Priceless

The Market Myth of Water Pricing Reform

food&waterwatch

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Food & Water Watch works to ensure the food, water and fish we consume is safe, accessible and sustainable. So we can all enjoy and trust in what we eat and drink, we help people take charge of where their food comes from, keep clean, affordable, public tap water flowing freely to our homes, protect the environmental quality of oceans, force government to do its job protecting citizens, and educate about the importance of keeping shared resources under public control.

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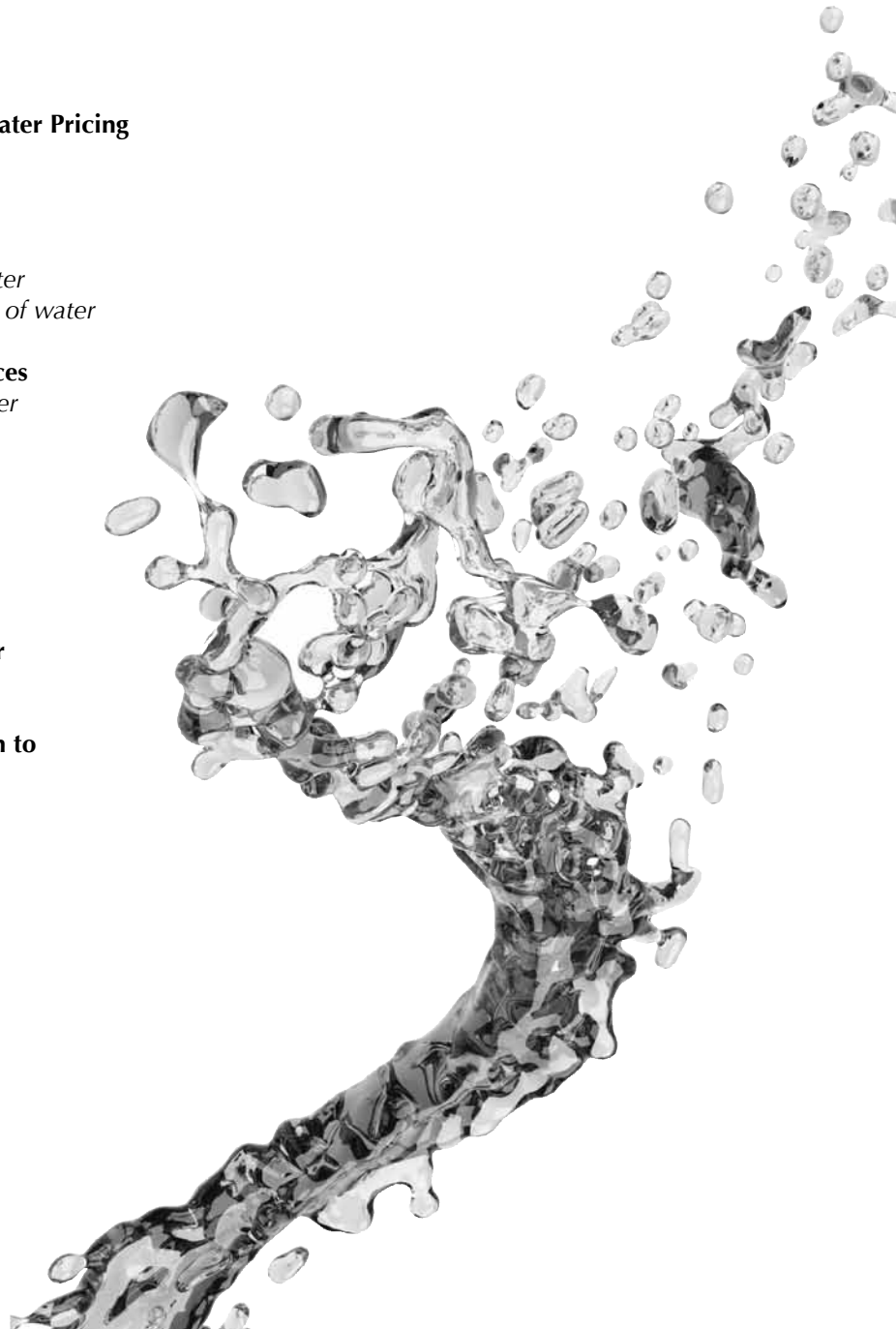


"The importance of water to our survival renders it, literally, priceless."

–Holly Stallworth, Economist
Office of Wastewater Management
U.S. Environmental Protection Agency

Executive Summary

America's rising water demand risks exhausting available supplies. Developing effective strategies is necessary to address scarcity, improve water efficiency and encourage conservation while strengthening U.S. water infrastructure.

To tackle the tension between dwindling supplies and growing demand, many economists, market-oriented environmentalists and think tanks have advocated for market-based pricing of household water rates — essentially charging consumers more for water to encourage conservation. Most U.S. residential water rates are low, so raising these rates has a certain logical appeal. But this simple-sounding proposition is not so simple.

Water pricing reform alone is no panacea for America's water-management challenges. Society's interest in ensuring environmentally sustainable water use and universal access to affordable water service is poorly served by a market model. Water is essential to life; commodifying access to water treads on the basic human right to water.

Market-oriented pricing reform contains two fundamental flaws: It focuses almost entirely on residential water use and it assumes households can or will reduce water use when faced with higher prices. Residential water use is a small fraction of water withdrawals in America — only about 8 percent of water goes towards household water use. Any strategy that ignores more than 90 percent of the problem cannot reduce total water use significantly.

Even draconian water price increases will have little impact on household water consumption, since much of residential water goes towards essential uses like drinking, cooking and sanitation. Because of this, consumer demand for water does not really change, regardless of price. Economists call this price inelasticity. Consumers will not drink twice as much water if the price of water falls by half, nor will they reduce the amount of water they drink by half if the price of water doubles. A Food & Water Watch review of the economic literature found only a modest consumer response to rising water prices. Households generally reduce water use slightly in the face of even steep price increases.

