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Is Water Different?

Mono Lake has gotten a reprieve. Over a fifty-year period, this California lake—our country's oldest lake and one of its most beautiful—shrank from more than 80 square miles in area to about 60. Why? Because in 1941, most of the eastern Sierra mountain water that once fed Mono Lake began disappearing down a 275-mile-long aqueduct, south to Los Angeles, where it was used to wash cars, sprinkle lawns, and otherwise lubricate the lifestyle of southern California. Environmentalists cried out that the diversion of water from Mono Lake must stop. Los Angelenos, who pay $350 per acre-foot for the water, claimed there were no viable alternative sources. Central California farmers, who pay but $12.50 per acre-foot for subsidized water from the western side of the Sierras, feared that diverting their own "liquid gold" to save Mono Lake would dry up their livelihood. Meanwhile, this migratory rest stop for hundreds of thousands of birds was disappearing.

Finally, in 1994, prodded by the California Water Resources Control Board and aided by special funds voted by the state legislature, the City of Los Angeles agreed to drastically curtail its usage of Mono Lake water. Under the water-trading plan agreed to, Los Angeles will cut its usage of Mono Lake water by more than 80 percent until the lake's water level has risen sixteen feet. Even after that elevation has been reached, the city will limit its usage of Mono Lake water to less than half of its long-term average usage. To replace the water it is losing, Los Angeles will buy water from elsewhere, using state funds appropriated for this purpose.

The issues that have arisen over the future of Mono Lake are surfacing in hundreds of locations throughout the United States. Conservationists are increasingly concerned about the toxic contamination of our water supply and the depletion of our underground water sources. Extensive irrigation projects in the western states use

more than 150 *billion* gallons of water a day—seven times as much water as all the nation's city water systems combined. The Ogallala aquifer (a 20-million-acre lake beneath the beef-and-breadbasket states of Colorado, Kansas, Nebraska, New Mexico, Oklahoma, and Texas) has been dropping by three feet per year because 150,000 wells are pumping water out faster than nature can replenish it.

Water problems are not confined to the United States. In China, water is being siphoned away from farmlands surrounding Beijing in order to meet rising urban and industrial demands, and some 300 Chinese cities are now estimated to face water **shortages.** In the arid Middle East, water is a constant source of friction, and schemes to add to the region's supplies have included floating plastic bags of water southward across the Mediterranean, and stirring the sea in the summer in the hopes of causing more rain to fall in the winter. In the island city-state of Singapore, half of the total land area of 247 square miles is set aside for collecting and storing water. Because there is no more room for additional reservoirs, Singapore is now building desalination plants to convert seawater into drinking water. The result will be more water, but the cost of fresh water produced in such a manner is seven to eight times higher than the current cost of treated water.

The common view of water is that it is an overused, precious resource and that we are running out of it. The economic analysis of the water "problem," however, is not quite so pessimistic, nor so tied to the physical quantities of water that exist on our earth and in the atmosphere. Rather, an economic analysis of water is similar to an analysis of any other scarce resource, revealing that water is fundamentally no different from other scarce resources.

The water industry is one of the oldest and largest in the United States, and the philosophy surrounding it merits some analysis. Many commentators believe that water is unique and that it should not be treated as an **economic good,** that is, a scarce good. Engineering studies that concern themselves with demand for residential water typically use a so-called requirements approach. The forecaster simply predicts population changes and then multiplies those estimates by currently available data showing the average amount of water used per person. The underlying assumption of such a forecast is that, regardless of the price charged for water in the future, the same quantity will be demanded per person. Implicitly, then, both the short- and long-run price elasticities of demand are assumed to be zero.

But is this really the case? Perhaps not. Consider, for example, the cities of Tucson and Phoenix in Arizona. Although these cities are located only 100 miles apart, their water-usage rates are notably different. While the average household in Phoenix uses 260 gallons per day, in Tucson the average usage is only 160 gallons per day. Could this usage difference be accounted for by the fact that the price of water is only about half as much per gallon in Phoenix as it is in Tucson? To see why such an inference is likely correct, let's look at a study of water prices in Boulder, Colorado, conducted by economist Steve Hanke.

Boulder was selected by Hanke because a number of years ago the water utility in Boulder installed water meters in every home and business that it supplied. Prior to that time, Boulder, like many other municipalities in the United States, had charged a flat monthly rate for water. Each household paid a specified amount per month no matter how much (or how little) water was used. In essence, the previous flat-fee system meant that a zero price was being charged at the margin (for any incremental use of water). The introduction of usage meters meant that a positive price for the marginal unit of water was now imposed.

Hanke looked at the quantity of water demanded both before and after the meters were installed in Boulder. He began by computing an index of water usage, relative to what he called the "ideal" use of water. (The term *ideal* implies nothing from an economic point of view. It merely indicates the minimum quantity of water required to maintain the aesthetic quality of each resident's lawn, taking into account such factors as average temperature, the effect of rainfall, and so forth.) An index value of 100 meant that usage was exactly equal to the hypothetical ideal. A value of, say, 150 meant that residents were using 50 percent more than the ideal, whereas an index of 75 meant that usage was 25 percent less than Hanke's ideal figure of 100.

