hydrants and establish illegal connections, and mostly truck in stolen or illegally sold water. Some 2,000 such private trucks operate daily in the city. Ramanand Sharma, who runs Keshav Water Supplies, is widely believed to be one of the city’s “tanker kings” of illegal water.⁸⁰ Sharma supplies not only poor neighborhoods, but also many middle-class families, charging 3,000 rupees (roughly \$45) for a 5,000-liter water tank. Yet it is particularly the poor who bear the burden of exorbitant prices. Many poor Indians thus have to spend some 20 percent of their meager income to buy the daily U.N.-recommended minimum of 50 liters per person. Although the police regularly intercept Sharma’s tankers, he pays them off with bribes between 10,000 and 30,000 rupees (roughly \$150-450).

The populist and presumably anti-corruption Aam Aadmi Party (AAP), elected to lead Delhi’s administration in 2015, has promised free water for all by extending pipes to slums and cracking down on water mafias, but it has so far not delivered on many of its key promises. Previous attempts to deliver free water broke down as government-authorized water tankers delivered water only to middle-class families who would pay bribes for it.⁸¹ As in previous administrations,⁸² raids by the city’s water commission—the Delhi Jal Board (DJB)—to shut down illegal tube wells on private lands occasionally take place, but without the installation of legal connections supplying an adequate amount of water, and without pricing to discourage wasteful use, illegal connections are quickly re-established. The AAP has also begun placing GPS tracers on government-authorized trucks to monitor their improper diversion to areas where they were not requested to go.

Even though local populations frequently use the terms “water cartels” or “water mafias,” there is in fact a great variation in the structures of these illegal or semi-legal providers. Some may be hierarchical, while others are highly decentralized. In some cases, such as in Tijuana’s illegal settlement of Divina Providencia, organized water mafias are altogether absent and the community is self-organized to regulate its illegal water use.

80 Sai Manish, “Black Market for Water Expands in Delhi,” *The New York Times*, September 18, 2013.

81 Aman Sethi, “Midnight Marauders,” *Foreign Policy*, July/August 2015, 55-65.

82 “Delhi Jal Board Task Force Takes on Water Mafia, Illegal Tube Wells,” *The Indian Express*, January 9, 2014.

In the Divina Providencia slum, illegal settlements surround the official water canal of the city. Illegal water pipes plug into the canal and divert water to settlements on the top of the canal. The illegal water distribution is managed by a water committee, whose seven members are annually elected from among the slum's residents.⁸³ The roles of the elected committee are extensive. They include allocating access to the illegal water network, including who is permitted to access and how often, as well as maintaining the physical infrastructure of the illegal water distribution system. Significantly, the committee also adjudicates disputes over water use—attempting to persuade a *comelón* (“water hog”) within the slum community to desist from water use over the committee's quota. When such dispute resolution fails, the committee will prosecute and punish the individual's theft of water from the community's supply (which is illegal to start with).⁸⁴ Similarly, the use of water in illegal settlements within Tijuana's river canal and sewer system is controlled by the slum community. The occupants nominate a leader to settle disputes among them, to protect them from police raids, and to issue permits to newcomers to live there.⁸⁵ Indeed, as in these two examples from Tijuana, much of the illegal sourcing and smuggling of water around the world is neither anarchic nor unregulated. That is also the case with other illegal natural resource economies.⁸⁶

The illegal sourcing of water by slum communities in Mexico is just one of the many forms of water theft in the country. Although the Public Register of Water Rights, an electronic database, has helped to mitigate some water theft, a great number of delinquents never pay their water bills. Awarded contracts continue to lack transparency, and illegal siphoning of water and drainage by industries and agricultural businesses is frequent, as is dumping wastewater on beaches.⁸⁷ Ironically, at times, illegal water use is actually better regulated than the legal use.

The overuse and illegal use of water, and water theft and smuggling particularly, pervade agricultural areas around the world—from Mexico to India. In many places, farmers simply drill deeper wells—which can be illegal, depending on the jurisdiction. However, regardless of the legality, the practice sets up severe policy inefficiencies and, sometimes, outright policy failures, as underground aquifers become depleted and a chain of negative environmental consequences ensues, such as the sinking of

83 Katharine Meehan, “Disciplining De Facto Development: Water Theft and Hydrosocial Order in Tijuana,” *Environment and Planning D: Society and Space* 31 (2013): 319-336.

84 *Ibid.*

85 Katharine Meehan, “Disciplining De Facto Development: Water Theft and Hydrosocial Order in Tijuana,” *Environment and Planning D: Society and Space* 31 (2013): 328.

86 Paul Robbins, Kendra McSweeney, Anil Chhangani, and Jennifer Rice, “Conservation As It Is: Illicit Resource Use in a Wildlife Reserve in India,” *Human Ecology* 37 (May 2009): 573.

87 Transparencia Mexicana (Transparency International Mexico), “Mexico,” in *Global Corruption Report 2008: Corruption in the Water Sector*, Transparency International (Cambridge: Cambridge University Press, 2008), 168-9.

land. In India, the inadequate response of digging deeper wells is greatly exacerbated by cheap, subsidized electricity that perversely encourages the greater use of drills and pumps at ever-greater depths. The problem has been known for some decades, yet because of its politics, India has been unable to increase electricity prices sufficiently to reduce water use.

The phenomenon of digging deeper wells, with its negative effects on neighboring landowners and communities without addressing underlying water overuse,⁸⁸ is also becoming widespread in California, where it is legal yet problematic. Those who can pay more for deeper wells often dry up the water of neighboring communities, generating local tensions. In normal years, around a third of California's water comes from underground, but during the recent droughts as much as 75 percent of the supply has come from underground sources, yet the state has been willing to issue far greater numbers of drilling permits than a decade or two ago.

In Yemen, the cultivation of the mild narcotic qat (legal there, and extensively chewed in the Horn of Africa, but illegal in the United States) generates disastrous environmental impacts even though it is the country's foremost agricultural product. Qat is a highly water-thirsty plant and Yemen is one of the world's most water-distressed countries. Some 99 percent of water drilling in Yemen is unlicensed and illegal. In the capital of Sana'a, water extraction rates outstrip water replenishment by a factor of four. Even before the latest phase of civil war, in 2010, a liter of water sold for \$0.15, a steep price in a country where the average income is \$2 a day.⁸⁹ If water consumption were to amount to the U.N.-recommended minimum of 50 liters per person per day, the cost daily per person would amount to \$7.50, a sum clearly unaffordable for many Yemenis.

Peri-urban areas, or rural areas abutting major cities, often are the crux of illegal water markets. Not only do they tend to be areas of illegal water diversion for agriculture feeding the cities, they are also a key source of water smuggled into the cities. They also tend to be on the receiving end of wastewater produced by cities, and are often used for illegal dumping. In India, for example, these illegal and informal water market dynamics spanning the urban and peri-urban areas are prominent. Often facing unemployment or eking out mere survival livelihoods, many poor rural households, such as around Delhi or Hyderabad, are tempted to sell their water to smuggling outfits. Although

In [Yemen's] capital Sana'a, water extraction rates outstrip water replenishment by a factor of four.

88 Matt Richtel, "California Farmers Dig Deeper for Water, Sipping Their Neighbors Dry," *The New York Times*, June 5, 2015, https://www.nytimes.com/2015/06/07/business/energy-environment/california-farmers-dig-deeper-for-water-sipping-their-neighbors-dry.html?_r=0&mtref=www.google.com&gwh=5737CE9BD03D126BDA279E773468A8D1&gwt=pay.