Addressing low residential water prices should be part of a more integrated water strategy, not the only strategy. While some increases in water price might help curtail excess demand for non-essential water use, sharp increases in household water rates alone will do little to curb total water demand. Public education campaigns to promote conservation and incentives for households to adopt more water-efficient appliances can do more to reduce water use than price increases alone.

The highest water savings can be achieved through restoring America's aging and leaking infrastructure, which wastes considerably more water than residential users. Charging higher prices for industrial water users can also generate more water savings than hiking prices for residential users. Unlike households that predominantly have essential water uses, business users have greater incentives to reduce wasteful water use in the face of rising prices — and do, according to many studies. Nonetheless, today in many places, businesses pay less for a gallon of water than nearby residents.

No single strategy is sufficient to address water demand-management needs. Any water policy must be tailored to local conditions and address both residential and industrial use. There is a range of policy alternatives. Focusing solely on water pricing as the mechanism for managing demand is unfair to ratepayers and doomed to be ineffective. We must recognize the collective impacts of water use, from agricultural needs to industrial needs to home needs, and demand collective responsibility.

Introduction

In 2009, the Organisation of Economic Co-operation and Development (OECD), an international economic association of wealthy nations, released a report that promoted the use of market-based water pricing reforms to combat water scarcity, address environmental concerns and efficiently allocate water resources.[1] This was another attempt to shoehorn water into a market model that cannot accommodate its unique, life-sustaining qualities and to bring water under what one World Bank water expert calls "the hegemony of the market model."[2]

Pricing reforms that explicitly target household water use appeal to many market-oriented policymakers, but the promise of water pricing is a mirage. Residential water pricing reforms alone cannot significantly increase water conservation, protect freshwater resources or alleviate water scarcity.

America's rising water demand from residents, businesses and farms is starting to outpace available supplies. The demand for water already exceeds the available supply in many water basins, especially in more arid regions and places with recurring droughts, including throughout the Colorado River and Rio Grande watersheds.[3] Even cities in less arid regions like Atlanta have faced alarming shortages in recent years. Climate change will make water challenges even more daunting over the coming years.

Traditionally, U.S. water utilities have constructed new water projects like reservoirs to cover shortfalls. This strategy is no longer feasible even in regions endowed with more plentiful water resources. Water managers must delicately balance dwindling freshwater supplies with the residential, industrial, commercial and agricultural demands to prevent water resources from being over-exploited.[4] Instead of increasing the supply of water, a strategy to manage demand can encourage conservation and improve the allocation of water resources.[5]

There is a wide mix of policy alternatives to motivate U.S. consumers to improve their water-use efficiency and conserve freshwater resources. Demand-management strategies include rules to decrease water use (restrictions on certain water uses like watering lawns or washing cars during droughts), positive incentives (programs to encourage users to adopt more efficient equipment, appliances or water fixtures), and negative incentives to make consuming additional water costly to the user (most commonly by reforming water pricing structures).

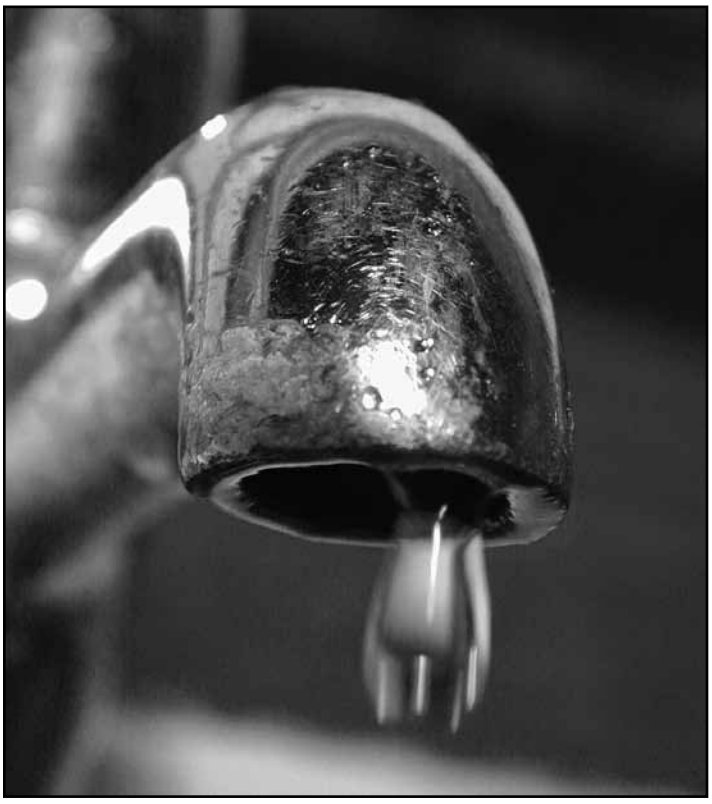
Despite the menu of available policy choices, market fundamentalists have seized upon water pricing reform as the only solution to water scarcity. Proponents contend that idealized market forces will bring water supply and demand into balance, efficiently allocate water resources and eliminate water scarcity.[6] The market fundamentalists assert, "Water price is the main instrument to control demand."[7] Although utilities have more policy tools available to reduce demand, economists view pricing as "the central mechanism that determines the availability and allocation of water."[8]

The rigid confidence in water pricing reform is partially based on the low prevailing price of water service in the United States. Historically, the price of water service has been below its value to households, industries and agriculture.[9] U.S. consumers pay one dollar for water service out of every $200 in household income (0.5 percent), the lowest level in the industrialized world.[10] When consumers receive more value from a good than they pay for it, the economic theory suggests they will over-consume the good.[11] Persistently low-priced water service provides little incentive for users to conserve.

In the context of growing scarcity and low prices, water pricing reform has a certain logical appeal. Theoretically, pricing reform is a neat and easy solution to the problem. The proponents argue that raising prices — especially charging more for using more water — should reduce water use. But this simple-sounding proposition is not so simple.

Water pricing reform alone is no panacea for America's water management challenges. Society's interest in ensuring environmentally sustainable water use and universal access to affordable water service is poorly served by a market model. Market-oriented pricing reform contains two fundamental flaws: It focuses almost entirely on residential water use, and it assumes households can or will reduce water use when faced with higher prices.

