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## The Value of Water

### Executive Summary

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- Americans are not accustomed to paying, and have been largely unaware of, the true cost of treating and delivering clean, safe water to their taps. Americans pay less for water – about a penny per gallon on average – than do residents of most other developed nations. Water is also typically the lowest percentage utility cost per household, less than gas/oil, telephone and electricity.
  - The historic under-pricing of water is largely due to a perception that water is “free” – a fundamental human need supplied by the earth itself. The vast infrastructure required to treat and deliver that water where it is needed, however, is far from free.
  - An historic lack of investment in infrastructure has left the nation’s vast network of water systems in serious disrepair, warranting a D- grade from the American Society of Civil Engineers. Every two minutes a significant water line ruptures in the U.S., resulting in trillions of gallons water wasted annually and severe economic losses to businesses.
  - The price tag to bring water and wastewater systems up to date is projected to be close to \$1 trillion over the next 20 years – a cost that consumers will have to share.
  - Because the majority of water funding comes from revenues generated by pricing, it will take a major shift, then, in the way water is priced if the U.S. is to continue to meet its infrastructure needs.
  - There are encouraging signs of acceptance of this new water reality. Recent surveys point to changing perceptions of water’s worth among consumers and industry alike, as both grow increasingly aware of its critical role in every aspect of life. In addition, U.S. municipal water prices have been rising at a rate faster than the overall cost of living since 2007. This helps pave the way for rate structures that reflect the true cost of water treatment and delivery.
  - Full-cost pricing will not only help water utilities continue to provide customers with safe and clean water but will have the added benefit of encouraging more conservative use, ensuring a sustainable supply for future generations.
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### Introduction

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Water is necessary to life itself. Much as the human body relies on water to survive, virtually every aspect of society depends on water in order to function. Without it, there would be no fire protection, no agriculture, no **manufacturing, and** no power grid. (Yet this most precious resource is too easily undervalued, particularly in the U.S., where 300 million Americans are accustomed to paying as little as a penny a gallon for clean, safe water from the tap.<sup>1</sup>

The historic under-pricing of water is largely due to a perception that water is “free” – a fundamental human need supplied by the earth itself. The vast infrastructure required to treat and deliver that water where it is needed, however, is far from free. In fact, the cleaning and delivery of water is three times more capital intensive to provide than any other utility, yet it is typically the least expensive of Americans’ monthly utility bills.<sup>2</sup>

This has created an increasingly unsustainable scenario, as a growing population puts stress on the available water supply and the aging infrastructure the nation relies on. Across the country, water systems – and their customers – are enduring the ramifications of underinvestment and, consequently, poor maintenance. It is estimated that every two minutes a significant water line ruptures somewhere in the U.S.,<sup>3</sup> leading not only to trillions of gallons of water wasted annually, but severe economic losses as well. In the summer of 2011, for instance, the rupture of a century-old water main in The Bronx disrupted the morning commute, damaged two gas mains, shut down electrical service to 500 customers for several days,<sup>4</sup> and put as many as 60 local businesses at risk of permanently closing.<sup>5</sup>

Until it is priced in a way that encourages wise use, reflects the true cost of delivering it, and allows for adequate replacement of that infrastructure, Americans will continue to take water for granted, and the infrastructure that makes it so easy for them to do so will continue to deteriorate.

### Taking Water for Granted

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Only three percent of the drinking-quality water that is delivered to American homes is used for drinking on a typical day, while the vast majority of it goes to watering lawns and gardens, washing clothes and dishes, bathing, flushing and other uses.<sup>6</sup> Yet, the average household pays only about \$523 for a year’s worth of water and wastewater service – covering all of these uses – compared to \$707 just for the soft drinks and other beverages they consume.<sup>7</sup> In addition, water and wastewater service is typically the lowest percentage utility cost per household, at an average of 12 percent, compared to gas/oil at 18 percent, telephone at 33 percent and electricity at 37 percent.<sup>8</sup> It is no wonder, then, that most Americans fail to understand the true value of water.

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<sup>1</sup> LeChevallier, Mark. American Water, Water Science and Research Division Chair. Personal Interview. 14 August 2007.