89 James Dorsey, "Corruption Fuels Crisis in Water-Poor Yemen," *EurekaStreet.com.au* 20, no. 2 (February 12, 2010), <https://www.eurekastreet.com.au/article.aspx?aeid=19082#.V9qvFq0b-M8>.

in the short-term such water sales may bring more immediate income than subsistence agriculture, and although a few lucky individuals may even graduate into the ranks of water smugglers themselves, many will deplete their water levels and undermine both of their revenue streams. Smugglers also illegally drain lakes and rivers in peri-urban areas, depleting the surface water, and drill wells on public lands, depleting groundwater. Therefore, the urban middle classes and industries de facto buy out the water from underneath the peri-urban poor.⁹⁰ The dynamic is exacerbated by the fact that rural populations in India have a right to drill wells for agriculture and receive subsidized energy to operate drills and pumps. Yet the smugglers re-sell water to industries in excess of the industry water permits and regulations and sell water to the middle-class households for consumption. Eventually some of the peri-urban poor may come to depend on the water mafias to provide their essential water.

Widespread water theft and smuggling are symptoms of more than inefficiencies and inadequacies of regulatory design. In Jakarta, Indonesia, for example, systemic disincentives persist for public utilities to connect poor households to public-goods grids, including water supply, and for poor households to seek connections to the formal systems.⁹¹ Regulatory capture and corruption in the legal water sector play a crucial role in setting up, and sometimes outright controlling, water theft and smuggling and exacerbate it in multiple ways. In the most basic form of corruption, many water officials accept bribes for violating water regulations. In India's cities, including Delhi, water trucks are mandated by law to deliver water to unconnected communities within three hours of a request call to the city's official water board. But unless they know that they will receive a hefty bribe, they often do not show up.⁹² Many of the so-called water mafias that operate in the city are connected to the DJB, and corrupt DJB officials receive kickbacks from private operators selling water at inflated prices, closing their eyes to illegal water sourcing, smuggling, and resale in the city and on its outskirts. In Pakistan's Punjab state, farmers regularly bribe water officials to obtain water over their legal quotas, as well as to lobby politicians to extort and pressure water officials into such illegal behavior.⁹³ Both large-scale landowners, the feudal elite of the country, and sharecroppers benefit from the bribery

90 Anjal Prakash, "The Periurban Water Security Problem: A Case Study of Hyderabad in Southern India," *Water Policy*, 16, no. 3 (June 2014): 456, 466.

91 Karen Bakker, "The 'Commons' Versus the 'Commodity': Alter-Globalization, Anti-Privatization and the Human Right to Water in the Global South," *Antipode* 39, no. 3 (June 2007): 430-55.

92 Sai Manish, "Black Market for Water Expands in Delhi," *The New York Times*, September 18, 2013.

93 Jean-Daniel Rinaudo, Pierre Strosser, and Sophie Thoyer, "Distributing Water or Rents? Examples from a Public Irrigation System in Pakistan," *Canadian Journal of Development Studies* 21, no. 1 (2000): 113-139; Jean-Daniel Rinaudo, "Corruption and Water Allocation: The Case of Public Irrigation in Pakistan," *Water Policy* 4, no. 5 (2002): 405-22.

and its political sponsorship. Downstream farmers, in contrast, suffer multiple costs. Unlike upstream farmers, who often use the water for which they paid bribes for the cultivation of cotton, rice, and sugar cane, downstream farmers often tend to be limited to subsistence crops. Although these farmers are required to pay a flat water fee, they also have to pay bribes in order to actually receive any water at all.⁹⁴ When police sporadically crack down on rural water theft, they predominantly target poor farmers who lack effective protection from powerful politicians.⁹⁵ Meanwhile, water levels in Pakistan, the world's sixth most populous country, are rapidly collapsing, with disastrous effects on the country's agriculture, through which most people earn livelihoods, and its overall economy. By 2025, Pakistan, alarmingly, is forecasted to deplete its available water supply.

In India too, water officials are regularly bribed to overlook illegal water connections or falsify meter readings and bills. Water contracts are often allocated in non-transparent and corrupt ways, with legislators sometimes awarding themselves the water supply contracts. Such practices also give rise to price-fixing cartels,⁹⁶ making it highly lucrative to illegally source and smuggle water.

Most of the water theft and smuggling I have described has been local, even though illegal pipes often extend for kilometers, and water trucks sometimes traverse tens of kilometers. Moreover, as drastic water shortages further affect severely water-stressed countries in South Asia and the Middle East, cross-border water smuggling is likely to emerge. Just as with the drug trade, such smuggling may well cross contested borders, such as between Pakistan and India, Pakistan and Afghanistan, or in the Middle East, West Africa, or the Sahel. It is thus only a matter of time before water smuggling also becomes a transborder illegal economy, intersecting with other smuggling and organized crime, as well as with and geostrategic and political issues.

THE POWER OF CONTROLLING THE TAP

Even when the state is not complicit and implicated in such criminalized illegal water distribution systems (oftentimes it is), officials face a normatively excruciating and politically difficult dilemma. Cracking down on illegal water use and smuggling by

94 Mahmoud Ahmad, "Water Pricing and Markets in the Near East: Policy Issues and Options," *Water Policy* 2, no. 3 (July 2000): 229-42; and Jean-Daniel Rinaudo and Zubair Tahir, "The Political Economy of Institutional Reforms in Pakistan's Irrigation Sector," in *The Economics of Water Management in Developing Countries*, eds. Phoebe Koundouri, Panos Pashardes, Timothy Swanson, and Anastasios Xepapadeas (Cheltenham: Edward Elgar, 2003).

95 For some recent raids, see, for example, "Pakistan Police Arrest 28 Farmers over Water Theft," *BBC*, July 26, 2016.

96 See, for example, Jennifer Davis, "Corruption in Public Service Delivery: Experience from South Asia's Water and Sanitation Sector," *World Development* 34, no. 1 (2004): 53-71.

the rich and the middle class, industries, and large-scale agribusinesses might appear to be an obvious legal and moral imperative (though those with a maximalist definition of water as a human right may object). However, such crackdowns can be extremely challenging politically as they can alienate core constituencies, clients, and even patrons of governments (and water boards).

Disconnecting and disrupting illegal water channels to poor, marginalized slum communities may be politically easier, but it can severely jeopardize the health and even survival of those communities in addition to contradicting the SDGs and the normative precepts of the right to water. There would be protests. Water smugglers would seek to capitalize. Before dying of thirst, most of such disconnected slum and rural residents would, of course, seek to move, even illegally, to other areas where water policing is less intense. However, even reducing the illegal water flow to poor communities can lead to deadly outbreaks of disease such as cholera, and to social and political unrest and violent strikes that affect not just the marginalized community but also the rest of the city, including its privileged enclaves. And although states are often unwilling to provide adequate legal water supply to marginalized communities and illegal settlements, they do not want to be guilty of letting people die of thirst. It is often far easier to allow criminal, often politically-connected water mafias to operate and fill the void.

This is not to say that virtually all private water providers engage in water smuggling or water theft. Many operate legally and provide a crucial service, sometimes outperforming the state. The World Bank and the International Monetary Fund have often urged the privatization of water supply in developing countries, such as in sub-Saharan Africa, precisely to provide a more efficient and extensive water supply, improve water quality, and reach those whom the state is not able to connect to public networks.⁹⁷ In South Asia, where the corruption of water authorities increases the cost of water provision by an estimated 20 to 35 percent, the private sector has at times outperformed the state in cheaper and more reliable water provision.⁹⁸ In Argentina, water privatization is believed to have resulted in a 5 to 7 percent decline in the child mortality rate.⁹⁹ In Chile, where government regulation of the privatized water industry is strong, the privatized system has performed very well in ensuring access, quality, and an affordability of water in urban areas.¹⁰⁰ Some

97 World Bank, "Tapping the Markets: Opportunities for Domestic Investments in Water and Sanitation for the Poor," World Bank, 2014, <https://openknowledge.worldbank.org/bitstream/handle/10986/16538/9781464801341.pdf>.