Households account for less than a tenth of total water consumption, so even radical and dangerous reductions in residential water use would never generate significant water savings. If residential consumers cut water use in half, total water use would fall by less than 5 percent. And because most household water consumption is for essential uses like drinking, cooking and sanitation, consumers cannot reduce consumption by very much, even under steeply rising water prices.



These limitations may explain why there is little evidence that water pricing mechanisms designed to increase conservation actually work. The *American Water Works Association Journal* noted, "Few water providers, however, have a solid empirical basis for determining the effectiveness of pricing as a conservation tool."[12] One economist noted that price-based conservation policies lack "adequate (or, perhaps, convincing) information about their relative performance."[13]

Pricing reform is an impractical approach to addressing water scarcity. Nonetheless, in the United States, all water users — not just households, but agriculture, industry and other businesses — should bear fair and equitable costs for receiving water services. Water pricing should not contribute to the commodification of water. Rates can incorporate the cost of the services provided by the utility, but should not reflect a monetary value placed on the water itself.

Water pricing cannot and should not be the only source of funding for water delivery and infrastructure. Because water bills based on volume regressively impact lower-income households, pricing water service to allow full cost recovery would force low-income households to bear a disproportionate fiscal burden. Much of the value of water is public — water for fire hydrants and hospitals and

schools. Public financing can account for this public use and ensure that lower-income households have affordable access to water service. Indeed, society could finance water services without user fees or market-based pricing mechanisms, just as it does for emergency services like fire and police protection.[14]

More integrated water management policies would cover not only residential use, but also the other 90 percent of water consumption. Reducing municipal water use and increasing efficiency should include upgrading America's decaying and leaky infrastructure, encouraging the adoption of more efficient water appliances and equipment, curbing wasteful water use during the dry season and droughts, and more aggressively educating the public about water conservation. No single one of these policies will be a silver bullet, but together they can be a more effective approach than relying on water pricing alone.

This paper focuses on the theoretical and practical problems of market-based water pricing reforms in the United States. Similar efforts are afoot in the developing world with even more alarming consequences, since higher water prices can significantly erode the incomes and endanger the lives of billions of people living on less than $2 a day. This paper will analyze the model that proponents use to justify water pricing reform as the sole tool for water demand management, and discuss the many and significant limitations of the market model to the unique properties of water, the goals of water utilities in setting prices and the most common water rate structures. The paper explains how and why household water use does not decline in the face of rising prices, discusses the limited application of residential water pricing reforms to water scarcity, and delineates a more integrated approach to water demand management.

Water pricing should not contribute to the commodification of water. Rates can incorporate the cost of the services provided by the utility, but should not reflect a monetary value placed on the water itself.

The Theory Behind Market-Based Water Pricing

The market fundamentalists believe that water is just an economic good like any other and that the invisible hand of the market can best arrive at a fair price for water. The international community legitimized the market model for water at the 1992 Dublin Water and Sustainable Development Conference, which concluded that "water has an economic value … and should be recognized as an economic good," and that economic tools can be used to promote efficient water use and conservation.[15]

When market theorists apply supply and demand constraints to water, they mean that the market can allocate scarce freshwater resources efficiently between competing users — households, businesses and farms. When water is priced at its economic value, the marketplace can allocate water to its best uses.[16] The idea of water as an economic good means that water has a value to users who are willing to pay for it. Water pricing proponents contend that since water is an economic good with tangible value, it is appropriate that users pay for it.[17]

In its most generous light, the market proponents suggest that water's inherent value to life, food and economic growth could be distributed more efficiently and water conservation could be promoted if market-determined prices could help balance water demands and water supplies. But market fundamentalists like the World Bank advocate the application of pricing reforms to bring water under the control of "market-like and market-friendly instruments for managing all elements of the economy."[18] These efforts are paired with aggressive promotion of other market mechanisms to take over common, public water resources, like the privatization of public water utilities and the creation of water markets to trade water rights on speculative water exchanges.

Free-market theory suggests that the marketplace balances the supply of a good with consumer demands, and prices respond to these market forces to help allocate the goods between different consumers. Higher demand will reduce supplies and push prices up, while abundant supplies combined with indifferent demand will yield falling prices. This model works pretty well with discretionary consumer purchases. When too many buyers want too few new electronic gizmos, the price rises, but when there is a large unsold inventory of unwanted retail goods, prices fall.

Why Water Is Not Like Widgets

These market forces may work for widgets, but water is not a widget. The special properties of water make it uniquely unsuited to allocation purely through market mechanisms. Water is essential to life; commodifying access to water treads on the basic human right to water. People need drinking water and water to grow food, making it different than other goods that consumers could choose to forego. Especially during periods of water scarcity, water completely ceases to be an economic good and exhibits its most essential quality as a basic human need.[19] As a U.S. Environmental Protection Agency (EPA) economist noted, "The importance of water to our survival renders it, literally, priceless."[20]

Moreover, consumers cannot substitute their demand for water with another like product. If the price of water is too dear, people could not choose to drink another liquid like ammonia or gasoline. With food, consumers can use their purchasing power to choose between ground beef and filet mignon. But with water, consumers cannot select between different kinds of water to come out of their faucets.

Perhaps more importantly to economists, water is delivered in a non-competitive market with one seller and many captive buyers. The market theory assumes many sellers and many buyers arrive at mutually acceptable prices through competition. Water services are natural monopolies, because it is cheaper for a single utility or company to operate a water infrastructure system than to have several duplicative water networks.[21]

This natural monopoly prevents informed consumers from voting with their pocketbooks based on price or service quality.[22] When a single seller sets prices based on consumers' willingness to pay, the prices rise to the level a profiteering monopolist would charge.[23] Indeed, when private water companies wrest control of these natural monopolies, water prices tend to increase. Food & Water Watch examined public and private water systems in 33 U.S. states and found that private water bills were on average 30 percent higher than water bills from public utilities. In some states, private water companies charged 80 percent more than public providers in the same state.[24] There is no competitive marketplace for tap water, and water's unique properties make real market competition impossible.