<sup>2</sup> AUS Utility Reports – 2008

<sup>3</sup> Duhigg, Charles. “Saving U.S. Water and Sewer Systems Would be Costly,” The New York Times. 14 March 2010. <http://www.nytimes.com/2010/03/15/us/15water.html>

<sup>4</sup> Ember, Sydney, “Flooding in Bronx After Water Main Breaks,” The New York Times. 27 July 2007. <http://cityroom.blogs.nytimes.com/2011/07/27/jerome-ave-becomes-river-after-a-water-main-bursts/>

<sup>5</sup> Paddock, Bary. “Owners of 60 Bronx Businesses Face Going Broke in Wake of Water Main Break,” New York Daily News. 29 July 2011. [http://articles.nydailynews.com/2011-07-29/local/29844261\\_1\\_flood-zone-business-owners-giant-water](http://articles.nydailynews.com/2011-07-29/local/29844261_1_flood-zone-business-owners-giant-water)

<sup>6</sup> “Only Tap Water Delivers,” the American Water Works Association.

<http://drinktap.org/consumerdnn/Portals/0/pdf/ConsumerSheet%20-%20Quality%20of%20Life.pdf>

<sup>7</sup> <http://water.epa.gov/infrastructure/sustain/Water-and-Wastewater-Pricing-Introduction.cfm>

<sup>8</sup> 2004 Bureau of Labor Statistics; Assumes four person household.

For many Americans, bottled water is perceived to have a greater value than tap – a result of successful marketing strategies and a price tag that, depending on the brand, is 250 to 10,000 more expensive than tap.<sup>9</sup> Sales of bottled water tripled from the 1990s to the 2000s,<sup>10</sup> despite the reality that 25 to 40 percent of bottled water sold in the U.S. is from municipal sources; in other words, tap water in a bottle.<sup>11</sup> What's more, the 60 to 75 percent of bottled water that is not sourced from tap has a potentially bigger downside: FDA standards regulating bottled water are far less rigorous than those set by the EPA, which governs tap water.<sup>12</sup>

According to a 2010 survey of American voters by ITT Corporation, 69 percent admit that they take access to clean water for granted. At the same time, 95 percent believe water is the most important service they receive, ahead of electricity, heat, the internet and cell phone service. (See Figure 1.) As many as 80 percent support water infrastructure reform, 29 percent believe the system is approaching crisis stage, and 63 percent say they are willing to pay more on their water bills to address the nation's infrastructure needs.<sup>13</sup>

Requests by water utilities for rate increases, meanwhile, continue to be met by strong political and public opposition in communities across America – a scenario that begs the question: when their pens shift from a survey form to their checkbooks, are Americans prepared to pay more for their water?

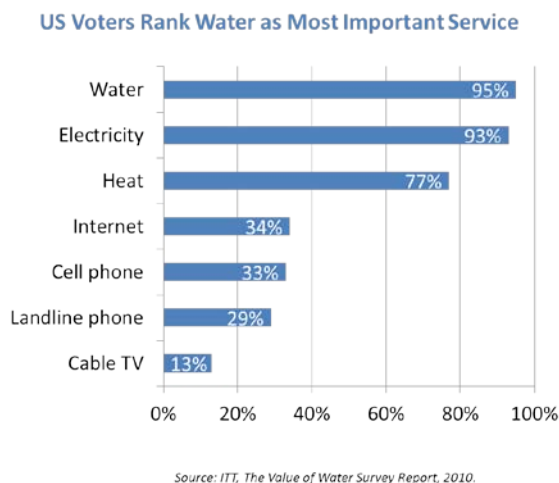


Figure 1

### A Historical Perspective

An early example of assigning value to water dates back to 13<sup>th</sup>-century London, when the city developed a system of 12 conduits to deliver water from springs to cisterns and, ultimately, to storage facilities that would dispense the water by tap. By the early 14<sup>th</sup> century, local businesses and residents were charged for the water they used from the system, which was hand-delivered to them, thus giving it value. Two centuries later, a more extensive water system was funded by the king and 29 other investors. As the costs of building the infrastructure far exceeded revenues from the sale of the water it conveyed, it took 20 years to return the initial investment.

This story, as outlined in *Water Efficiency, The Journal for Water Resource Management*, illustrates a model that has changed little over the centuries, as “water remains the most capital-intensive utility business in which to operate” today.<sup>14</sup>

### From Source to Tap

The water infrastructure system is deceptively straightforward. From source to tap, water travels through three main channels: the pumping station, the treatment facility and the distribution

<sup>9</sup> Standage, Tom. “Bad to the Last Drop.” *The New York Times*. 1 August 2005.

