What is the value of water? It turns out that the answer to that question is not straightforward. While the element water - two hydrogen atoms attached to one oxygen atom - is simple, water as a resource is highly complex and filled with contradictions. Water is abundant yet scarce; priceless yet “free,” life-sustaining yet if contaminated, life-threatening.

In 2010, the United Nations declared water and sanitation to be a human right alongside other rights such as recognition and equality before the law or life, liberty and security of person. The General Assembly “expressed deep concern that some 884 million people were without access to safe drinking water;” and “expressed alarm that 1.5 million children under five years old died each year as a result of water- and sanitation-related diseases.” The UN adopted the resolution in part because access to clean water is an important component to realizing other human rights. From the cellular level to the international level, water is essential.

In the developing world, lack of access to clean water causes disease, hinders human development and can cause international conflict. The modern technologies that define the developed world often cannot overcome a lack of access to clean water, and the very advancement of technology and quality of life often soaks up more and more water.

Businesses are increasingly looking to water issues as the potential costs of adaptation rise and threaten profitability. As articulated by BSR, a global business network and consultancy focused on sustainability, climate change will “test companies’ ability to effectively deliver high-quality products and services.” Extreme weather, rising energy costs and the price of adaptation pressure thin profits and compel CEOs to address water and resource issues head-on.

Social and private sector leaders are seeking common ground on water issues, in part because water is so intertwined with both human life and business success. But what is the right model to think about water, to value the vital importance of water and manage it better?

An Economic Model, a Social Model, or Both?

To practically address the needs of a growing population, some have turned to economic models. Valuing water as an “economic good” would allow for market efficiencies, and encourage conservation. It would reward innovation around cleaning, moving and accessing water. Such an approach was the cornerstone of the City of Los Angeles’ water conservation ordinance discouraging waste by expanding and penalizing prohibited uses of water, including “doubling existing fines for residential customers from $50 for a first offense to $100 and quadrupling existing fines from $50 to $200 for a first offense for large customers, including businesses.”

— Thomas Fuller

We never know the worth of water till the well is dry.

Gnomologia, 1732
However, in 2003, the United Nations asserted that “Water should be treated as a social and cultural good, and not primarily as an economic commodity.” Because it is essential for life, water is often qualified instead as a “merit good,” or something that people should be encouraged and allowed to consume, a good that enables great benefits for a relatively low cost.

The discerning policymaker or global leader is then tasked with defining a value of water that balances critical competing interests in a just and productive way. What is the policy approach that will optimize opportunity for people, local communities, nations and business? How can thinking differently about water and “water productivity” illuminate new mutually beneficial solutions?

Innovative policy can spring from shifting the basic conversation about water in the first place. Societies undervalue water when they see it as a commodity to be delivered for free. On the other hand, people and businesses alike understand and invest in public health, sanitation infrastructure and wastewater treatment as essential goods to ensure and improve the quality of life. Societies are more likely to understand that water has value because of the safety and health benefits of reliable access and treatment. Simply put, the same stakeholders that may balk at placing a value on a “free” liquid, can also clearly define the value of investing in the systems needed to deliver and process that liquid to improve safety, health and productivity.

The current debate about water use and water rights applies 20th century perspectives on a uniquely 21st century problem of water shortage. As author Charles Fishman recently said, “The golden age of water is rapidly coming to an end. The last century has conditioned us to think that water is naturally abundant, safe, and cheap — that it should be, that it will be. We’re in for a rude shock.” Traditionally, businesses think about resources to be exploited for gain; environmentalists think about resources to be protected. A new way of thinking can define the water resource and bring about an explosion in water productivity.

The developed world has climbed the slope of productivity for decades, squeezing out more value from individual workers and technology. Debt and increased work-hours have powered many recent gains in developed-world economic growth. These productivity gains were achieved in a world of abundant water. But how will productivity increase further in a water-constrained world? Water offers a new frontier for forward-thinking scientists, business leaders, policy-makers and individuals to increase productivity and improve human prosperity.

At the same time, hundreds of millions of people in the developing world lack the water access to move out of poverty. As articulated by the United Nations, “safe, clean, accessible and affordable drinking water” is integral to realizing all human rights.

The agriculture industry has made a science of “water productivity,” and offers an instructive place to begin an analysis. In large part due to improved crop yields, the total productivity of water in agriculture improved by at least 100% between 1961 and 2001. Because agriculture accounts for about 70 percent of world water use, the industry has had the strongest incentive and greatest impact. In the pages that follow, we will examine how thinking differently about water can benefit individuals, communities, nations and businesses.
Thinking Differently About Water: Part II  The Value of Water

The Value of Water for the Individual

In striving for just and equitable water policy, decision-makers must consider the negative impacts on individuals in the developed and developing world when water is valued far below its actual human worth. As accustomed as individuals in the developed world are to abundant, drinkable water available from any tap, the mere concept of defining a value for water seems as nonsensical as defining the cost of air. It only takes a close look at ordinary consumer behavior though to put that assumption to rest. The average U.S. water bill at home is $34 a month. So for what we thoughtlessly spend on a few gulps of water at 7-Eleven, we get a day’s water at home — 300 gallons, for everything from bathing to cooking. One dollar a day.” 10 Clearly, even consumers in the developed world assign a monetary value to water, a value that scales according to context, need and experience.