Water Costs, Values and Prices

Although water pricing reform proponents favor the market mechanisms of supply and demand to determine water prices, there is no marketplace for municipal water. Water supply and demand forces do not come into balance on

a clearinghouse like a stock exchange. Nor do aggregate consumer demands for trendy tap water drive prices.

The limitations of the market model for water require the adoption of alternative measurements of supply and demand. The price of water supply is determined by the full range of costs to deliver water to consumers, and demand is based on the value different users place on water. The market model requires that both the costs and benefits of water be assessed. The loose intersection of total water cost and the value consumers place on water creates a proxy for market pricing.

The value and benefit of water

Individuals, businesses and farms all derive value from water and pay for access to water services. The most obvious value is the essential drinking, cooking and sanitation water each person needs. Businesses gain value from water in its role in producing a good or a service. The value of water to industry, agriculture and other businesses is greater than the price they pay for it.[25] Different users put different values on their access to water and are, in effect, competitors for the resource. Consumers and communities bear a cost to receive water service, but that water provides the users with real value.

Economists estimate the value individuals put on household water use as what they are willing to pay.[26] But for an essential good like water, willingness to pay roughly equals a consumer's ability to pay.[27] Willingness to pay is an easier concept to model and measure with widgets, but water is delivered on what a senior water advisor for the World Bank calls "highly imperfect" markets, so it is difficult to estimate the willingness to pay of different users.[28]

Society places a higher value on families' access to water than their ability or willingness to pay for it. Most people view water more as a public good that should be allocated fairly so all citizens have equal access, since this resource is required for life itself. Water should properly be considered part of the public commons, where water use, waste and pollution affects all citizens, communities and the environment. Access to water can be compared to other community values such as reducing poverty, disease, unemployment and food insecurity.[29]

In contrast, market-based pricing proponents worry that concerns over affordable access to water will prevent water from becoming sufficiently expensive. In 2009, the Organisation for Economic Co-operation and Development cautioned against underestimating individual consumers' willingness to pay when setting water rates, noting, "The risk is that decisions about tariff [water rate] levels and structures will be based on exaggerated assessments of affordability constraints that underestimate willingness to pay."[30]

If the price of water is too dear, people could not choose to drink another liquid like ammonia or gasoline. With food, consumers can choose between ground beef and filet mignon, but consumers cannot choose different kinds of water to come out of their faucets.

Accounting for the true cost of water

The total price of water service should reflect the true costs of bringing water from its source to the faucet, but residential water prices alone need not bear the entire burden of covering these costs. Nor should the price of water be envisioned only in terms of what ratepayers pay. Other public revenue streams can and should contribute to the financial sustainability of water utilities. These funding sources should cover the total costs of delivering water to consumers and the full spectrum of environmental costs of withdrawing and discharging, as well as some of the cost of financing water infrastructure. The most obvious costs include those of source water and its treatment, the operating and maintenance costs of the system, and the capital costs of past and future infrastructure investments.

These capital costs for water infrastructure, in particular, are rising. In 2007, the EPA surveyed the national infrastructure needs and found that drinking water systems required $334.8 billion investment to upgrade and rebuild aging systems.[31] In 2008, the EPA found that clean water sewer systems needed another $298.1 billion, 17 percent more than the 2004 estimate of the investment need.[32] Paying for this $632.9 billion in infrastructure needs over

the next 20 years could imperil access to water for many Americans.

The significant need for water and sewer upgrades have been falling on smaller localities that in turn pass the costs on to residential consumers. Over the past three decades, the burden of paying for necessary water infrastructure has shifted from the federal government to localities. The federal government passes the responsibility to the states, the states pass it to the localities, and the localities pass it to ratepayers.[33] As a result, residential users now provide 63 percent of water company revenues.[34]

Public water systems provide invaluable services to the entire community, including maintaining public health and slaking the economic needs of industry, business and agriculture. Putting the entirety of the financial infrastructure costs on local municipal systems — and in turn, household residential water users — overly burdens the small municipalities least capable of making investments that benefit the local, regional and even national economy. In theory, a full-cost pricing structure seeks to recover the complete cost of providing drinking water and wastewater services, including overhead and capital expenditures. In practice, full-cost pricing puts the onus of funding on the locality rather than state or federal resources. Recovering the needed investment by relying on increasing costs to ratepayers is less fair than spreading the communal cost of water across the full spectrum of potential revenue streams.

Compounding the problem, the locality providing the service is frequently quite small. More than four-fifths (82 percent) of all water systems serve fewer than 3,300 people.[35] Those systems only provide service to 9 percent of the population, yet need 19 percent of the infrastructure funding for drinking water alone.[36] While a large city such as New York City or Chicago might have access to the municipal bond market to raise capital, defray these costs and spread them out over time, a small system is unlikely to have the same access to these markets to be able to easily raise capital. Additionally, smaller systems are less able to rely on the ratepayer base to cover the costs of service because there are fewer, typically lower-income residential users. The impact on small municipal water systems of full-cost pricing would be disproportionately large, in many cases putting the largest burden on rural ratepayers who can least afford it.

The true cost of water service is also much higher when the environmental costs are fully taken into account.

Other upstream and downstream water users bear the costs from the withdrawal of water from aquifers and surface water as well as the discharge of polluted effluents into the watershed.[37] Environmental controls only constrain or mitigate the damage of polluted discharges that effectively limit the available freshwater supply to other current and future users.[38] Moreover, drinking and wastewater withdrawals and discharges directly impact the ecosystems that are now competing for required freshwater.

