



Maxwell

# Four Critical Trends in the Future of Water

*In his book *The Future of Water*, published by AWWA last year, Steve Maxwell examined the future of different types of water use and consumption. In this detailed analysis and evaluation, Maxwell identified four key issues or recommendations that may characterize the future of water consumption. This article provides an overview of these four key issues.*

**A** broad-ranging review and assessment of the world water situation reveals four key underlying themes that seem to appear repeatedly. These will weave through and encompass many of the more specific trends and developments we're likely to see in the water industry in the future.

First, it seems likely that water will become increasingly recognized as one of the key "factors of production" in industry—a key criterion in the development of public policy and in both economic and personal decision-making. Economists have traditionally pointed to labor, capital, and energy as primary criteria in economic decision-making. We will see the availability of water begin to be regarded as a more critical criterion—and one that will increasingly need to be balanced against other factors of production.

Second, in the future we'll see much more emphasis given to the concept of our "water footprint," or the total contained water impact

of everything we buy and use and everything we do. Direct consumption of water is fairly easy to measure and manage, but our indirect total consumption of "contained" water is a much more critical consideration. Only by understanding our full water impact—the total amount of water that goes into a product or that we use in a given behavior—can we move toward wiser consumption decisions and more efficiently allocate scarce water resources. The total amount of water required over the full life cycle to produce a given product or service is referred to as virtual water content ("The Concept of Virtual Water: Understanding our Real Water Use," December 2010).

Third, although most of us still tend to talk about different kinds of water—drinking water, wastewater, rainwater, stormwater, source water, groundwater, seawater, contaminated water, and so on—in reality, all these different types of water will increasingly be viewed simply as water. We must realize that from a plane-

tary perspective, there really is just one water. We'll see more recognition of this in the future, and a gradual breaking down of the silos or boundaries between, for example, drinking water and wastewater. Before we can solve our myriad water challenges, we need to begin thinking more holistically about water.

Finally, perhaps the most critical and recurring theme that manifests itself in any review of the world water situation is the importance of moving toward the full-cost pricing of water. In many regions of the world, water prices bear little relationship to the true costs of delivering that water—and even less relationship to the real value of that water. We are all going to be paying much more for water in the future, and this will in turn dramatically change our priorities and our behavior. If we continue to assume that water is free, or almost free, we will tend to waste it and not pay much attention to how we use or conserve it. Once water prices rise high enough to affect our wallets, our attitudes and behavior will start to change, and we will be forced to become better stewards of this scarce resource.

Following is a discussion of each of these key trends in more detail—recommendations for how legislators, policymakers, and each of us individually should view our allocation and consumption of water.

## **BALANCING OUR RESOURCE TRADE-OFFS IN A SMARTER MANNER**

Water will become a more critical issue and key determinant in almost all personal, economic, and business decisions. But water is obviously not the only factor or input that we have to consider in making economic or social decisions. Unfortunately, a seemingly logical and well-thought-out approach toward more sustainable behavior with respect to a given objective may often be at odds with respect to another objective. For example, we'll find that it's often not possible to minimize our carbon and water footprints at the same time. Buying asparagus grown in the Central Valley of California with scarce water transported from hundreds of miles away may not be very good for our water footprint. But buying asparagus grown in Peru and shipped by jet and truck to the local grocery store is not very good for our carbon footprint. Consumers are going to have to make trade-offs.

Consider another example—the “buy local” consumer trend that is emerging in many parts of the United States, as a means of promoting local agriculture, encouraging people to eat healthier, fresher food, and reducing the carbon footprint of large-scale food transportation around the world. The buy-local movement, although it has many attractive aspects, may often be in conflict with the concept of water footprint or indeed, simply the local availability of actual water. Does it really make sense to use up very scarce water trying to grow vegetables in the desert outside of Santa

Fe, N.M., so that wealthy residents can enjoy the satisfaction of buying local at the farmer's market? If you look around at many of the major and growing cities in the Southwest and elsewhere around the world, there simply isn't sufficient water or the appropriate climate in many areas to locally grow all the needed food.

It's not just water or energy considerations that go into these difficult decisions and trade-offs. Other inputs and decision factors also enter into the equation. Labor costs and labor conditions are often issues. The capital costs of manufacturing something in a given locale can differ significantly because of widely variable environmental regulations—that's one reason so much mining and manufacturing has moved out of the United States. Geopolitical, moral, and ethical considerations can also cloud and complicate these types of decisions. Should we buy jogging shoes made in a plant in Asia under poor working conditions, when boycotting those shoes may put the plant out of business altogether and drive those workers into even deeper poverty?