98 Robert Bain, Rolf Luyendijk, and Jamie Bartram, "Universal Access to Drinking Water: The Role of Aid," (Helsinki, Finland: U.N. University World Institute for Development Economics Research, 2013), http://www.wider.unu.edu/publications/workingpapers/2013/en_GB/wp2013-088/.

99 Alix Peterson Zwane and Michael Kremer, "What Works in Fighting Diarrheal Diseases in Developing Countries? A Critical Review," *World Bank Research Observer* 22, no. 1 (Spring 2007): 1-24.

100 Madeline Baer, "Private Water, Public Good: Water Privatization and State Capacity in Chile," *Studies in Comparative International Development* 49, no. 2 (June 2014): 141-67.

countries such as Ghana (at the forefront of water privatization in Africa) have wholeheartedly embraced this approach.¹⁰¹ Nor is reliance on private providers a sign of government corruption or negligence. Extending piped water in some urban spaces may just be too costly, particularly for governments in poor areas, and the provision of water through tankers and water kiosks, through public-private partnerships and sometimes solely through private actors, will need to remain part of the menu of ways to provide water to everyone. Some 100 million people around the world rely on tankers and containerized water deliveries for at least a part of their water needs. Such extensive water supply systems cannot be quickly replaced. Sometimes the private delivery of water in tankers or containers is the optimal water supply approach.

In other cases, government actions to improve the quality of private water delivery services is necessary. As the previous analysis indicated, and the discussion below further elaborates, private water providers sometimes behave not only illegally and corruptly, charging exorbitant prices, but also thuggishly. In Malaysia, for example, the top three performers of water services are private companies, but so are the bottom two.¹⁰² In some countries, the tanker sector is deeply pervaded by corruption, inefficiency, and water theft, and it mostly delivers water of poor quality. It is easy for the state to slip into abdicating its mandate and responsibility to ensure the provision of vital public services such as water distribution by arguing that it does not have the capacity to do so, and into excessively giving up monitoring, regulation, and enforcement of private providers. A better approach is for the state to establish joint water boards or public-private partnerships. Worse yet, the state and water authorities can sometimes be complicit in the corruption permeating the water sector, the illegal water rackets, and other undesirable practices.

The state needs to be able to crack down on systematic water theft and smuggling regardless of who perpetrates it—whether that be other state agencies or private enterprises.

Not cracking down on systematic water theft and smuggling perpetuates and exacerbates water mismanagement and shortages that may eventually harm the water sustainability of the entire country, including the affluent and powerful businesses. In the short term, the mismanagement generates pernicious feedback loops and intensifies further demand for smuggled water.

101 For the pros and cons of privatization, see, for example, Abu Shiraz Rahaman, Jeff Everett, and Dean Neu, "Trust, Morality, and the Privatization of Water Services in Developing Countries," *Business and Society Review* 118, no. 4 (Winter 2013): 539-75.
102 Lee Yoong Hon, Tan Hui Boon, and Cassey Lee, "Technical Efficiency in the Malaysian Water Sector: A Stochastic Frontier Approach," *Journal of Developing Areas* 50, no. 3 (Summer 2016): 149-65.

However, for the state to mobilize the willingness and capacity to reform its water supply system may be very difficult, even while it is crucial. Particularly in the context of official neglect, those who can arrange for the supply of water, including its illegal provision, profit far more than simply financially. Even as these “water mafias” are sometimes resented for their usury practices as well as their collusion with complicit and corrupt government officials, they can also accumulate a great deal of political power. Lives of entire communities can literally depend on the mafias, as can the prosperity of farms and industrial businesses. They become crucial intermediaries at—and powerful quasi-state managers of—the intersections of official and unofficial power.

In India and Pakistan, for example, local politicians are well aware of these dynamics and seek to control, or at least receive some revenues from, the illegal water supply, in addition to prominently campaigning on water promises. Workers belonging to the various political parties compete for contracts to lay sometimes legal, but often illegal, pipes from communal boreholes (that themselves may be illegal) to residents of slum areas, such as Delhi’s Sangam Vihar. Typically, they charge each household between 50 and 500 rupees (roughly between \$0.79 and \$7.90) for the services.¹⁰³ Sometimes local politicians retain even more direct control of the illegal pipes, collecting monthly fees for not turning the water off to local slum households.¹⁰⁴ This water policing, while hardly accountable and fair, tends to be more efficient than policing of water use by the state, even in middle-class neighborhoods. Local politicians also seek to control the access of illegal water suppliers and facilitate, through bribes, the delivery of water by government-mandated trucks. In multiple ways the politicians act as brokers between the state, the slums, and the illegal water economy. And of course, they demand from local residents broader contributions to their political party as well as votes.¹⁰⁵

The political capital of the water dons can be surprisingly robust and enduring. India’s AAP political party swept Delhi’s elections in 2013 not merely on the basis of its broad anti-corruption and populist message, but also by promising to improve water supply and reduce its costs, or even supply water for free. In the Sangam Vihar slum, the AAP political representatives sought to liberalize the water market and weaken the power of the tanker mafias and rival politicians connected to it. They organized raids on illegal boreholes and they also set up water user associations composed of local people “recommended” by local residents (whatever that process meant in practice). The associations were expected

103 Sai Manish, “Black Market for Water Expands in Delhi,” *The New York Times*, September 18, 2013.

104 Anuj Porwal, “Lacking Water, New Delhi Residents Dependent on ‘Tanker Mafia,’” *France24*, July 10, 2013, <http://observers.france24.com/en/20131007-water-delhi-colonies-tanker-mafia>.

105 Author’s interviews with political party representatives, journalists, human rights advocates, and local shopkeepers, Karachi, May 2016.

to oversee the equitable distribution of water, and particularly to monitor the private operators of government boreholes. Two years later, more than 100 such associations popped up throughout the slum. However, very quickly the associations came to be dominated by the politically-connected operators who were running the wells before the associations existed. Some of the operators were major kingpins of the illegal water supply.¹⁰⁶ Thus, instead of the new oversight mechanisms democratizing water access, the prior political capital of the water dons was sufficient for them to dominate the new politics and procedures. And once again, the new-old water dons collect fees from the local community, ostensibly for the maintenance of the pumps and pipes and for employees who oversee the well and who can access it.

On the other hand, in Brazil's Porto Alegre, such an explicit effort to integrate the poor into water decisionmaking has achieved more success. After citizens became involved in participatory budgeting and spending reviews on water and sanitation, access to water increased from 80 percent in 1989 to near-total coverage in 1996, and access to sanitation grew from less than 50 percent to 85 percent. To ensure a "pro-poor focus" in the water decisionmaking, votes of the poorest people were weighted more to increase their influence in the processes.¹⁰⁷

In Pakistan's rural areas, politicians who provide illegal water supply in excess of the quota to farmers similarly receive substantial political support and maintain their positions for lengthy periods of time. In turn, they can provide job security and extralegal benefits and ease the promotion of pliant, corrupt water and irrigation officials who tolerate their illegal bidding.¹⁰⁸ The system has perpetuated itself for decades.