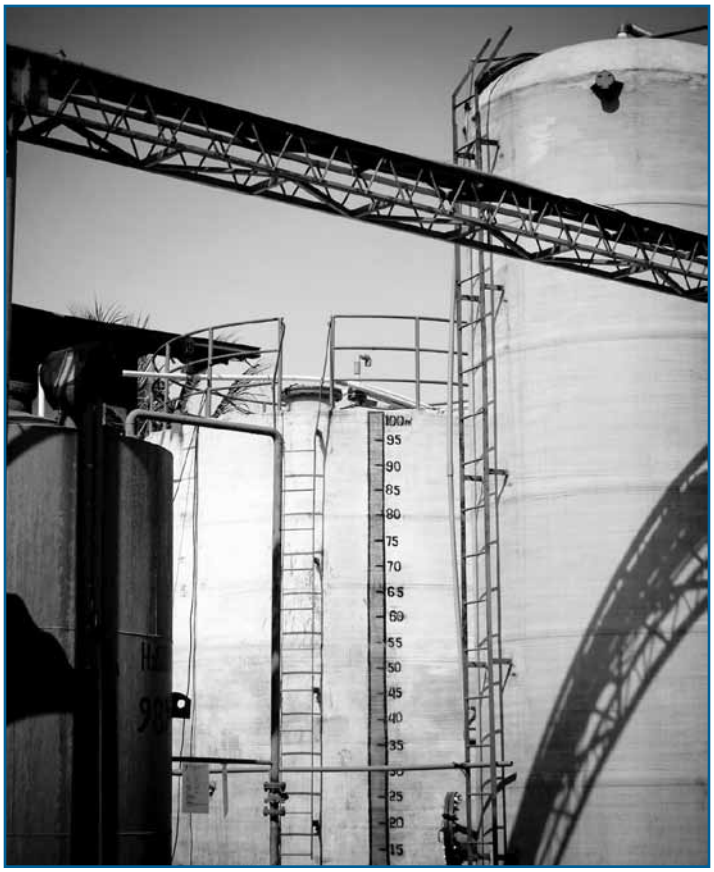
The costs of unsustainable water use cannot be easily assessed in monetary terms.[39] Although the water users that imposed these environmental costs should bear the burden of the resource use (or exploitation) and pollution, it is difficult to identify, measure, monetize and attribute all of the environmental harms in the water system. The polluter-pay principle is attractive to economists and many environmentalists, but in practice, as the EPA admits, "It is rare to see an 'externality' fully priced and charged."[40]

Theoretically, the sum of all of these costs[41] would form the basis for true cost pricing. Economists contend that adopting marginal cost pricing — where users pay the full cost of replacing each gallon they use — would ensure that water goes to the most valuable uses.[42] Nonetheless, even the idealized full-cost pricing is unlikely to reflect

the true cost of delivering water and treating degraded water discharges.[43] The social costs of maintaining ecosystem sustainability, repairing environmental degradation and addressing water resource depletion require a strong public safety net to ensure these vital public interest goals are adequately funded.

Water prices that more fully reflect all the costs of providing water should, in theory, provide better incentives for consumers to use water wisely. When water is priced below its value to the user, the argument claims, it deters conservation. Better, higher price signals could motivate users to conserve more water.[44] In theory, consumers would use less water when water prices are higher, which is how it works with widgets.[45] Higher water prices for larger volumes of water could encourage water conservation and the adoption of water saving technologies.[46]

The straightforwardness of the theory has significant appeal as a policy approach, because efficient pricing, if possible, would seem to encourage water conservation, the adoption of more efficient water fixtures and appliances, and ensure that water resources were directed to the most valuable consumption. Pricing will never be able to balance all the social values of water (including ensuring affordable access and sustainable water use) with the true cost of providing and protecting water. Strong public involvement in water management is essential to protect the human right to water and the ecological value of the freshwater commons.



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Water Utilities' Goals in Setting Prices

Water utilities must balance several, often conflicting goals in setting water rates and prices. These include demand-management goals as well as practical constraints for the utility. The utility needs to receive enough revenue to cover the costs of the system without inequitably burdening less affluent consumers. The pricing structure should encourage efficient water allocation but not be too complex for users to understand. The prices should not be so steep as to prevent households from accessing water, but nonetheless provide disincentives to prevent wasteful use.

Revenues from water bills need to supplement appropriate public investment to provide sufficient financing. The cost of delivering water, maintaining the system and investing in future or replacement water infrastructure must be recovered to continue to deliver water to users. A steady revenue stream from water users (including industry, commercial businesses, farms and households) is necessary for the utility to maintain consistent service and delivery of safe, clean water. Underfinanced utilities cannot deliver reliable or safe drinking water to users.[47]

Water systems also must ensure that water service is priced fairly to ensure that all residents have access to water.[48] Water prices need to be equitably applied across all users, in part to make the system acceptable politically.[49] The pricing burden should not be borne disproportionately by the middle- and lower-income residents.[50]

While water prices should not pose an undue burden on lower-income households, price can still function as a part of a demand-management strategy. For example, it would be appropriate to charge high water fees on high-volume water users, since this water is above essential consumption and these households are assumed to be wealthy enough to bear higher costs.[51]

None of the water pricing regimes can balance all of these competing goals perfectly. Utilities have to strike balances and design rate structures that are appropriate to their local conditions and finances, and many utilities diverge from the idealized market-based pricing regimes

Comparison of Selected Water Rate Structures

	Water Rate Schedule	Price for 12,000 gallons	Price for 21,000 gallons	Price for 30,000 gallons
Increasing Block Rate	• $2 per 1,000 gallons for the first 12,000 gallons • $3 for every 1,000 gallons between 12,000 and 21,000 gallons • $7 for every 1,000 gallons over 21,000 gallons	$24 per month	$51 per month ($24 for the first 12,000 gallons and $27 for next 9,000 gallons)	$114 per month ($24 for the first 12,000 gallons, $27 for next 9,000 gallons, and $63 for the next 9,000 gallons)
Variable Unit Pricing	• Flat rate of $2 per 1,000 gallons if total household use is under 12,000 gallons • Flat rate of $3 per every 1,000 gallons if total household use is between 12,000 and 21,000 gallons • Flat rate of $7 per thousand gallons if total household use is over 21,000 gallons	$24 per month	$63 per month	$210 per month

to provide for social or environmental goods. Almost any water billing system will disadvantage some households. There are market advocates who suggest that some of these disadvantages could be fixed by tinkering with the billing schedules to address these inequities, or by offering subsidies to disadvantaged households. In reality, public investments, safety nets and common-sense regulations are necessary to achieve the multiple social goals for water that the marketplace cannot deliver.