<sup>10</sup> Carpenter, Traci E. “Water Down the Drain.” *Newsweek*. 23 August 2005.

<sup>11</sup> Mascha, Michael. “Bottled Water vs. Tap Water in the News.” *Fine Waters – The Water Connoisseur*, June 2005. [http://www.finewaters.com/Newsletter/June\\_2005/Bottled?Water?vs.?Tap?Water?in?the?News.asp](http://www.finewaters.com/Newsletter/June_2005/Bottled?Water?vs.?Tap?Water?in?the?News.asp)

<sup>12</sup> Pollick, Michael. “Is Bottled Water Bad for the Environment?” 20007. <http://www.wisegeek.com/is-bottled-water-bad-for-the-environment.htm>

<sup>13</sup> “Value of Water Survey,” ITT Corporation, 2010. <http://www.itt.com/valueofwater/>

<sup>14</sup> Hill, Trevor and G. Symmonds. “Why Do We Pay for Water?” *Water Efficiency: The Journal for Water Resource Management*, July-August 2011. <http://www.waterefficiency.net/july-august-2011/pay-for-water.aspx>

system.<sup>15</sup> The **pumping station** serves two primary purposes. The first is to extract raw (untreated) water from a source – whether an underground aquifer, river or reservoir – and deliver it through the use of pressure to a treatment facility. The second is to transport the water from the treatment facility to the distribution system that ultimately delivers the water to your home. Usually situated above ground, the pumping station moves water 24 hours a day using large pumps, pipes and a power source to drive the pumps. Its sophisticated equipment requires regular maintenance and upgrades.

After raw water is pumped from its source, it is sent to a **treatment facility**. This is where water is tested for quality and contaminants and treated to meet or exceed the levels of purity and quality set by the EPA. Impurities and excess minerals are removed through a combination of chemicals, a progression of filtration screens, and ultraviolet light. Water for drinking is obviously held to the highest quality standards, while “grey” water used in manufacturing processes may require fewer treatment steps. Treatment facilities must keep pace with increasingly stringent EPA regulations, and the introduction of new contaminants into the water supply, in order to meet the specific consumption and quality needs of the communities they serve.

The treated water then enters the **distribution system**<sup>16</sup> – the network of pipes that delivers water across vast expanses to homes, businesses, farms, industrial plants and a multitude of other destinations. Laid end to end, this network would stretch 700,000 miles -- more than four times the length of the National Highway System.<sup>17</sup> In order to ensure that adequate water is delivered where it needs to go, engineers run computer simulations of the hydraulic activity of the water to determine proper pressure, pipe sizing and other factors (a fire hydrant, for example, will require high levels of pressure and larger piping than will water for residential use).

Electricity is one of the largest recurring costs involved in all three channels of the water delivery system. Another significant expense is the building, replacing and upgrading of facilities and pipes. Yet another: employing the hydrologists, engineers (civil, chemical and electrical) and computer programmers who design, monitor and protect our water systems both from everyday equipment failures and the rare but real risks of catastrophe -- whether water-borne epidemic or terrorist attack.

### **The State of the Infrastructure**

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The American Society of Civil Engineers has rated the state of U.S. water and wastewater systems a D-minus in its 2009 Report Card on Infrastructure.<sup>18</sup> In many cases, pipes intended to survive 50 to 75 years have been in service for more than 100 years.<sup>19</sup> At least three states – South Dakota, Alaska and Pennsylvania – in some areas still use water mains made of wood.<sup>20</sup>

Due to their low rate of replacement, broken and leaking pipes currently result in 1.7 trillion gallons of water (\$2.6 billion) wasted every year – water that can scarce afford to be lost, especially as demand from a growing population is expected to result in water shortages in as

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<sup>15</sup> For the purposes of this paper, the discussion on infrastructure will center on supply water and not other water services such as wastewater management or stormwater runoff systems.

<sup>16</sup> In some cases, water will first enter a storage facility or reservoir so that it can be supplied when demand exceeds pumping capabilities.

<sup>17</sup> “Straight Talk on Water Infrastructure,” The American Water Works Association.

<http://www.drinktap.org/consumerdnn/Default.aspx?tabid=198>

<sup>18</sup> American Society of Civil Engineers 2009 Report Card on Infrastructure. <http://www.infrastructurereportcard.org/factsheet/drinking-water>

<sup>19</sup> “Value of Water Survey.”

<sup>20</sup> “Value of Water Survey.”

