Everyone on Earth uses water and energy every day. We use water for drinking, bathing, cooking, and producing everything from silicon chips to potato chips. We use energy for heating, cooling, transportation and any number of domestic and industrial processes. We would die without access to clean fresh water. We would be miserable without using energy from renewable and non-renewable sources.

Our use of water and energy makes life possible and life worth living, but our use comes with costs. Water allocated to one use leaves less water for other human economic activities that benefit us directly and less water for the environmental flows that benefit us indirectly. Non-renewable energy used today (coal, oil, nuclear and natural gas) leaves less energy for use tomorrow. Renewable energy from hydro, solar, wind, and other sources can — theoretically — be used indefinitely, but these sources met less than ten percent of domestic demand in 2011 (U.S. Energy Information Administration).

So the first fact we need to acknowledge is that the US is still heavily reliant on non-renewable fuels.

The second fact to acknowledge is that we need water to extract and consume fuels of all types. Water is used for everything from transporting coal in pipes to extracting heavy oil from tar sands and natural gas via hydraulic fracturing, to generating hydropower and cooling thermoelectric energy plants. We could produce energy without water, but we would produce less at a higher cost. Water, in other words, lowers the price of the energy we consume.

We demand water for agricultural, industrial, residential uses, as well as energy production. We also want to leave more water in the environment, to save or restore stressed ecosystems that directly and indirectly benefit us.

Water is a renewable resource when demand is less than supply because use and evaporation in one place results in precipitation in another place, but it’s possible — and common — for our demand to exceed the supply of water in different locations (think Las Vegas or Atlanta). In these instances of water scarcity, we are “mining” water today that will not be available tomorrow. Such mining turns water into a non-renewable resource (like oil) that we will not have tomorrow.

Given the increasing scarcity of water resources in the US, we need to change the way we manage water if we want to keep using it for drinking, growing food or generating energy.

So now we come to the curious idea of the “water-energy nexus,” which means that water is necessary to produce energy, but energy is necessary to produce water (via pumping, treatment, and so on).

People have been discussing the nexus for the past few years because they are worried that a lack of water will reduce energy availability or that a lack of energy will reduce water availability. The impact, in either case, would be detrimental for our economies and our quality of life.

This is a valid concern, but how is it different than, say, the “truck-energy nexus” (we need fuel to move trucks that move fuel) or the “water-steel” nexus (we need water to produce steel that can pipe water)?

The difference can be traced to the existence of markets, competition and pricing for these goods and the lack thereof for water.

To understand this difference, let’s set aside the issue of environmental water and concentrate on water as a resource that can be used for economic activities. Most resource water is managed, priced and distributed by local monopolies, whether it’s an irrigation district delivering water to farmers or a utility delivering water to residential and industrial users. These monopolies often sell their water at the cost of delivery — covering the fixed costs of pipes and variable costs of treatment and pumping. It’s extremely rare that water prices reflect water scarcity, which means that it’s also rare for the price of water to rise when demand exceeds supply. This means that some users may consume “too much” water, leaving other users high and dry. (Or they may not — deciding that they’ve taken “their fair share,” but such restraint is rare when it’s possible to use more cheap water to increase profits.) Water managers may not work to prevent these shortages, since they are not penalized for shortages, allowed to raise their prices above cost, or worried about losing business to competitors.

That’s not the case for energy, steel or trucks, as each of these businesses operate in markets, where prices adjust to equalize supply and demand and where competition makes it easier for new suppliers to meet demand when their competitors run out of inventory.
The impact of water shortages are much greater than implied by lost sales of water. A restaurant may pay one dollar for 100 gallons of tap water that is used to produce food worth thousands of dollars. An industrial facility may pay the same to produce products worth hundreds of times more. All of these users would be willing to pay far more in the event of water shortage, but their money is worthless when there’s no water. They then have to close the restaurant, turn off the turbines and shut down the machines for producing silicon chips or potato chips. Workers lose their wages, customers lose access to products — the effects multiply and spread, all for lack of “cheap” water that does not exist.

The solution to these problems is the same solution that will end our need to discuss the water-energy nexus: price water for scarcity. Such a solution would treat “economic water” as we treat oil, coal, shoes, coffee or any other product: prices will rise when demand exceeds supply and fall when supply exceeds demand. Prices that reflect scarcity will keep supply and demand in balance, rationing water to those willing to pay more and preventing shortages. (Water managers will make more money than the cost of delivery, of course, but they can refund excess revenues to customers under the supervision of their regulators.) These operations require only a change in perspective: we need to treat water as a valuable input to our economic activities.

About David Zetland
David Zetland is a senior water economist at Wageningen University in the Netherlands. He blogs daily atwww.aguanomics.com, and is the author of The End of Abundance: Economic solutions to water scarcity.

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TheWaterStrategist says:
January 13, 2013 at 1:31 pm
Pricing is but one element in a long list of challenges making US water markets inefficient and unsustainable. In fact, urban demand-side water consumption has been improving and undermining utilities’ revenue stream (for which they need to compensate by charging flat base charges). Moreover, the focus on repricing has enabled municipalities and utilities to focus on cost-recovery while ignoring efficiency-focused technologies and innovative engineering approaches. Other factors to be taken into account include: cheap debt availability, misleading bond rating that largely ignores a huge funding gap, out of date regulation, lack of enforcement by government agencies, political bias favoring the main consumers (i.e. agriculture, industry and energy sectors), market fragmentation, professional conservatism, etc.

Lets begin by tracking the levels of water sources and enforcing water audits and related system innovation programs- transparency may lead to better policy planning, improve enforcement and shape both public awareness and the much-needed political leadership’s agenda.

Anuj says:
January 13, 2013 at 2:40 pm
Do you think it's equitable to price water for scarcity? I agree that water is underpriced and its true cost is not internalized by consumers, but I fear that pricing water at its “actual” value is a form a rationing based on income. The law of demand says that increasing price of water will reduce the quantity demanded – however, I think it also shifts the cross-section of who CAN use water and for what purposes: poorer people are more likely to use water only for basic necessities and the relatively richer are more able to use water for industrial and innovative procedures. Of course, this is already true, but pricing water at its level of scarcity will surely increase this already inequitable distribution of the function of water?

I wonder, further, if you have an (percentage) estimate of how much water is underestimated?