Some common water pricing plans include:

Fixed fee: Fixed water rates charge each customer the same amount every billing period regardless of how much water they use. Fixed water rates provide no incentive to conserve, because each additional gallon is free.[52] Fixed rates are not uncommon in more rural unmetered utility districts.[53] Many smaller cities in California's Central Valley have unmetered water utilities.[54]

Two-part billing: A two-part water fee structure charges a flat service charge as well as a per-gallon rate for the water each household uses.[55] Most utilities include a fixed or service fee for each household that represents the base payment on the water bill that often includes metering, billing, customer service, some capital investments, connection fees or cost-of-service fees.[56] Often the fixed fee includes a basic volume of water. The per-gallon prices could be set by any of the volume-based pricing schedules (below). Two-part water schedules promote some conservation and provide basic water service at low cost to consumers.[57]

Uniform or flat volumetric rate: Uniform volumetric pricing systems charge the same price for every gallon. Household costs increase as water consumption rises, which encourages consumers to conserve water.[58] This deters wasteful, non-essential water use, but not as much as rate schedules that charge higher rates for larger levels of consumption.[59]

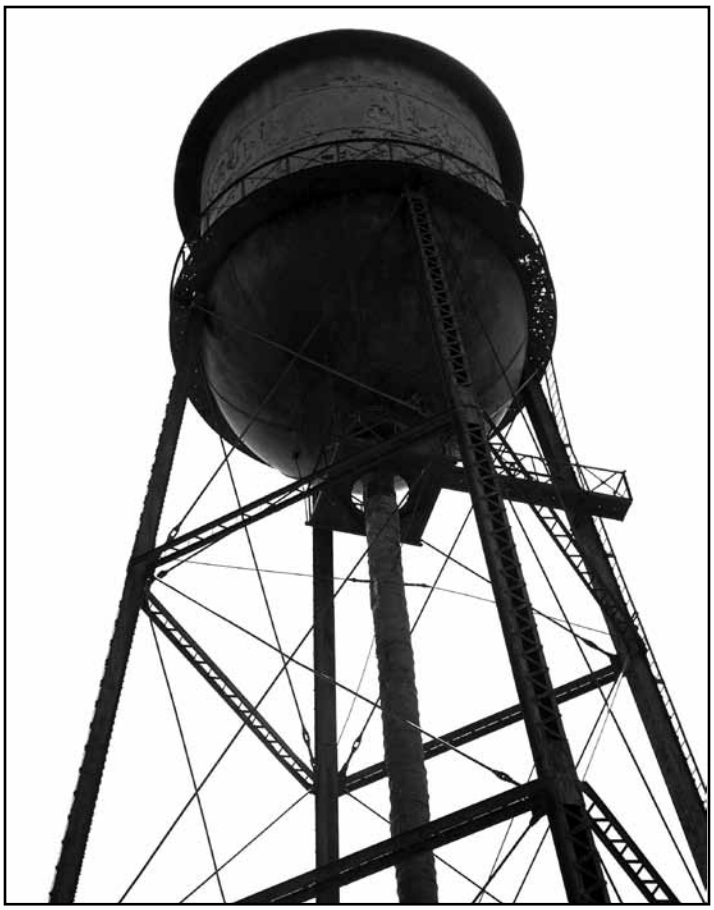
Increasing block rates: Increasing block rates charge progressively higher per-gallon prices at higher levels — or blocks — of water consumption. Water is priced based on a series of volume levels that each have a different, higher price.[60] Consumers might pay $2 per 1,000 gallons up to 12,000 gallons per month; pay $3 per 1,000 gallons between 12,000 gallons and 21,000 gallons of consumption; and $7 for every 1,000 gallons above 21,000 gallons (see chart). Increasing block rates can encourage conservation

and provide a basic level of affordable water since the most important water uses (like drinking and cooking) are priced the lowest and additional uses (like washing the car) are the most expensive.[61] Increasing block rates have become more common. In 1982, only 4 percent of U.S. water systems used increasing block rates, but by 2004, more than a third (36 percent) of water systems used increasing block rates.[62]

Although increasing block rates are favored by many economists, the complexity of increasing block rates make the prices very difficult for consumers to discern.[63] When consumers turn on the tap, they do not know which volume block they are using or how close they are to the threshold of the next block. That lack of knowledge makes the bill less predictable for households that are depending on a low water cost and also prevents the pricing from encouraging conservation. A user cannot react to economic incentives that are effectively hidden. Increasing block rates necessitate both a needlessly complex bill, which can be difficult for consumers to understand and for utilities to implement and administer. Setting the price and volume parameters for the basic block is vital to ensuring the system's fairness, but this can be difficult to establish.[64]

Increasing volume rates or variable unit pricing: Increasing rate schedules charge a single per-gallon price during each billing period, but the price is based on the total monthly household consumption. Unlike increasing block rates that charge different prices at different levels of consumption, increasing rate schedules charge higher water consuming households a higher rate for each gallon of consumption.[65] So a household using under 12,000 gallons might pay $2 per thousand gallons; a household using 21,000 gallons might pay $3 for every thousand gallons and a household using 30,000 gallons might pay $7 for every thousand gallons (see chart). The rising rates encourage conservation, the simple bills are easy to understand, and lower-volume users can access water at reasonable rates.[66]

Declining block rates: Declining block rates charge consumers lower prices at higher levels of consumption — sort of like giving consumers bulk discounts for using more water. In 2007, several American water systems still used household declining block rates, although the OECD reports no other industrialized countries with residential declining block rates.[67] Declining block rate structures provide disincentives to curb wasteful water use.



Increased Prices Do Not Significantly Reduce Household Water Use

Water pricing reform models work better in ivory towers than kitchen sinks. Consumers have not significantly reduced water use in response to higher water prices. Most household water use is for essential purposes like drinking, cooking, bathing and sanitation, so consumers cannot reduce water use when prices rise. The market-based pricing proponents assume that consumers will reduce their demand for water when its price increases. This process of adjusting demand and supply with prices is the cornerstone of market allocation of goods and services. This assumes that consumers could or would reduce their demand when prices rise or increase their demand when prices fall, a theory that works better for discretionary consumer goods like widgets than water.