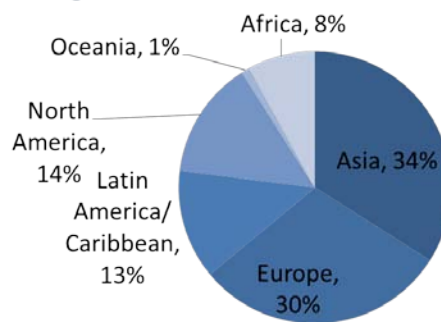
many as 36 U.S. states by 2013.<sup>21</sup> To bring water and wastewater systems up to date will require a projected \$1 trillion investment over the next 20 years,<sup>22</sup> a price tag that will necessarily be shared by the consumer.

According to the ITT survey, the majority of Americans are prepared for the reality of higher water costs. Of the 63 percent of participants who responded that they would be willing to pay more for water service, as many as 67 percent would be willing to pay about \$6.20 more per month (an average 11-percent increase) on their water bills to upgrade the nation's system. That additional investment alone, by only the 63 percent who indicated they would be willing to pay it, would add more than \$5 billion per year to U.S. infrastructure investment.<sup>23</sup> Unfortunately, even with that added investment, a significant gap in needed funding would still remain.

To create a sustainable infrastructure will also require a greater investment in brainpower. In yet another sign of the undervaluing of water in the U.S., the United Nations reports that of the 3,873 institutes worldwide that offer higher education courses on water-related subjects, only 14% are located in North America.<sup>24</sup> (See Figure 2.)

**Institutes offering water-related courses**

World distribution of the 3,873 institutes offering higher education courses on water-related subjects



Source: UN World Water Development Report, from International Association of Universities, 2002. World Higher Education Database 2001/2

**Figure 2**

**Full-Cost Pricing**

As a percentage of household income, the U.S. Environmental Protection Agency reports that U.S. residents pay less for water and wastewater services than most other developed countries.<sup>25</sup> The Executive Summary of the World Water Development Report made a similar finding in 2001, ranking the U.S. fourth lowest in water pricing per cubic meter among developed nations.<sup>26</sup> (See Figure 3.)

Because the majority of water funding comes from revenues generated by pricing, it will take a major shift, then, in the way water is priced if the U.S. is to continue to meet its infrastructure needs. Water pricing must be restructured to cover the full costs of treatment and delivery to consumers, including expenses related to building, operating and maintaining and replacing water systems – in other words, its true value.<sup>27</sup>

The need for full-cost pricing was also underscored in The Johnson Foundation at Wingspread's *Charting New Waters: A Call to Action*

**Water Pricing in Developed Countries**

Country	\$/cubic meter
Germany	\$1.91
Denmark	\$1.64
Belgium	\$1.54
Netherlands	\$1.25
France	\$1.23
UK - Great Britain & N. Ireland	\$1.18
Italy	\$0.76
Finland	\$0.69
Ireland	\$0.63
Sweden	\$0.58
Spain	\$0.57
United States	\$0.51
Australia	\$0.50
South Africa	\$0.47
Canada	\$0.40

Source: UN World Water Development Report. Extracted from Summary of the World Water Development Report. Water

**Figure 3**

<sup>21</sup> "Value of Water Survey."

<sup>22</sup> <http://win-water.org/reports/winow.pdf>

<sup>23</sup> "Value of Water Survey," ITT Corporation, 2010. <http://www.itt.com/valueofwater/>

<sup>24</sup> "Valuing Water," UN World Water Development Report.

[http://www.unesco.org/water/wwa/facts\\_figures/valuing\\_water.shtml](http://www.unesco.org/water/wwa/facts_figures/valuing_water.shtml)

<sup>25</sup> <http://water.epa.gov/infrastructure/sustain/Water-and-Wastewater-Pricing-Introduction.cfm>

<sup>26</sup> "Executive Summary of the World Water Development Report," Watertech online, 2001.