In Bangladesh, those who control the illegal water supply to slum areas often become broader slumlords, known as *mastaans*. Beyond the delivery of water, the *mastaans* also arrange for the delivery of other basic infrastructure such as sanitation, electricity, and road paving. They are not the sole providers of water to marginalized areas; sometimes the state provides water, as do NGOs. Yet the establishment of illegal water connections tends to be dominated by the *mastaans*, frequently with the acquiescence and connivance of the state, including water commission officials and the police. Most *mastaans* tend to be associated with political parties and, like in India, engage in collecting "voluntary" contributions for their political patrons

106 Aman Sethi, "Midnight Marauders," *Foreign Policy*, July/August 2015, 61.

107 Odete Viero, "Water Supply and Sanitation in Porto Alegre, Brazil," Porto Alegre's Water and Sanitation Department, February 20, 2003, http://www.sswm.info/sites/default/files/reference_attachments/VIERO%202003%20Water%20Supply%20and%20Sanitation%20in%20Porto%20Alegre%20Brazil.pdf.

108 Robert Wade, "The System of Administrative and Political Corruption: Canal Irrigation in South India," *Journal of Development Studies* 18, no. 3 (1982): 287-328.

and delivering votes for them.¹⁰⁹ They also engage in other forms of blatant extortion and seek to exercise control over the slum in other ways. Critically, they organize violence—against disobedient local slum residents, political rivals, and even the state—as a form of political bargaining.

Like in India and Pakistan, the broader context of water administration in Bangladesh is one of mismanagement and corruption. Although Bangladesh is richly endowed with water resources, drinking water and good sanitation are not available to most people. Even legally-piped water tends to be contaminated with bacteria, and its supply is sporadic and often limited to a few hours of the day, even in middle-class neighborhoods. False billing, tampering with meters, and refusal by the affluent to pay water bills means a perpetual lack of resources to improve and correct the supply and extend it to large segments of the population.

The same problems of inadequate delivery are all the more severe in the slums, where often no formal legal water delivery system exists and water fees are often two to three times greater per liter than in middle-class or affluent neighborhoods.¹¹⁰ Indeed, the privately and illegally-provided water tends to be full of dirt and unsuitable for drinking. Yet the power of the *mastaans* is so strong over their slum areas that instead of providing better illegal services in response to community complaints, they tend to suspend all water delivery to coerce the community into submission. During such periods, the slum areas face severe water shortages.¹¹¹

Indeed, although providers of illegal water supply to areas lacking legal water acquire substantial political capital and power, they are hardly benevolent or accountable actors. In India, local politicians and water tanker dons often seek to disrupt whatever government efforts there are to extend legal pipes and wells to marginalized communities, often by whipping up riots and violence, so that they do not lose their profits and political power.¹¹² In Lagos, Nigeria, as well, government efforts to extend legal water distribution are often met with violent disruption and intimidation by local water mafia groups and associated politicians and slumlords who benefit from unequal and illegal water distribution. Many of these actors go so far as to destroy public wells and pumps so that they can continue profiting financially and politically from their illegal

[A]lthough providers of illegal water supply to areas lacking legal water acquire substantial political capital and power, they are hardly benevolent or accountable actors.

109 M. Sohail, ed., *Accountability Arrangements to Combat Corruption in the Delivery of Infrastructure Services in Bangladesh* (Loughborough, U.K.: Water, Engineering and Development Centre, Loughborough University, 2007), 21, <http://developmentbookshop.com/accountabilityarrangements-to-combat-corruption-in-the-delivery-of-infrastructure-services-inbangladesh-pb>.

110 *Ibid.*, 24.

111 *Ibid.*

112 K. Lokhandwala and N. Namboodiri, "Tanker Lobby Is Squeezing Us Dry," *Bombay Times*, March 9, 1999; K. Lokhandwala and N. Namboodiri, "Population, Politicians Worsen Water Problem," *Bombay Times*, March 9, 1999.

or private water distribution.¹¹³ Yet like in Bangladesh, the water they distribute is not only more expensive, but also contaminated, sometimes spreading contagious diseases.¹¹⁴ Surprisingly, pushback from marginalized communities has not resulted in better service delivery nor has business and political competition among the “water mafia” groups weeded out the worst providers. Similarly, in Ecuador water mafias and even licensed legal vendors have opposed, at times violently, the extension of public water provision and engaged in vandalizing existing networks to maintain control over the illegal and privatized water market, boost the prices of their illegal water services, and tighten their political control over neighborhoods.¹¹⁵

On the other hand, in Mozambique, the competition among informal providers of water has curbed predatory water pricing. In the country’s capital Maputo, there are more than 200 small-scale suppliers of water from unregulated boreholes. The supply is still unauthorized, and depending on sourcing may be outright illegal, but the level of misbehavior on the part of the informal water providers is nowhere near the scale of the water mafias in South Asia, and the pricing is considerably fairer.¹¹⁶

At the same time, the existence of a legal public supply of water does not inevitably enhance the legitimacy of water distribution or eliminate perceived coercion. In Kenya, for example, over 50 percent of Nairobi’s households connected to a legal water supply found their bill unfair but did not dare challenge its accuracy for fear of being disconnected.¹¹⁷

In short, highly varied levels of accountability, equity, and efficiency can be present in informal and illegal water markets. Those crucial characteristics as well as water sustainability also vary widely in legal water markets, whether private or public. But those who control the tap, particularly illegally, establish dependencies, clients, and patronage networks and can accumulate large political capital and power. And if the state fails to provide adequate legal water supply, the illegal supply of water may be seen as highly legitimate.

113 Matthew Gandy, “Planning, Anti-Planning and the Infrastructure Crisis Facing Metropolitan Lagos,” *Urban Studies* 43, no. 2 (February 2006): 383.

114 Austeen Osumah, “How Lagosians Search for Potable Water,” *Post Express*, February 14, 2001.

115 Erik Swyngedouw, *Social Power and the Urbanization of Water: Flows of Power* (Oxford: Oxford University Press, 2004). See also, Tova Maria Solo, “Independent Water Entrepreneurs in Latin America: The Other Private Sector in Water Services,” *The World Bank*, April 2003, <http://documents.worldbank.org/curated/en/786541468012040884/pdf/multi0page.pdf>.

116 Muhammad Sohail and Sue Cavill, “Water for the Poor: Corruption in Water Supply and Sanitation,” in *Global Corruption Report 2008: Corruption in the Water Sector*, Transparency International (Cambridge: Cambridge University Press, 2008), 53.

117 Transparency International Kenya, “Nairobi Water and Sewerage Company Limited: A Survey, April-May 2005,” (Nairobi, Kenya: Transparency International Kenya, 2006).

SOURCES OF POLICY FAILURE

The sources of policy failure are multiple—the first of these being the inherent complexity the issues. Environmentally, water systems tend to be both highly complex and opaque, with underground aquifers often improperly measured and understood, with many hydrological connections and interdependencies hidden. Water systems can span vast areas and cross administrative or even national borders. Decisionmakers often lack the scientific and administrative knowledge of, and capacity to administer, water management themselves. As the 2006 World Bank report on water states, “a high NRW [non-revenue water] level is normally a surrogate for a poorly run water utility that lacks the governance, the autonomy, the accountability, and the technical and managerial skills necessary to provide reliable services to their population.”¹¹⁸

Unregulated urbanization and other disruptions to customary regulations of water use further undermine effective and accountable water governance. But even transparent, accountable, knowledgeable, and non-corrupt water authorities often find it politically infeasible to adequately raise water prices to steer consumption toward sustainable use. For example, in Ireland, increasing costs of household water use elicited the largest backlash and greatest protests among all the austerity measures the country had to adopt as part of its 7-year, 30 billion euro (\$34.5 billion) austerity restructuring.¹¹⁹ In the absence of effective policing—in the context of weak rule of law and preexisting illegal water markets—greater prices, however needed for sustainability, may encourage a greater demand for illegally-sourced water, illegally-supplied water, and illegal water markets.