Consumer demand for some essentials, like food and water, does not really change, regardless of price. Economists call this price inelasticity. Consumers will not drink twice as much water if the price of water falls by half, nor will they reduce the amount of water they drink by half if the price of water doubles.

Almost every study has found only a modest consumer response to rising water prices. Households generally reduce water use slightly in the face of even steep price increases. In the California droughts of the late 1980s and early 1990s, several communities hiked their water prices from 300 percent to 500 percent within only a few years and saw their water use decline between 20 and 33 percent.[68] The Alameda County Water District applied steeply increasing block rates that doubled, tripled and quadrupled prices for higher water blocks to curb water use during the drought. A 1999 study found that even more than quadrupling water prices had a relatively small effect on consumer demand, and residential water use declined by 16 percent.[69] These reductions are not insignificant, but they were achieved in conjunction with other demand-management strategies including public education campaigns and incentives for installing water-efficient appliances.

Other recent studies confirm the weak correlation between higher water prices and usage. A 2004 Delaware study found that water consumption (more than a tiny allowance of 110 gallons per day for essential water) would be reduced by 15 percent if water rates tripled.[70] A 2008 study of nearly 400 Texas communities that considered weather, income and other factors found that consumer demand for water was non-responsive to price increases and doubling water prices would only reduce water consumption by 13 percent.[71] Higher water prices have a greater impact on curtailing non-essential water use — like washing the car, watering the lawn or filling the swimming pool.[72]

The response to sharp increases in price can suppress water use by lower-income households without any appreciable reduction in water use by the upper-income households that are presumed to use more non-essential water like filling swimming pools. A study of the 1980s California drought found that doubling the price of water lowered total household use by a third, but it reduced water use by half for households earning under $20,000 while curtailing water use only by 11 percent for households earning more than $100,000.[73] These price increases that aim to conserve water may have the effect of making water too expensive for some households. The OECD has reported that water is becoming unaffordable for lower-income households even in industrialized countries.[74]

Residential Water Price Reforms Will Not Significantly Reduce Water Scarcity

Even if all the aspects of water pricing reform worked as advertised, it would barely reduce water scarcity. The water pricing reform model has targeted residential water users, who are a tiny share of total consumption. It would not matter if water behaved like widgets and consumers responded to higher water prices by curtailing use, because even steep reductions in total household water use would be barely a drop in the bucket.

Almost all of the studies promoting pricing-based water demand management focus exclusively on household consumption, but not on the large water users like industry, commercial businesses and agriculture. One study noted that the academic "study area of greatest concentration pertains to household demand for water in urbanized areas."[75] Some models explicitly "avoid introducing complications of non-urban uses of water, which have no material impact on pricing principles."[76] A Food & Water Watch review of academic and industry literature found that three quarters (76 percent) of the studies looked *only* at residential response to price, and an additional 12

percent focused on residential water use but included other, non-residential water users.[77]

Household water use is a small share of total water use, so any pricing reforms aimed at residential water users will not generate significant water savings, even if they reduced household water use to zero. Small efficiency gains in agricultural water use would dwarf potential savings from household water uses, and efficiency gains from industrial or commercial users may generate significant water savings without burdening lower-income households.

In the United States, household water use constitutes a tiny fraction of total water withdrawals, so any water savings would have little impact on scarcity. Domestic water use was 8 percent of freshwater withdrawals, compared to 40 percent for irrigation, livestock and aquaculture and 52 percent for industrial, commercial, mining and electric utilities in 2005, the latest data available.[78] This means that even a 5 percent increase in agricultural water efficiency could make enough water available to supply a quarter of America's residential consumers with water.

Most commercial water users and many industrial firms get their water from the same municipal utility networks as household users, but these corporate users are rarely included in the academic literature on water pricing reforms. Although businesses are expected to reduce costs and inefficiency, corporations routinely waste more water and discharge more pollution than is profitable.[79] But when prices increase, these firms have a significantly easier time increasing water efficiency than households do. The EPA estimates that industrial water users are about twice as responsive to price increases as households, reflecting a greater ability to squeeze wasteful water use out of industrial operations than out of kitchen faucets.[80] The American Water Works Association has reported that "conservation rates and other conservation programs have a greater effect on non-residential customers than residential customers."[81]

Applying water price reforms to industrial water use can generate significant water savings. A 2005 study of residential and non-residential (both industrial and commercial) water users in Spain found that non-residential users were 45 percent more responsive to rising water prices than households.[82] A 1999 American Water Works Association study found that raising industrial water prices by 9.4 percent reduced industrial water use by 34 percent, but that price increases did not reduce household water

use.[83] These non-residential consumers cut daily water use by 4.5 million gallons — more than three times the daily 1.4 million gallons reduced by residential consumers.[84]

Most water systems have different prices for different types of users, and households can even pay more per gallon than the largest industrial water users. Industrial, bulk water users are typically charged a higher base rate but a lower per-gallon price than household users are charged.[85] Some industrial consumers still pay declining block water rates with lower prices for higher volumes of water use, which provides no incentive to install more water-efficient equipment.[86]

In some places, beverage companies that compete for water resources with local communities are paying a tiny amount for access to giant volumes of municipal water. Coca-Cola's Dasani bottled water plant in Marietta, Georgia, pays a lower average price per gallon than neighboring residents (assuming the beverage plant is billed at the cheapest rate for the largest industrial intake meters). Marietta Power & Water charges the largest industrial users $1,080 for the first 300,000 gallons of water and then $3.57 for each additional 1,000 gallons.[87] The Dasani plant draws about 9.6 million gallons of water a month from the municipal water supply, costing about

It would be a mistake for local water utility managers to rely on the faulty promises of market-based pricing to address demand-management needs.

$34,300 per month for an average price 0.357¢ per-gallon.[88] The monthly bill for a single person who used 5,000 gallons a month would amount to $25.71, or an average price of 0.514¢ per gallon — 44 percent more than Coca-Cola pays per-gallon.