<sup>27</sup> <http://water.epa.gov/infrastructure/sustain/fullcostpricing.cfm>



*to Address U.S. Freshwater Challenges*<sup>28</sup> – the result of a two-year collaboration of U.S. businesses, farmers, environmental not-for-profits and government agencies to explore solutions to an impending freshwater crisis. “For too long, our society has treated water as a cheap, non-strategic and infinitely available resource. Not anymore,” said S. Curtis Johnson, chairman of Diversey Inc and a co-signer of the call to action. “Threats to water quality and access are putting our businesses, communities and way of life in jeopardy. The time to act is now.”<sup>29</sup>

Stressing that reliable freshwater supplies are essential to U.S. economic security, the report called for, among other actions, a better accounting of the full cost of services delivered by municipal water and wastewater utilities and the sharing of that information with consumers. “Revised pricing structures that more accurately reflect the full cost of services could be one step toward financing badly needed upgrades to U.S. water and wastewater systems.”<sup>30</sup>

### Signs of Change

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Recent surveys point to changing perceptions of water’s worth among consumers and industry alike, as both grow increasingly aware of its critical role in every aspect of life, not to mention increasingly concerned about its future availability. A March 28, 2011 Gallup Poll found that Americans are more worried about water than any other environmental issue. In fact, water-related concerns accounted for the top four of the nine issues polled, while global warming ranked last. At least three in four Americans surveyed reported they worry a “great deal/fair amount” about contamination of soil and water by toxic waste (79 percent); pollution of rivers, lakes and reservoirs (79 percent); pollution of drinking water (77 percent); and maintenance of the nation’s supply of fresh water for household needs (75 percent).<sup>31</sup>

Similarly, a survey of 700 U.S. utility leaders revealed a growing awareness of the nexus of water and energy issues within the energy industry; in other words, the fact that large amounts of electricity are required to acquire and process water, and large quantities of water are needed to produce electricity. For the first time in the five years of the Black & Veatch survey, water supply was the top environmental concern among all participants and water management was rated as the “game changer” business issue that could have the greatest impact on the utility industry.<sup>32</sup> The message was clear: if the nation is to meet its water and electricity needs, a new approach is needed.

In addition, recent rises in municipal water rates are creating an opportunity for investor-owned utilities, too, to seek higher rates. Since 2007, city water prices have risen at a rate faster than the overall cost of living. Nationally, average water and sewer rates posted a year-to-year percentage change of 6.8 percent in 2010 compared to a Consumer Price Index of 1.5 percent.<sup>33</sup> The Cleveland Water Department announced in March 2011 that it is seeking to raise its rates 82 percent over the next four and a half years, while rates for suburban users in Lancaster, Pennsylvania were set to increase 65 percent as of June 2011.

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<sup>28</sup> “Charting New Waters: A Call to Action to Address U.S. Freshwater Challenges,” The Johnson Foundation at Wingspread. <http://www.johnsonfdn.org/chartingnewwaters>

<sup>29</sup> “Nation Urged to Take Action to Head Off Looming Freshwater Crisis.” Press release. <http://www.johnsonfdn.org/sites/default/files/charting-new-waters/charting-new-waters-press-release.pdf>

<sup>30</sup> “Nation Urged To Take Action” press release.

<sup>31</sup> <http://www.gallup.com/poll/146810/water-issues-worry-americans-global-warming-least.aspx>

<sup>32</sup> “Strategic Directions in the Electric Utility Industry,” 2011 survey by Black & Veatch.

<http://www.bv.com/electricutilitytrends/#Insight5>

<sup>33</sup> Bureau of Labor Statistics

### Conclusion

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In the words of Ralph Waldo Emerson, “Nature never gives anything to anyone; everything is sold. It is only through the abstraction of ideals that choice comes without consequences.” The choice throughout history to under-price the treatment and delivery of clean, safe water to American households has resulted in a perception that this vital resource is both plentiful and cheap. As a consequence, the nation has developed excessive consumption habits that have put a serious strain on the available water supply as well as the system that delivers it. At the same time, illustrating the real-life consequences of ignoring the adage “an ounce of prevention is worth a pound of cure,” a historic lack of infrastructure investment across all levels of government has left the nation’s water systems in a serious state of disrepair, just as the nation finds itself in the midst of a financial crisis that leaves it ill-equipped to pay the mounting price tag,

There are encouraging signs that the tide is turning, evidenced by a recent wave of infrastructure stories in the national media, the introduction of bipartisan legislation (the Sustainable Water Infrastructure Investment Act of 2011) that would free up billions of private capital dollars for investment in the nation’s water infrastructure; and a call for water infrastructure investment by the U.S. Conference of Mayors.

Water utilities, for their part, must continue to communicate the value message to their customers in order to pave the way to rate structures that reflect the true cost of water treatment and delivery. Full-cost pricing will not only help water utilities continue to provide customers with safe and clean water but will have the added benefit of encouraging more conservative use, ensuring a sustainable supply for future generations.