By that same token, allowing supply and demand dynamics to assign a value to water swings too far toward the other extreme, reducing water to an economic rather than a social good, and potentially compounding the hardship of people in the developing world already suffering from extreme water insecurity. The human variable must remain central to solving the water equation. Alleviating need and increasing dignity is the strategic imperative for policymakers looking to achieve an equitable solution to any limited social good, especially water. Ironically, however, doing that means assessing the true value of water in human terms, according to the real value placed on it by people in the developing world. Often that value is defined by human experience: walking and carrying water for miles, waiting for hours for unreliable sources, ultimately being uncertain about the safety of the water and lacking any resource to sterilize it. As stated so eloquently by Wesley Laîné, Program Manager for International Action, “life without clean water is humiliating, embarrassing, and painful—in every sense of the word.” 11

But can that individual experience translate into an objective valuation of water that can actually improve its equitable distribution and foster innovation? Charles Fishman thinks it can, citing the example of Delhi’s Rangpuri Pahadi neighborhood, where residents living on $3 a day successfully funded their own miniature well system, collecting money, building storage tanks, and laying pipes to their homes.

“Those who want water pay about one day’s wages a month, and the residents are thrilled. Their “upstart utility” gets them better water than the public standpipe, it comes on schedule, it liberates them to have jobs, liberates their kids to go to school. They pay the equivalent, for a U.S. family, of $150 a month for water. And they did it themselves.” 12

This example clearly demonstrates an important principal: water with an economic value that does not reflect its social value exacerbates the problems of scarcity. Water innovation cannot be funded when water is “free.” Even in the developing world, people suffering from severe water scarcity will assign a real value to water that is proportional to their resources, and the increase in value an improved existence delivers.

From that perspective, policymakers can approach the question of water in much the same way we approach the question of land as a society. Yes, it can have an economic value, but as societies we have developed all kinds of alternative valuation models that go beyond supply and demand alone. Individuals in communities think nothing of reserving land for family or household use. When water carries a value proportional to its value to the individual, it is easy to imagine incentives for households to invest in home treatment or rainwater storage systems as naturally as they invest in a backyard or a commons.

The Local Value of Water

Water that is valued below its actual benefit to human life can heighten individual suffering and water insecurity. How much more, then, must it affect entire communities? Arguably, any social good with a value so artificially low that supply is essentially unlimited creates imbalance from accelerated use. Consider free parking, as an analogy. If all parking spaces carried a value proportional to its value to the individual, it is easy to imagine incentives for households to invest in home treatment or rainwater storage systems as naturally as they invest in a backyard or a commons.
congestion and improving land use. Instead, many municipalities have developed around a presumption of minimum parking requirements that have worsened sprawl and created disincentives to transit innovation through what amounts to a free parking subsidy weighing in at least $127 billion per year.13

There are real consequences at the local level to “valueless” water. Improper valuation can lead to ineffective management and inequitable distribution that ripples through villages, towns and cities. Ceres, an environmental research and sustainability group, 24/7 Wall St, and the National Resources Defense Council declare that 10 of America’s biggest cities are in severe danger of water shortages in the relatively near future. The top three cities in danger are:

- Los Angeles, California, via hundreds of miles of aqueducts, the fastest growing city in the United States, Los Angeles relies on bringing in water from the Colorado River;
- Houston, Texas, located in a high drought area, draws its municipal water from nearby Lake Houston and Lake Conroe; and
- Phoenix, Arizona—adopting an aggressive campaign to recycle water, replenish groundwater and discourage over-consumption.14

But the effects of ineffective water management are felt around the world, in communities far smaller and with far less developed – or even nonexistent – water infrastructure. Often the local community is best defined, and its problems best addressed, not by socio-political boundaries, but by the natural divisions of the watershed itself. Consider rural Ethiopia, where long-term drought and changing water tables have resulted in pervasive food insecurity and degraded livelihoods. In 2001, Catholic Relief Services opted for an Integrated Watershed Management (IWM) Program to address these problems in three communities, instituting a number of agricultural, sanitation and credit interventions including the multiple uses of water to better manage irrigation and domestic water supplies for both human and livestock use. These integrated programs carried an economic cost, ranging from roughly $300,000 to $975,000 in each village, but delivered a measurable human return on that investment. Although small-scale irrigation improvements reached only a small portion of the watershed households (between 11 and 20 percent), irrigation farmers began to reap significantly higher incomes than dry-land farmers (by 2-3 times). The IWM Projects resulted in one to three months increased food availability through improved crop production, and the majority of households (60 to 98 percent) reported an improvement in their overall living condition, and more than 90 percent of respondents in all three watersheds reporting that “women had more voice in community decision-making and in participation in community affairs as a result of the project.”15 Once again, the value of water at the local level is demonstrated most clearly in human experience and not economic terms alone.