From the data in Table 6–1, which compares water usage in Boulder with and without metering, we find that individuals used much more water under the flat-rate system than they did under the metered-rate system. Column 1 shows the meter route numbers of the eight routes studied by Hanke. Column 2 shows the index of water usage for each of the routes during the unmetered period when a flat rate was charged for water usage. The data in column 3 show water usage on each route for the one-year period after the

TABLE 6–1 Comparing Water Usage With and Without Metering of Actual Usage

(1) Meter Routes	(2) Index of Water Usage (Flat-Rate Period)	(3) Index of Water Usage (Metered-Rate Period)
1	128	78
2	175	72
3	156	72
4	177	63
5	175	97
6	175	102
7	176	105
8	157	86

Source: Adapted from Steve Hanke, "Demand for Water Under Dynamic Conditions," *Water Resources Research*, vol. 6, no. 5, October 1970.

metering system was put into effect. Note that under the flat-rate system every route used substantially more than the ideal amount of water, whereas under the metered system six of the eight routes used less than the hypothetical ideal. Moreover, water usage dropped substantially on every route when metering was introduced, and each user was being charged for the actual amount of water used. Because less water is used in the presence of metering (which raises the price of incremental water), Hanke's data indicate that the quantity of water demanded is a function of the price charged for water. Moreover, Hanke found that for many years after the imposition of the metered-rate pricing system for water, the quantity of water demanded not only remained at a lower level than before metering but continued to fall slightly. That, of course, means that the long-run **price elasticity of demand** for water was greater than the short-run price elasticity of demand.

Would attaching a dollar sign to water help solve problems of recurring water shortages and endemic waste? Many economists feel it would. It is well known, for example, that much of the water supplied by federal irrigation projects is wasted by farmers and other users because they have no incentive to conserve water and curb overconsumption. The federal government, which has subsidized water projects since 1902, allots water to certain districts, communities, or farmers on the basis of previous usage "requirements." This means that if farmers in a certain irrigation district were to conserve on water usage by, say, upgrading their irrigation systems, their water allotment eventually would be reduced. As a result, a "use it or lose it" attitude has prevailed among users of federal water. Water supplied by federal water projects is also inexpensive. The Congressional Budget Office has estimated that users pay only about 19 percent of the total cost of the water they get.

One would think that with growing worldwide concern over water conservation, the federal government would be trying to do its part to reduce waste. If anything, the reverse seems to be true. As recently as 1993, Congress authorized completion of the Central Utah Project (CUP), which includes a series of dams, aqueducts, tunnels, and canals designed to collect water from the Colorado River drainage in Utah and transport it to the Great Basin. The cost of delivering this water to farmers for irrigation is estimated to be $400 per acre-foot. The water will be used to produce additional crops yielding enough revenue to make the water worth $30 per acre-foot to the Utah farmers who receive it. But these farmers will pay only $8 per acre-foot for the water—that is, only *2 percent* of the cost of delivering the water to them!

Economists have suggested that raising the price of federal water would lead to more efficient and less wasteful water consumption. For example, a study by B. Delworth Gardner, an economist now at Brigham Young University, concluded that a 10 percent rise in prices could reduce water use on some California farm crops by as much as 20 percent. Support for such a price increase is politically difficult, however, because federal law stipulates that ability to pay, as well as cost, must be considered when determining water prices.

An alternative solution involving the trading and sale of water rights held by existing federal water users has been proposed by some economists. Such a solution, it is felt, would benefit the economy overall because it could help curb water waste, prevent water shortages, and lessen the need for costly new water projects. Trading and sales of water rights have already taken place in California, Oregon, and Utah. In addition, environmentalists were instrumental in helping to arrange the water trading plan for Mono Lake. Despite these modest successes, numerous federal and state laws have, to date, made such trading very difficult.

Until recent years, it had been thought that there was so much water we simply did not have to worry about it—there was always another river or another well to draw on if we ran short. Putting a price tag on water would require a substantial change in the way we have traditionally thought about water. Is this possible or even desirable? Well, events half a world away from Mono Lake may shed some light on this. In the Chinese capital of Beijing, an extended period of dry weather in 1997 caused the water levels in the city's reservoirs to drop sharply. The municipal State Council responded by raising the price of water for home use to $110 per acre-foot from its previous level of $80. For industrial and government users, the price hike was to $160 per acre-foot from the previous $125. Why were these actions taken? According to Liu Hangui, deputy director of the Beijing Water Conservancy Bureau, "the price adjustments were introduced to relieve the water shortage." Even communism, it would seem, is not enough to make water different.

DISCUSSION QUESTIONS

1. In your opinion, do the data presented in Table 6–1 refute the "water is different" philosophy?
2. How much water does your neighbor "need"? Is your answer the same if you have to pay your neighbor's water bill?
3. Evaluate the following: "Although taxpayers foot the bill for federal water sold to farmers at subsidized prices, they also eat the crops grown with that water. Because the crops are cheaper due to the subsidized water, taxpayers get back exactly what they put in, and so there is no waste from having subsidized water for farmers." Would you give the author of this quote an A or an F in economics?
4. During the drought that plagued California in the late 1980s and early 1990s, farmers in California were able to purchase subsidized water to irrigate their crops, even though many California homeowners had to pay large fines if they watered their lawns. Can you suggest an explanation for this difference in the treatment of two different groups of citizens within the state of California?