Policing of water is difficult under the best of circumstances, and is very frequently highly controversial. Some of those who define access to water as a human right will even oppose the mere concept of policing water. Throughout the world, the enforcement of water regulations is thus underdeveloped and underemphasized. Often police and other law enforcement authorities lack the ability to monitor gauges in real time and react swiftly to capture culprits illegally sourcing water. Some of the real-time monitoring can be solved through technological fixes, but swift law enforcement action requires major increases in assets and changes in police duty prioritization and is thus costly not only financially, but also in terms of opportunity costs. If water property rights have not been assigned or are very complex, and determining wrongdoing can entail unpredictable

118 Bill Kingdom, Roland Liemberger, and Philippe Marin, “The Challenge of Reducing Non-Revenue Water (NRW) in Developing Countries,” (Washington, DC: World Bank, December 2006), v, <http://siteresources.worldbank.org/INTWSS/Resources/WSS8fin4.pdf>.

119 “Irish Anti-Water Charge Protesters Keep Pressure on Government,” *Reuters*, March 21, 2015, <http://www.reuters.com/article/us-ireland-politics-protests-idUSKBN0MHOMO20150321>.

years-long battles, many justice, enforcement, and water officials give up on prosecution attempts.

Penalties for violating water regulations tend to be low. In California, those suspected of engaging in water regulation violations mostly get away with a warning and by promising to obtain a permit, such as for a private well. Inspections and inspectors are unavailable to check whether self-reported water use is accurate.¹²⁰ In 2014, California's State Water Resources Control Board, for example, had only 33 employees assigned to investigating illegal water diversion, though wildlife officials also conduct their own investigation, informing the water board officials. The number of inspectors may be low for a state the size of California, but such numbers would be a dream for many developing countries. Lately, California has sought to increase the penalties for unreasonable use to start at \$1,000 per month and go as high as \$40,000 a month for continuous violations of at least 18 months amidst severe drought conditions. When detection, enforcement, and prosecution are difficult and complicated, it is cheaper and easier for many users to violate the law and pay an occasional fine rather than to comply with regulations.

In other countries, penalties for water theft can be stiff. In Jamaica, those who fail to pay their water bills can have all of their property seized by the water commission, and water theft can carry a penalty of up to \$250,000. Yet such severe penalties are rarely imposed and water theft is pervasive and massive. In New Zealand, action by water management authorities against water theft frequently results only in serving abatement notices, even though water theft is legally punishable not just by fines but also imprisonment. In Jordan, water theft and smuggling can be punished with imprisonment of up to five years, but reducing the prevalence of water theft has remained a challenge. In India, Pakistan, and Bangladesh, illegal water pumps, wells, and connections are often reestablished as soon as police authorities take them down—and such actions are rare.

Indeed, even tougher penalties do not create adequate deterrence effects if effective prosecution is sporadic and uncertain. Thus, in California a major recent effort by the State Water Resources Control Board to better enforce water regulations appears to have collapsed. In July 2015, the board imposed unprecedented penalties on two Central Valley irrigation agencies for illegally taking river water. The Byron Bethany Irrigation District, serving 160 farms and 15,000 people within the community of Mountain House, faced a penalty of \$1.5 million for pumping water from the Sacramento-San Joaquin River Delta, while the West Side Irrigation District supplying about 45 farmers faced a fine of

¹²⁰ Mark Crosse, "California Drought Puts Spotlight on Water Theft," *Fresno Bee*, March 22, 2014.

up to \$10,000 for the same violations. Those prosecutions were intensely watched across the state as a sign of the state's new wherewithal and capacity to regulate even so-called senior water rights holders, as well as to crack down on illegal water sourcing. Yet both cases collapsed and in May 2016, the board moved to dismiss both cases.¹²¹ For those who believe that for sustainability and conservation reasons, water needs to be assigned a value, the collapse of these cases was seen as highly problematic, undermining the Board's credibility and ability to better regulate water use and suppress water theft (whether existing or potential). For those who see access to and use of water as a right, and who believe that water sustainability and conservation should be achieved through collaborative and conflict-resolution approaches rather than punitive enforcement, the collapse of the cases was a predictable and welcome development.

Water mismanagement and vast illegal water markets are not merely the result of the challenges of effective water policing and the lack of the scientific and administrative competence of regulatory authorities. Water mismanagement and illegal markets often exist by design—as a result of regulatory capture, corruption, and the exercise of political power. As shown above, some water commission authorities around the world are complicit in water mismanagement, corruption, and illegal water markets because of illicit profit motivations or political pressures and inhibitions. Regulatory capture by industries and farming lobbies can prevent effective policies from ever being set. Pervasive lack of the rule of law and state presence severely undermine the state's capacity to set effective policies and adequately supplant illegal water markets, as do extensive collusion of the government and water authorities in water smuggling.

Furthermore, in places such as Brazil, India, Pakistan, Bangladesh, Nigeria, and Kenya, the wealthy can opt out of improving public services by relying on private solutions, such as private licenses, pumps, wells, purification devices, and suppliers, to which they have exclusive access due to their high prices. This negative dynamic reflects the unfortunate fact that the high prices of such private solutions still remain less than what would have to be paid in the form of higher taxes to fund the upgrading and extension of needed public water and sanitation services.

Similarly, it is not just the water mafias with their political connections who oppose the extension of public services to the poor and marginalized. In India and Brazil, the middle classes also frequently oppose them because they do not want to shoulder the tax burden for such extensions. Many who have recently moved upward into the middle class fear sliding back to poverty

121 Fenit Nirappil, "Regulators Say State's First Illegal Water Siphoning Case Aided by Detailed Records," *The Associated Press*, July 23, 2015; and Kurtis Alexander, "State Backs Off on 2 Water Agency Cases," *San Francisco Chronicle*, May 30, 2016.

as a result of economic downturns or illness in the family; they do not feel generous to the poor since their disposable income is still very limited.¹²² As long as they themselves do not face disease spread from the slum areas or can isolate themselves from it, they may have few incentives to sacrifice their income for better public service distribution in the slums. This phenomenon is hardly new and has characterized many colonial cities. Moreover, lacking access to adequate public services themselves, today's middle classes in India, Pakistan, Nigeria, Kenya, and elsewhere often remain connected to illegal distributors of public goods, such as the water mafias. Rising into the middle class does not necessarily sever those connections or eliminate their demand for illegal public goods services, and their purchase of the illegally-supplied public goods, such as water, further reduces what is available to the poor—viz., the previously discussed water dynamics between India's urban middle class and the poor in rural and peri-urban areas.

Such systemic public water distribution failures thus go beyond individual or even institutional corruption. They reflect the constraints embedded in basic political and socio-economic systems and of inequitable and inadequate tax collections—symptoms of weak or non-existent social contracts. In the short term, it is often cheaper and easier politically for the state not to attempt to provide public services, such as water, to the poor and instead to tolerate and indirectly participate in an illegal market for such services. In the long term, however, such short-term measures can weaken and delegitimize the state, and water shortages can come to affect all, including the affluent and powerful, such as large landowners and industries. Moreover, by limiting legal access to water to what the state can provide and only selectively cracking down on illegal water distribution, water becomes an important tool of state-making. The state can design which illegal and informal settlements to tolerate at which time and which to shift elsewhere by cutting off access to water. Legalizing informal settlements and slums, desirable as that would be from the perspective of slum residents, thus requires that the state devote resources to provide needed public goods services. Such legalization also limits the state's coercive capacity over those areas as well as the coercive capacity of state-linked illegal agents, such as water mafias or slumlords. Giving illegal settlements a legal status and distributing land titles also risk inadvertently encouraging further uncontrolled migration to urban areas and new land encroachment and squatting. At the same time, tolerating illegal urban water markets can ultimately dry up surrounding rural areas as well, thus also exacerbating uncontrolled migration to urban slums.