Defining the local value of water, therefore, is an economy that includes the human factor in its equation, embracing water innovation as an essential part of delivering an improved community experience. Again, we are used to thinking of public goods like land as having an economic value that reflects shared human experience. That is the basis of city parks and
neighborhood playgrounds: a publicly valued good that represents a shared investment benefiting all. Imagine the improvements that could come from communities embracing the same analysis for their water supply. Local policymakers adopting a “public parks” approach to water could affect innovation in communities large and small: from new developments built with ponds to recharge rainwater before returning it to the aquifer, to massive multi-year river restoration projects, like the Hudson River clean-up, impacting property values, recreational tourism and fisheries. This approach to defining a local value for water can foster innovation at the community level, like H20 for Life which connects schools in the United States with schools in developing countries to share capital and exchange best practices in water innovation over long-term relationships.

Already, large water-challenged communities in the U.S. are improving community life and reaping important resource management benefits from assigning a value to water. Orange County, Florida has long been mandating the use of purified wastewater for landscaping in all new construction. The amount of wastewater cleaned and pumped back to residents is almost equal to the amount of potable water, allowing the population to double without having to double the amount of potable water delivered. Similarly, by outlawing front lawns, paying residents $40,000/acre to remove grass, and recycling 94 percent of all indoor water back to Lake Mead, Las Vegas, Nevada consumes as much water as it did ten years ago, even while its population grew by 50 percent during that time.

The National Value of Water

Clearly, by assigning a new value to water the private sector has more incentive to innovate new solutions that makes growth possible amid resource constraints. That is no less true for countries than it is for cities and villages. Consider the fact that the U.S uses less water now than it did 30 years ago, when total use was 440 billion gallons a day. We use less water to produce an economy of $13 trillion than we did to produce an economy of $6 trillion. That statistic alone should make water innovation a priority for policymakers at the national level.

The value of water to nations is measured in resource independence and sovereignty. Singapore recovers a high percentage of its water from domestic use, which it purifies and sells to industry for a price. This allows the island nation to effectively manage a closed loop on industrialized and urbanized water. As a self-contained city state, this measure helped reduce reliance on water imported from Malaysia and is deemed an important development for national resource independence. Although primarily produced for industrial use, the water is purified to drinking quality using dual membrane microfiltration and reverse osmosis technologies, and marketed as bottled water for human consumption under the consumer brand NEWater.

The consequences of nations that do not properly value water can be grave, as competition for water with neighboring states can become a matter of national security. Civil unrest in Egypt has created an opportunity for Ethiopia and neighboring nations upstream on the Nile to seek an alliance allowing them to rewrite a 1959 water treaty. In April 2011, Ethiopia laid the foundation for the Grand Millennium Dam that will power a 5.25 gigawatt hydroelectric plant in a bid to quintuple the nation’s electricity supply by 2015.

A forthcoming World Bank study on climate change in the Middle East forecasts political unrest to be born of water insecurity:

“With little prospect of securing economically feasible supplies, water scarcity is turning into a major crisis that threatens the socio-economic development of Arab countries, especially those with weak financial resources,” the authors of one chapter wrote. “The fact that many Arab countries derive the bulk of their supplies from water resources shared by other nations makes water a politically contentious issue that may strain relations with neighbors or even lead to armed conflict.”

Yet, investing in land to be held for posterity has long been an accepted goal of national park systems. It is easy to imagine a similar approach to water resources managed for the public good at a national level. In that light, putting a value on water at the national level is nothing less than investing in security and independence.
The Corporate Value of Water

When corporations think traditionally about water, they don’t consider the full cost or value to their business. The Carbon Disclosure Project recently found that water has entered the boardroom. In a questionnaire to 302 of the world’s largest companies, nearly 40% are already experiencing negative impacts of water disruption, from drought or flooding to declining water quality, increases in water costs or pollution.23

While companies have started to see the negative impacts of water uncertainty, most lack the metrics, visibility or incentives to address their water use and risks. A business manager focused on meeting tough profitability standards can’t integrate water into the black and white of profit and loss. Organizations like BSR aim to make the business case for water stewardship, but without incentives to improve water productivity, companies will focus elsewhere.