Sometimes, carefully evaluating a decision or a behavior and trying to take into account all of these critical inputs can lead to some interesting, counter-intuitive, or even slightly humorous conclusions. Put another way, when attempting to take into account energy consumption, food consumption, and implied water and carbon footprints in carrying out routine daily tasks, some researchers have come to some rather surprising findings.

For example, it's been suggested that in some cases it may be more environmentally sustainable to drive your car to the store to pick up a few items than it would be to bike or walk. How can that be? Let's say you live in Norway—which is close to abundant fossil fuel production—but where much of your food has to be grown far away, say on farms in Spain. Those farms have to be irrigated and treated with chemical fertilizers. When they are ready to be harvested, those water- and energy-intensive foodstuffs are flown in high-carbon-footprint jets to Norway and then trucked to the store, where you buy them to provide your body with enough energy to walk or ride your bike to the store. Taking all of these various concerns and inputs into consideration, researchers have (only half tongue-in-cheek) been able to show that it is better to just hop in the car powered by cheap local energy if you need something from the store—and save all that “energy” that must be generated in order for you to ride your bike there. As you might guess, this effect is even more pronounced, depending on whether you're a vegan or if you get your sustenance from eating beef.

On the other hand, if you don't ride your bike to the store, you won't have to use so much water to wash your sweaty clothes, and therefore you won't have to dump as much phosphorus into the sewer from your detergents. Then again, water is plentiful in Norway. Obviously,

these issues can be argued around and around, but this reveals the complexity of looking at an issue or a given behavior from a broad environmental sustainability perspective. What is a unit of water worth, versus a unit of energy, versus not releasing a bit of carbon into the atmosphere? A single idea or approach or philosophy—like the water footprint—may appear very logical or elegant when viewed in isolation, but when it is viewed from a more holistic and integrated perspective, things can become murkier, and it becomes more obvious that many approaches and objectives have to be considered and balanced. As we step back and take a more global view, it becomes clearer that everything is tied together. None of these individual issues can be viewed in isolation. For each individual in a specific place around the globe, carbon footprints, water footprints, agricultural footprints, and food consumption are all tied together in different, intriguing, and complex ways.

### **THINKING MORE IN TERMS OF VIRTUAL WATER**

We must start to incorporate the concept of virtual water into more of our trade, consumption, and commerce patterns. International trade systems will eventually have to promote the growth of water-intensive crops in more water-rich areas; exports to relatively drier countries would help free up water in the drier country for other more critical uses—and perhaps create a more stable political situation in the process. As water becomes scarcer and more expensive, this will

naturally start to happen, but we need to devise ways of hastening this type of thinking. The liberalization of agricultural trade policies and tariffs is obviously a vexing political challenge, but progress here could contribute to better production decisions and ultimately to the individual competitive advantage of nations.

At the same time, the concept of virtual water has serious limitations, and may in some cases conflict with other trade or consumer objectives, as was discussed previously. Because food requires so much water, international trade patterns in virtual water are essentially a reflection of trade patterns in agricultural commodities. Stronger industrial countries without as much agriculture will obviously tend to be net importers of water in the form of food, whereas less industrialized and more agrarian countries will tend to be agricultural (and water) exporters—regardless of their natural water resources. As Christopher Gasson of *Global Water Intelligence* put it “you cannot tell peasant farmers in North Africa or India that they should give up their land and become advertising executives or bank clerks because those professions use the least water.” “Perverse” virtual water flows are here to stay, and what really needs to be addressed is the efficiency of that water use where it is most scarce.

Better conservation practices in Arizona are not going to help solve water problems in southern India. However, changing certain types of purchasing habits in Arizona might indeed contribute to solving water

problems in southern India. Shifting patterns of food consumption or changes in our behavior in terms of consumer goods purchasing could potentially have a major effect on water availability in specific regions elsewhere in the world. These are big issues, and things are not going to change overnight, but a better understanding of our real water use will allow us to at least start making better decisions.

### **THINK MORE HOLISTICALLY ABOUT WATER**

We all talk about different kinds of water—drinking water, wastewater, stormwater, seawater and so on—but from a more holistic perspective, we will all increasingly realize and start to view all of these different “types” of water as being just simply one thing—water.

Too often, we think and behave as though water were defined and characterized by all these different labels. Too many of us still think of ourselves as “stormwater managers” or “drinking water authorities” or “wastewater experts.” Stormwater and sewage are still typically thought of as a problem or wastes to be disposed of—not as potential resources to be harvested and productively used. Groundwater users are still held to a different set of legal and regulatory requirements than are surface water users—even though we understand now that surface water and groundwater are often interconnected. These perspectives and problems are unfortunately reinforced by an increasingly archaic and often conflicting set of federal and state laws, by a plethora of congressional and legislative committees with disparate jurisdictions, and by numerous federal and state water agencies with a single purpose or mandate. Furthermore, it’s generally the same situation around the rest of the world.