[B]y limiting legal access to water to what the state can provide and only selectively cracking down on illegal water distribution, water becomes an important tool of state-making.

¹²² See, for example, Susan Chaplin, "Indian Cities, Sanitation, and the State: The Politics of the Failure to Provide," *Environment and Urbanization* 23, no. 1 (2011): 57-70; and Susan Chaplin, "Cities, Sewers, and Poverty: India's Politics of Sanitation," *Environment and Urbanization* 11, no. 1 (1999): 145-58.

Encouraging the privatization of public services, one of the dominant policy responses during the 1990s, also comes with limitations. Outside providers, such as international experts and firms, at times provide plans unsuitable to local conditions, nor do the outsiders have the political understanding of the patronage, corruption, and illegal market systems that dominate local urban landscapes, as happened in Lagos in the early part of the 2000s.¹²³ Local private providers may have better knowledge and the capacity to operate within the overlapping legal, public, informal, and illegal systems of distribution, but they can—and often do—collude with the system’s distortions, perpetuate its deficiencies, and oppose policy improvements. For local private suppliers to develop sufficient incentives to break with the existing inadequate systems, they need to be able to capture much of the market share and develop political power by promoting desirable public policy improvements. Moreover, the interest of many private operators is in making money quickly at the expense of water sustainability in the long term.

CONCLUSIONS

The concepts of water theft and smuggling are highly controversial. Water use is governed by highly varied and sometimes complex regulations, and determining what constitutes illegal appropriation and supply of water—what I have called water theft and smuggling—can be a difficult task. In some countries, the legal community and water regulators prefer not to use such terms at all. Moreover, across the world, significant constituencies believe that access to water is a right that is appropriately exercised without significantly paying for the water. For those of this persuasion, the very concepts of water theft and smuggling are uncomfortable.

In this paper, I have argued that if water is acquired and supplied in violation of water laws, it can and should be viewed as water theft and smuggling. How the state or community respond to such violations, however, should be a function of the motivation (such as acquiring water for survival versus merely to avoid payment) and scale of the violations.

Water theft can be an expression of severe water scarcity as well as of weak rule of law, inadequate capacities of water authorities, or the state’s unwillingness to extend the legal water supply to marginalized areas. However, even when resulting from institutional and policy deficiencies, water theft and smuggling can pose a variety of severe threats and further compromise the ability to design and implement effective policies to assure water sustainability for consumption, agriculture, industry, and energy. At the same time, many large urban slum areas as well as marginalized and peripheral rural areas can entirely depend on

123 Matthew Gandy, “Planning, Anti-Planning and the Infrastructure Crisis Facing Metropolitan Lagos,” *Urban Studies* 43, no. 2 (February 2006): 385.

illegally-sourced and smuggled water for consumption and food. Paradoxically, the poor residents of such areas often pay far more for the illegal water supply than those connected to the state's legal water distribution system, however imperfect the legal system may be. But legal water supplies can be also pervaded by deficiencies and produce problematic, unsustainable, and environmentally harmful water use and depletion.

The size of water theft can be astounding. In various countries of the world, between 30 and 70 percent of the water supply can be lost due to theft and leakage. Often this is the case in some of the world's most water-stressed countries. Water theft takes many forms, from simply not paying bills, to highly complex corruption schemes linked to powerful actors. Water smuggling often takes place using illegal pipes and water tankers, but as of today, such efforts rarely cross international border. Both methods are pervasive around the world, with some of the most extensive and sophisticated networks of illegal water supply present in South Asia and the Middle East, but also emerging in Latin America. Yet at the same time, water theft is not merely a phenomenon of developing countries.

The smuggling networks that provide water vary widely in their organizational structures and the degrees of their hierarchical and vertical integration. They also vary widely in the quality of water distribution services they provide to the marginalized, and in the level of their accountability as well as in their responsiveness to powerful, legal, industrial businesses and agricultural lobbies. Indeed, although widely referred to as "water mafias," the providers of illegally-sourced water often operate in complex ways and also supply legally-sourced water. Sometimes, they even have a license for distributing water, despite acquiring some (or most) of it illegally. And they supply not only illegal slum settlements; they also deliver water to powerful legal economic actors as well as the upper and middle classes—such as in India and Brazil. Crucially, these so-called water mafias at times operate in collusion with official water board authorities and enjoy the cover of political parties to whom they deliver important services, including donations and votes. Key operators of the illegal water supply also accumulate large political capital by providing slum and marginalized populations with de facto survival—even if the water distribution to the marginalized remains shoddy and suboptimal. They can often ensure the perpetuation of their patrons in elected offices as well as derail the adoption of better water policies and prevent or disrupt an extension of public water provision systems to unconnected areas.

In short, highly varied levels of accountability, equity, and efficiency can be present in illegal water markets. Those crucial characteristics as well as water sustainability also vary widely in legal private or public water markets. But those who control

the tap, particularly illegally, establish dependencies, clients, and patronage networks and can accumulate large political capital and power.

The emergence and persistence of widespread illegal water markets stems from several sources. In all countries, even with developed and complex water policies and extensive public water supply, there are limits to law enforcement capacities for focusing on and preventing water theft. Often dealing with water theft and smuggling is of low priority, and effective prosecution and deterrence are lacking. The legal and normative controversies surrounding water laws, claims of water as a human right, and their potential enforcement are at times so intense that they discourage state and water authorities from attempting any punitive enforcement.

But the persistence and strength of the illegal water markets is attributable to more than the constraints on and limits to policing. They also are the consequence of policy complexity and opacity, as well as the complexity of environmental water systems. Around the world, water rights are often not adequately assigned. Only imperfect information exists regarding the size of available aquifers and their replenishment or depletion rates. Technological, technical, administrative, and managerial skills of water board authorities are lacking in many countries. Unregulated urbanization and other disruptions to customary regulations of water use further undermine effective and accountable water governance. Yet even transparent, accountable, knowledgeable, and non-corrupt water authorities often find it politically infeasible to raise water prices sufficiently to steer consumption toward sustainable use.

Crucially, illegal water markets sometime exist not only as a result of regulatory failure but by design—not just as a result of regulatory capture and corruption, but also of political power disparities. The wealthy can opt out of improving public water policies; and the middle class, particularly newly-emerged middle classes, as in India and Brazil, can be loath to absorb higher taxes to allow for the provision of legal water to slum and marginalized rural areas. For the state, as well as for slumlords and their political patrons, controlling the tap is useful as a means of exercising power over the population.

POLICY IMPLICATIONS AND RECOMMENDATIONS

Effective policy design needs to reflect local conditions, such as local institutional settings, as well as local policy challenges and problems. Detailed policy prescriptions will need to be tailored to local settings. Thus dealing with the issue of water theft in developed countries will require different elements than dealing with water theft and smuggling in Pakistan. In some rural parts of

Africa, modern water governance practices may be of limited and only partial applicability, while adopting or shaping customary water practices, recognizing their legal validity and extending property rights to local communities, including pastoralists, may be more appropriate.¹²⁴ Clearly, not all customary water practices around the world reflect similar beliefs as to what is fair and equitable. In post-conflict or conflict-ridden countries such as Afghanistan, traditionally customary practices may have been destroyed, while institutionalized approaches may not yet have filled the void of regulation and enforcement. Thus, the matching of cost-effective and innovative policies and programs to existing formal, informal, and customary institutions needs to be appropriately nuanced. Nonetheless, some broad policy implications, principles, and recommendations can be offered.