The commercial sector, especially the tourism industry, consumes significant volumes of water. America's 16,000 golf courses use about 5 billion gallons of water daily — more than the state of Texas pumps through all its water pipes every day.[89] Hotels also consume a large volume of water and a disproportionate share of all commercial water use. In Seattle, Washington, hotels represent about 1 percent of commercial water meters but use about 5 percent of the commercial water.[90] Nationwide, each hotel room can use up to 400 gallons of water a night, more than double the average individual water use of 180 gallons per day.[91] The least efficient hotel in Las Vegas uses nearly 1,000 gallons per room each day.[92] The high-volume industrial and commercial water users need water pricing reform more than households, both to increase fairness to smaller residential water users and to more effectively promote conservation in sectors that can wring water waste out of their operations.

Most analyses of water pricing structures also ignore agricultural water use and focus almost entirely on household water consumption. Most of the studies of agricultural water price reform models have focused on farmers in the developing world. In the United States, farmers generally pay for the cost of delivering the water to their crops and the cost of maintaining the irrigation network, but not the capital costs for the irrigation infrastructure.[93]

Theoretically, higher water prices should encourage farmers to adopt more efficient irrigation technology to reduce water use. But in the United States, farmers have not been considerably more responsive to increased water prices than have household consumers.[94] American farmers are unlikely to install better irrigation equipment because of higher price signals alone; farmers only adopt more efficient irrigation technology when it is appropriate for their farmland, their crop and their soil conditions.[95] A single, market-based policy tool like pricing is not an effective way to generate aggregate agricultural water savings.[96]

Conclusion: An Integrated Approach to Water Demand Management

While residential market-based water price reforms alone cannot significantly reduce water use or scarcity, improved water prices can be part of an integrated demand-management strategy. Better pricing schedules that reflect the true cost of water and encourage conservation by high-volume users should be a policy option in the toolbox to manage water demand, but not the only one. Fundamentally, demand-management strategies must apply to all water users, and a full range of appropriate policies should be tailored to the users.

In some cases, like with industrial and commercial water use or high-volume non-essential residential water use, certain pricing tools may be an effective option. Even when pricing policies will be used as a strategy to achieve appropriate social ends, such as water conservation, rigid adherence to market-based pricing should not be undertaken in a vacuum. Any pricing strategy, even as part of a broader range of demand-management policies, should be tailored to local conditions to best address the needs of the circumstances.[97] In many cases, water-use restrictions, incentives to install more water-efficient equipment or public education efforts may be much more effective.

Reducing total water waste and loss in municipal water systems is a key first step in combating water scarcity and reducing total water demand. The majority of America's water infrastructure was built just after World War II and is rapidly approaching the end of its productive life.[98] It costs more to deliver water through inefficient, leaky networks, and these older systems require more maintenance.[99] There are between 250,000 and 300,000 water main breaks a year in the United States, and leaks and main breaks spill an estimated 1.2 trillion gallons a year — amounting to as much as a fifth of municipal water use.[100] One reason America's water infrastructure is in such disrepair is a lack of federal funding. A federal Clean Water Trust Fund, similar to the program that provides funding for highways, would provide a guaranteed source

of funding for replacing and repairing these public infrastructure systems.

Historically, water utilities have not used price to reduce household water demand. Pricing strategies are negative incentives to deter wasting water, but governments and utilities can also utilize positive incentives to encourage conservation or quotas to restrict water use. Many utilities and local governments favor policies that do not rely on price as the primary tool to manage demand because of the potential negative impact raising prices can have on lower-income households.[101]

Theoretically, either a quota or a positive or negative incentive can be used to achieve the same water-saving outcome. For example, to encourage households to reduce their outdoor water use, governments could subsidize the purchase of rain barrels to collect water for lawn watering (a positive incentive), implement water pricing schedules with higher prices for higher levels of water use to encourage less water-intensive landscaping (a negative incentive), or establish a water quota by implementing a rotation lawn watering system that allows households to water their lawns only on certain days or certain hours.[102]

Positive incentives to adopt more efficient water fixtures, appliances and equipment can generate significant water savings. Many cities and water utility districts have mandated the use of low-flow water fixtures in new construction or provided rebates or other subsidies for homeowners to refit their homes with water-conserving upgrades.[103] Installing low-flow water fixtures (shower heads, toilets and washing machines) can reduce daily household water use by about a third, from 74 gallons to 52 gallons.[104] In California during the late 1980s drought, local programs to distribute low-flow fixtures, toilet tank displacement devices and dye tablets for toilet leak detection reduced water use by about 9 percent.[105]

The most basic positive incentives involve public education campaigns. The Institute for Water Education has reported that these efforts "have yielded considerable reductions in water use and pollution."[106] Public education and awareness efforts have included mailings to customers, community education workshops, public service announcements and leak detection programs for homeowners.[107] In California, these public education campaigns reduced residential consumption by about 8 percent.[108]

Water-use restrictions can effectively curb wasteful water use, especially non-essential water uses like watering lawns, washing cars and filling swimming pools. During the California drought, restrictions on washing sidewalks and driveways and prohibiting lawn- and landscape-watering during the hottest part of the day reduced total municipal water consumption by more than a quarter (about 29 percent).[109]

None of these policies can or should exist in a vacuum. Conservation technologies, effective public awareness campaigns, water restrictions and more effective pricing can work in combination better than they can work alone. Together, better water pricing and water-use restrictions can conserve more water than higher prices alone.[110]

It would be a mistake for local water utility managers to rely on the faulty promises of market-based pricing to address demand-management needs. Instead, U.S. localities should utilize the full range of policy alternatives available and tailored for local conditions. Any water rate system should seek to be equitable to all users, so that the burden of reducing demand does not fall disproportionately on any group of residents. Broad-based funding — encompassing fair pricing, grants, bonds and other public revenue streams — should be used in conjunction with strategies that encourage efficiency and conservation. No single strategy is sufficient, but used together, all can play an important role in a well-run water management system.

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