We now understand that not only are most of our water problems interconnected, but they are also interrelated with many critical issues beyond water—energy supply, air pollution, urban development, endangered species, transportation, housing, and so on. The more we learn about a given water problem, the more often it requires us to stretch our thinking outside the traditional mindset of water sector professionals. We need to move beyond this patchwork type of approach. Our water policy is now too critical to be defined or governed by these types of historical exemptions, exceptions, and additions.

The Clean Water Alliance America has recently worked to more broadly publicize this concept of “one water”—and to underline that this type of historically constrained “silo” thinking is a major cause of dysfunction as we try to formulate more of a national water policy. The proverbial “stovepipes” of different and often conflicting stakeholders may have made some sense at one time in the past, but in a collective sense they are now woefully outdated. Although many of us may be starting to grasp the concept of one water, we still don’t

usually act and behave in the prescribed manner. It is much easier said than done—and we need to get rid of all these little tails that are still trying to wag the big dog. We need to think outside of these silos—outside of the traditional box—about all of our different types of water, and begin to consider them all as simply one water.

Think for a moment about an astronaut circling in a spaceship far above the earth, gazing out the window and down at our spherical little planet Earth. From that perspective, it's pretty clear that we are a separate and self-contained little ball, mostly covered with water—a closed system, a zero-sum game, an isolated and solar-powered desalination plant quietly floating through space. We need to think of our water resources from the perspective of that astronaut. We have a lot of water—most of it is in the ocean right at the moment, some of it is raining down over the continents in various places, some of it is flowing down rivers and streams, some of it is sitting quietly in underground aquifers or polar ice caps, some of it is dirty and waiting to be cleaned up—and some of it is flowing through our houses, businesses, and bodies at the moment. Each one of us uses some of those molecules of water. We will make some of it dirty, we will clean it up again, and someone else will use it later. We can't create new water, and we can't destroy it, it's all just there.

## PREPARING FOR THE INEVITABILITY OF RISING PRICES

Finally we return to perhaps the most important theme in the water industry today—the need for more realistic and full-cost pricing of water. If there is one single and inescapable conclusion resulting from any review and discussion of the world water situation, it must surely be the inevitability of continuously rising water prices over the longer term—indeed, there is an urgent need for rapidly rising water prices in many parts of the globe. As water prices rise, not only will they better reflect true cost and value, but they will also help to gradually force and facilitate many of the necessary changes in thinking, policies, and usage discussed previously—and that desperately need to occur.

Water has traditionally been priced so low that most users simply don't have an economic incentive to conserve it or use it wisely. People naturally don't pay much attention to or conserve a commodity if they tend to view it as virtually free; until recently, that is exactly the way in which most people, particularly in the United States, viewed water. Too many politicians around the world seem to believe that “if you want to stay in office, you must provide people with free water.”

The true cost of delivering clean water—as well as the average price of water—is continuing to creep slowly upward in most localities, but in most areas, governments have not allowed prices to rise to the kind of rates that will be necessary if we are going to upgrade and maintain our infrastructure on a truly sus-

tainable basis. Almost all water use decisions and resource management issues would be far more efficient and solutions would begin to emerge more quickly if water prices were higher.

As prices rise, decisions about water use will inevitably begin to take on greater significance in the overall economy, and many of the incipient trends discussed previously will gather steam—greater reliance on reuse and recovery, more emphasis on conservation, a continuing trend toward more public-private partnerships, and more rapid advances in technology.

Among observers and water policy leaders, there really isn't a lot of dispute about this. The key policy question here is not really whether prices should rise, but rather how they should rise—gradually and “naturally” because of the market forces of supply and demand (weak and distorted though these forces typically are) or through some sort of government mandates and policies.

However, there is the critical flip side of this coin—higher water prices also inevitably raise the issue of the ability to pay by different people all across society, and the question of whether and how subsidies should be provided to certain parts of the population. This is an issue that may not be adequately addressed by market mechanisms and that must receive careful attention from federal and local policymakers. Indeed, one of the great challenges of the future of water will be trying to simultaneously treat and manage water more like a commodity, while also recognizing that access to water is a fundamental human right. In the United States, we've tried to work out that challenge with regard to food through the use of food stamps and federal and state programs, and we'll need to do something similar in terms of ensuring adequate access to water for all.

Regrettably, most of us still don't really recognize the true value of water—and few of us have to pay anywhere near what that water is really worth to us. Indeed, to quote that (overused) dictum of Ben Franklin from 200 years ago—“we only recognize the true value of water when the well runs dry.”

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