The basic principles of policy guidance have been established more than a quarter century ago in connection with the 1992 Rio Earth Summit. That year an International Conference on Water and the Environment in Dublin adopted the so-called Dublin Principles, designed to be the core of integrated water resource management. Those principles stated that:

- I. fresh water is to be treated as a finite and vulnerable resource;
- II. water development and management should be based on a participatory public approach, involving users, planners, and policymakers;
- III. women should play a central role in managing and safeguarding water;
- IV. water has value in all of its competing uses and should be recognized as an economic good.¹²⁵

The adoption of these guiding principles has varied widely around the world—both as core principles of policy and in their specific implementation.

Indeed, the most frequent response to water supply deficiencies and shortages that occur is to look for new sources of water and build large new engineering projects to bring water from elsewhere into areas of shortage. In many parts of the world, large-scale infrastructure projects are and will continue to be a necessary component of addressing water scarcity and improving the ability to deliver water to the entire population and

[T]he most frequent response to water supply deficiencies and shortages that occur is to look for new sources of water and build large new engineering projects to bring water from elsewhere into areas of shortage.

124 Kristen Lewis and Roberto Lenton, "Corruption and Water Resource Management: Threats to Quality, Equitable Access and Environmental Sustainability," in *Global Corruption Report 2008: Corruption in the Water Sector*, Transparency International (Cambridge: Cambridge University Press, 2008), 32.

125 Miguel Solanes and Fernando Gonzalez-Villarreal, "The Dublin Principles for Water as Reflected in a Comparative Assessment of Institutional and Legal Arrangements for Integrated Water Resource Management," (Stockholm, Sweden: Global Water Partnership, 1999).

its many agricultural and industrial users. However, large-scale infrastructure projects should not be adopted as a cop-out from water conservation. The cop-out mentality in fact is frequently present in places such as in India and Pakistan as well as Brazil. Instead of strongly committing to water conservation, addressing inefficiencies, overuse, and water theft, and replenishing aquifers and other water sources, the standard response becomes too easily to build new dams, canals, pipelines, and other mega-projects that are lucrative for those who obtain the contracts.¹²⁶ Large-scale engineering projects avoid political difficulties, such as of reforming and preventing new regulatory capture, raising prices, or turning off water to delinquents. And in areas of weak rule of law, the large projects also provide ample opportunities for new profitable kick-backs and corrupt deals. However, rather than truly addressing water sustainability issues, such new projects sometimes merely push the problem of water mismanagement and scarcity down the road. If bunkering existing water pipelines and siphoning off water from existing canals are common, simply building more of them and at greater distances will only compound policing problems and leave the population vulnerable to the same water theft and shortages. Similarly, merely switching sources to groundwater can prevent the internalization of the real costs of usage and continue ignoring severe environmental and ultimately social externalities. Building new water infrastructure may well be necessary and important, but it is rarely sufficient.

Crucially, *appropriate water rights and their policing and pricing* as well as *water conservation* need to rise in prominence in water policy.

Specific measures include:

1. Developing an inventory and database of available water and updating it regularly. A basic starting point, this inventory must include and not over-count groundwater, which is frequently connected in complex ways to surface water, so the two cannot be merely added together to arrive at the total water stock size. Yes, measuring the size of groundwater inventory is inherently difficult, and sometimes an accurate number can only be established once the water is pumped out. That may be too late. Measuring groundwater as much as feasible, and supporting innovative approaches to determine more accurately the size of aquifers, such as through remote sensing, needs to be encouraged.

¹²⁶ For such projects in the works in those countries, including drawing water from the Keenjhar Lake to supply Karachi, see, for example, Sabrina Toppa, "Dry Dams, Leaky Pipes and Tanker Mafias - Karachi's Water Crisis," *The Guardian*, June 28, 2016; for Brazil, see, for example, Scott Moore, "Water Pricing, Not Engineering, Will Ease Looming Water Shortages," *The New York Times*, March 31, 2015, <https://www.nytimes.com/2015/04/01/opinion/water-pricing-not-engineering-will-ease-looming-water-shortages.html?mtrref=www.google.com&gwh=F078E3F8183779CFA770EC2A795E3FA8&gwt=pay&assetType=opinion>.

II. Improving measurements of water usage—including for irrigation and from private wells. Particularly in this area, technical approaches, such as remote sensors, can be of significant utility because the number of human inspectors necessary may be too large and costly. Reliance on self-reporting should be minimized.

III. Establishing equitable water rights and developing the ability to enforce them. While such rights should be clearly articulated, they should not be granted in perpetuity or be excessively rigid. Changing conditions, including water overuse or scarcity due to climate change, may necessitate that water rights be altered in the future. Bracketing water rights within specific timeframes also encourages users to stay at the policy discussion table for the longer term.

In many areas, it is appropriate to allocate water rights to water user associations and traditional communities. They are often neglecting in allocation of formal water rights, yet with direct decisionmaking authority, they are often in the best position to meet their water while conserving water and preventing its theft.

IV. Exploring new technological policy improvements. Beyond measurement of water use, such approaches should seek to *enable the conservation* of water rather than simply drawing and consuming it from new sources, such as by desalination. In the United States, Las Vegas has been one of the leaders of such conservation innovation—for example by installing shower devices in hotels that bring up hot water immediately, thereby avoiding the need to waste water while waiting for it to heat up. In poor, marginalized, or developing regions, such innovations can include restoring old systems or creating new ones to capture rainwater or reviving methods to reuse water multiple times before discarding it.

V. Ensuring that a key operating principle of water management is conservation rather than use maximization. Countries and regions can and have managed to reduce their water consumption, such as Finland, Hong Kong, and parts of Australia and Western Europe.

This approach needs to include developing regulatory frameworks that enable, not hinder, water conservation and reuse. One such policy is to provide tax breaks for the installation of such systems and for so-called rain gardens that seek to encourage water absorption rather than waste. Another may be to simplify licensing systems for reusing so-called gray water, such as from dishwashers, washers, and showers (though for sanitary reasons, not toilets), and for watering gardens.¹²⁷ That is not to say that one should

¹²⁷ For how much water reuse is in fact often complicated and hindered by laws, see, for example, Matt Stevens, "From Laundry to Garden," *Los Angeles Times*, July 4, 2015. For household innovations for how to conserve water in drought-afflicted Puerto Rico, see, for example, Lizette Alvarez, "Water Crisis Brings Out Puerto Rico's Creative Side," *The New York Times*, July 14, 2015, <https://www.nytimes.com/2015/07/15/us/in-drought-puerto-rico-rations-water-setting-off-a-collection-frenzy.html?mtrref=www.google>.

rush into broadly permitting or encouraging gray water use. Using gray water high in harmful substances can result in negative effects on human health and accumulate in food. Treating reused water to decontaminate it may be very expensive. Thus, gray water policies need to be carefully examined, considered, and monitored.

VI. Ensuring that water policies are transparent and devised with wide participation of a variety of stakeholders and users. These processes must include the poor and marginalized who often are still excluded from such deliberations. Care needs to be taken to enlist participants who truly represent marginalized communities and are not merely under the thumb of local slumlords, water mafias, and their political patrons. Achieving such greater representation may require intense investigative preparation of the existing water market and the powerbrokers who dominate it and employing multiple channels of representation to avoid representation capture by such powerbrokers.

The goals of the increased participation are to avoid new policy capture by powerful actors, to consider the needs of all users, and to redress perceptions of unfairness and arbitrary decisionmaking so as to maximize the legitimacy of any new or reformed policy. Particularly when voluntary compliance is crucial and policing and enforcement face inherent limitations, such as in the water sector, perceived legitimacy is a crucial lever that influences compliance.