Hara, a start-up that helps companies monitor their environmental impact, describes a large pharmaceutical company with U.S. manufacturing concentrated in one location.24 When faced with a restricted supply of water, the company examined their processes to find new efficiencies. Hidden in their processes, they were using fully twice the water necessary.

By thinking differently about water and valuing it as a critical resource, firms can increase their bottom line, while having a more positive impact on their local community. One of the critical ways to improve the bottom line while improving water access is to reduce the power consumed by water purification. Using the latest reverse-osmosis technology, companies can reduce the power waste of their process by 99%.25

Three-quarters of the cost of municipal water processing and distribution is electricity, and electricity for pumps is the single largest contributor to the cost of desalination. While most companies doing their own water treatment are more likely to be purifying municipal water for specialized manufacturing, they face the same cost pressures. Reverse osmosis is the lowest cost separation process and reducing energy use can improve the process further. Capturing waste energy that “leaks” out during the process, and converting that heat back to useful electricity, can save significantly on electricity. Nearly all of the electricity can be recovered as energy to power the process.

New approaches to reduce the energy footprint of water treatment systems involve capturing waste energy throughout the treatment process. Innovative desalination technologies that use low-grade or waste heat instead of electricity have the potential to substantially reduce energy inputs, yielding a more environmentally benign process and lower operation costs. Other important technologies in the future include improved energy recovery devices in desalination plants like microbial fuel cells that will feed off wastewater and cogeneration plants co-located with wastewater treatment facilities. Thinking differently about water treatment can turn a cost-center into a more self-sufficient facility or even an energy generator.

For processes requiring especially high water quality, like silicon chip manufacturing, oil refineries, chemical production, and power plants, water is often filtered through reverse osmosis...
twice to achieve the highest purity. Dow Water & Process Solutions has improved the energy efficiency of this “two-pass” system by 50% in the last 20 years. The method is so common that this has saved enough electricity to power New York City for a year. When implemented by businesses with high water demands, these savings fall directly to the bottom line.

Levi Strauss has placed a new value on water, which is critical to manufacturing their iconic denim. It typically requires 42 gallons of water to “finish” a pair of jeans. On a new specialized line of jeans, the company saves from 28 to 96% of that water. By replacing the repeated wash cycles with ozone processing and removing the water from some steps, the company has created a unique product with a unique message for consumers. In the Spring 2011 line, the company expects to save 16 million liters of water.26

The beer brewing industry is particularly sensitive to water use, and has made impressive strides in efficiency. Most breweries use four to five liters of water per liter of beer produced. Anheuser-Busch InBev has reduced their ratio from five to four, with plans to reduce it to 3.5 by the end of 2012.27 In some plants in water-sensitive areas, they have cut the ratio approximately in half and achieved significant savings on both water and electricity costs. Because plants often pay for both water input and their sewage output, savings can mount even faster.

Thinking differently about water applies more broadly to corporate performance as well. At Dow, we have undertaken a partnership with The Nature Conservancy to examine the ecosystems on which our business depends, considering water, forests, food, land and biodiversity. We will gain understanding of the value of nature to our business, and be able to take action to protect the earth’s natural systems and the services they provide.28

Companies that rethink their water use and increase water productivity get better bottom-line performance. They reward innovative thinking at all levels and see improved profits in the long term.

Conclusion

The Middle East and North Africa represent a vivid case study in water scarcity, with 6.3% of the world’s population and only 1.4% of the world’s renewable fresh water. Even abundant and valuable oil cannot make up for the region’s lack of water resources. The challenges cut across individual, local, national and business interests, offering a cross-section of how to think about water.

Much of the future of the Middle East hangs on the “demographic bulge,” or the booming population under 25. How this population of individuals thinks about water and values individual water access will determine the use, and re-use patterns, that will set the trajectory for resource depletion and scarcity long into the future. At a local level, fostering a “public parks” approach to water has the potential to expand welfare and improve the management of water resources. Nationally, Saudi Arabia relies heavily on desalination for drinking water, and pumps water across great distances. This leads to an estimated cost of management as high as $6 per cubic meter. Most customers pay less than three cents per cubic meter, because of massive subsidies to production, transport and distribution of water.29 The Saudi government has made a significant national commitment to offer water at affordable prices, at great cost. For companies as well, thinking differently about water offers new routes to greater shareholder and stakeholder value.

Meeting human needs for water, in the Middle East and around the world, will of course depend in great part on the policy and social systems that alleviate or exacerbate water shortage but also to the extent they adopt innovative thinking about water and invest in the technologies needed to bring that thinking to life. Increasing water productivity guides leaders to rethink resources more broadly. When policymakers and leaders think about water from the individual, local, national and business vantage points they can encourage more intelligent use and re-use of this most precious resource.
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