However, water policy cannot merely respond to short-term economic maximization preferences of users and must be able to build in sustainability, in addition to responding to actors' preferences and societal norms.¹²⁸ It also must be able to arbitrate tradeoffs and conflicts, ideally in ways that achieve broad legitimacy.

VII. Establishing anti-corruption commissions and other transparency measures in the water sector, including mandatory disclosures of water contracts and water delivery and usage, such as through monthly online reporting. Other transparency and anti-corruption measures should include creating water usage and policy auditors and inspectors who themselves would be subjected audits.¹²⁹ However, often far broader anti-corruption improvements will have to be achieved before they strongly trickle down into the water sector as well.¹³⁰

com&gwh=C21FC20495EA6E5C8D93AB1125013E89&gwt=pay.

128 See, for example, Insa Theesfeld, "A Review of National Groundwater Instruments: Grasping Institutional Aspects of Transboundary Groundwater Governance," (Gloucester, U.K.: University of Gloucestershire, 2008), http://iasc2008.glos.ac.uk/conference%20papers/papers/T/Theesfeld_155301.pdf.

129 On how such a process reduced corruption in village-level infrastructure provision in Indonesia, see Scott Guggenheim, interview by Rushda Majeed, *Innovations for Successful Societies*, Princeton University, October 17, 2013, https://successfulsocieties.princeton.edu/sites/successfulsocieties/files/D12_SRA_RM_Scott%20Guggenheim_Final.pdf.

130 See, for example, Janelle Plummer and Piers Cross, "Tackling Corruption in the Water and Sanitation Sector in Africa: Starting the Dialogue," in *The Many Face of*

VIII. Pricing water appropriately. Getting prices right is crucial. In many parts of the world, that should entail increasing the price of water. However, the process of determining the appropriate price of water can and should vary according to use and volume. Thus some amount of water per person, for example the 50-liter daily personal minimum, could be provided cheaply or even for free. Other consumption would be more expensive according to set schedules. Consumption of water for watering lawns or filling swimming pools should cost considerably more than the personal minimum. Industrial and agricultural use would also be taxed according to volume-use schedules so as to encourage conservation. Prices should also vary in the dry and wet seasons.

Pricing systems—even while economically and environmentally efficient and facilitating cost recovery and adequate maintenance of water distribution systems—will not be sustainable if they are not equitable or locally acceptable. Achieving wide acceptance may be very difficult in countries where populations have become used to inappropriately and artificially low water prices. Educating the public that water sustainability requires higher and tiered pricing will be challenging and necessary.

Getting the price right also means eliminating subsidies that encourage water overuse. In India, this may mean eliminating subsidies for energy sources that operate pumps, such as diesel. In the United States and southern Europe, it may mean eliminating subsidies for water-intensive crops.¹³¹ It should be anticipated that the effect of eliminating water and energy subsidies, as well as direct crop subsidies, will be higher prices for food. Large constituencies around the world will be opposed to such policy moves.

Instead, subsidies and tax breaks should be accorded to technologies and processes that encourage water conservation. Among them are, for example, more efficient drip-irrigation systems that can cut down water use by some 30 to 70 percent. Less water-intensive crops should be promoted. Australia, for example, has provided farmers with assistance to switch to such crops.

Better pricing approaches to water should also include the establishment of private water markets and trading systems, such as in Australia,¹³² where users who do not consume their entire allotted water quotas have the right to sell the leftover water to others. But care needs to be taken to avoid the strengthening of undesirable and outright pernicious private water markets,

Corruption, eds. J. Edgardo Campos and Sanjay Prahlan (Washington, DC: The World Bank, 2007).

¹³¹ Scott Moore, "Water Pricing, Not Engineering, Will Ease Looming Water Shortages," *The New York Times*, March 31, 2015.

¹³² On how Australia went about to develop tradable water rights, see "Liquidity Crisis," *The Economist*, November 5, 2016.

like in India where rural and peri-urban users sell their water to water mafias who then smuggle it to urban industries and middle classes without taking into account water sustainability. Moving away from quotas and toward pricing schedules may be a less risky way to handle economic optimization of water consumption among users. Establishing water banks is a further important element of this approach.

IX. Increasing enforcement to combat water theft and smuggling. Neither proper pricing nor regulatory improvements alone will deliver what is needed if water theft and smuggling persist. In fact, illegal water markets can be strengthened as a result of greater water prices. Wealthy businesses engaged in systematic and large-scale water theft should be priority targets.

X. Improving investigative and prosecutorial capacity. Better enforcement includes not just greater fines and punishments for violations, but also greater certainty of identifying violations and greater prevalence and swiftness of effective prosecution.

XI. Dismantling illegal water markets after adequate legal water is provided. Cutting off slums and marginalized rural areas from smuggled water is clearly normatively undesirable if legally-sourced water is lacking and is unlikely to fully overcome illegal water sourcing or the establishment of new wells and pipes. Ensuring the sufficient supply of legal water can be accomplished through better taxation systems and new social contracts that generate tax revenues for better provision of public services to the poor and marginalized.

Establishing a legal water supply can *include legalizing some illegal water suppliers*, such as by giving them licenses if they obey certain regulations.¹³³ There are policy precedents for such legalization in Senegal, Vietnam, Ghana, and Mozambique.¹³⁴ Not all existing water mafias should be licensed. Nor should only one illegal water smuggling outfit be given the license, thereby creating a pernicious monopoly. Illegal water providers who systematically prevent the extension of public and legal water services or who supply contaminated water at particularly high prices should not be licensed. But those who supply illegally-sourced water in ways that cause the least harm to the public good and to local communities may well be appropriately licensed. Local communities should have a strong voice in terms of which illegal water suppliers should be issued a license to continue supplying the community and which should not. Strong oversight, including from within the community, should also be applied to the newly-

133 See, for example Sophie Trémolet and Catherine Hunt, "Taking Account of the Poor in Water Regulation Sector," (Washington, DC: World Bank, 2006), http://regulationbodyofknowledge.org/wp-content/uploads/2013/03/Tremolet_Taking_into_Account.pdf.

134 *Ibid.* See also David Parker and Colin Kirkpatrick, "Privatization in Developing Countries: A Review of the Evidence and Policy Lessons," *Journal of Development Studies* 41, no. 4 (February 2005): 513-41.

licensed providers and they should be subject to similar, if not the same, transparency measures as formal water suppliers—including the public reporting of deliveries and usages. Water mafias and illegal providers who do not receive a license, or those who do but continue violating the regulations applied to them, should be subject to diligent law enforcement actions.

Licensing tanker providers and water kiosk operators should also be complemented by distributing water treatment systems to poor communities and encouraging non-predatory, small-scale water loans to connect households to public water and sewage grids.

This broader legalization approach can also include legalizing heretofore illegal and informal settlements so that the state can legally connect them to public infrastructure and services.

XII. Improving international regional cooperation for cracking down on transborder smuggling and achieving better water management. This is a critical requirement, but achieving such international cooperation may be very difficult in regions where pre-existing international disputes over water already exist. Moreover, such transnational water smuggling may in some cases involve the outright sponsorship or at least tactical acquiescence of governments and powerful state actors.

XIII. Exploring privatization and repairing and building new water infrastructure. In settings of high regulatory capture and corruption, great care needs to be taken that privatization and new contracts do not merely strengthen the pernicious actors who distort policies in the first place.

XIV. Periodically reviewing, evaluating, and updating the regulations and measures. In many countries, including the United States, water regulations are decades old and antiquated. Policy design needs to maintain flexibility so as to correct policy failures, as water policies and water environments are highly complex. Water policies must also be able to respond to external shocks, whether natural or manmade, and adapt to the strategies and maneuvers of the many actors involved in water smuggling and water theft.



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