Chapter 8

ARE WE RUNNING OUT OF WATER?

If you believe the headlines, humans are about to die of thirst. A few samples should be enough to convince you:

"A World of Thirst" (*U.S. News & World Report*)
"Water Shortages May Lead to War" (*Financial Times*)
"Drying Up" (*The Economist*)
"Water Shortages Could Leave World in Dire Straits" (*USA Today*)

The world, it seems, is running out of water.

But how can this be true? After all, about 71 percent of the earth's surface is covered in water. Lake Michigan alone contains more water than the world's population uses in two years. Even more to the point, the earth is a closed system. Using water does not destroy water. Whether we drink it, flush it, irrigate with it, or even let it evaporate, it comes back to us eventually, just as clean and pure as the raindrops of a spring shower. In fact, every three weeks, enough rain falls to satisfy the water uses of the entire world's population for a year. So what, exactly, is the problem?

Water is the ultimate renewable resource: The act of using it begins the process that returns it to us. But—and this is the crux—water is also *scarce*. That is, having the amount of clean water we want, where we want it, when we want it there, is not free. We must sacrifice other resources to accomplish this. And as the level of economic activity grows, the demand for water grows, and so the costs of consuming water grow.

In this sense, water is no different from any other **scarce good.** If we want more of it, we must sacrifice more of other things to achieve that goal. But what makes water seem different is that unlike, say, broccoli, if we do entirely without it, disastrous things happen in a relatively short period of time. If water gets sufficiently scarce, people may start doing some pretty unpleasant things to each other to ensure that they,

rather than their neighbors or enemies, are the ones who end up with it. But before we see if this is really something we should worry about, we had better start by learning a little more about water.

Of the enormous amount of water on the earth's surface, about 97.2 percent is ocean water, which is too saline under normal circumstances to drink or use for irrigation. Another 2.15 percent is polar ice, which is certainly not a very convenient source. Of the remaining 0.65 percent, about 0.62 percent is underground in aquifers and similar geological structures; this groundwater takes hundreds of years to recharge and so is not really a sustainable source of freshwater over the relevant time span. That leaves us with rain.

Fortunately, it rains a lot, and despite the headlines, on a *worldwide* basis, the amount of rainfall doesn't vary much from year to year. About two-thirds of the rain falls on the world's oceans, where almost no one lives. But even so, and even taking into account evaporation and the fact that much of the rain over land quickly runs off into the oceans before it can be captured, there is still a lot of usable rainfall every year. Indeed, there is enough every year to yield 5,700 liters per person—about six times as much as the average person actually consumes. Of course, Mother Nature is not particularly evenhanded in the distribution of this usable rainfall. For example, China gets only 5 percent of it, despite having 20 percent of the world's population. Brazil, Canada, and Russia, which together have 6 percent of the world's population, receive 29 percent of the usable rainfall. And although the United States does pretty well on average, picking up 5 percent of the rain and having about 5 percent of the world's population, there are plenty of differences within our borders. Massive amounts of rain fall in southeastern Alaska and on the mountain slopes of Hawaii, while very little falls in Southern California. But the fact that people routinely choose to locate themselves in places where it does not rain highlights one of the fundamental points of this chapter: Water is an **economic good,** and the distribution and consumption of water are fundamentally economic problems, ones that can be solved in markets, just as other economic problems (such as the provision of food, shelter, and clothing) are solved in markets. To focus clearly on this point, let's examine some of the myths that have grown up around water in recent years.

Myth 1: The planet is drying up. As we have suggested earlier, there is nothing to worry about here. The cheapest (and completely sustainable) source of clean freshwater is rainfall, and roughly 113,000 cubic kilometers (3 quadrillion gallons) of the stuff falls every year on land areas around the world, year in and year out. Although small amounts of this are temporarily stored in plants and animals while they are alive, all

of it eventually either recharges groundwater or evaporates, forms clouds, and precipitates—all 113,000 cubic kilometers, year after year. Sometimes, more is in Brazil and less in Sudan, and sometimes more of it inconveniently runs off in floods, but because the earth is a closed system, that water stays with us.

Myth 2: We can save water by flushing less and using less in agriculture. Remember the closed system? That applies to toilets and alfalfa, too. Flushing the toilet does not send the water to the moon. It just sends it through the sewer system to a water treatment plant and eventually into aquifers under the ground or back down on our heads in the form of raindrops. So-called low-flow toilets (and showers) have no effect on the amount of water in existence. (Because they may slightly reduce the amount of water running through water and sewer systems, they may conserve a bit on the amount of resources used in these systems. But there are offsets. Such devices are routinely more costly to produce than regular toilets or shower heads, and they occupy people's time—because of double flushes and longer showers. On balance, besides not "saving" water, there is thus no evidence that such devices conserve resources at all.)

Even agriculture, notorious for consuming an enormous amount of (usually subsidized) water around the world, does not destroy the stuff. Most of the water used by agriculture evaporates or runs off into rivers or soaks into underground aquifers. A small amount is temporarily stored in the crops, but this, soon enough, is consumed by animals or humans and simply returns to the same system that delivers 113,000 cubic kilometers of water onto our heads every year. There is no doubt that all of this use of water in agriculture is costly, because it could be used elsewhere. Moreover, agricultural use of water is generally subsidized by taxpayers. Making farmers pay full market value for water would reduce agricultural use and raise our collective wealth by improving the allocation of resources. But it would not alter the amount of water available.

Having said this, agricultural use of water does present two important economic issues. First, as we just noted, government policies around the world routinely cause water for agriculture to be heavily subsidized. Farmers often pay as little as $10 to $20 per acre-foot (about 325,000 gallons) for water that costs anywhere from $500 to $1,000 per acre to provide to them. Because of this huge subsidy, farmers are no doubt richer, but the losses to society are much greater, meaning that our overall wealth is lower. (For an explanation of why we get such subsidies despite this, see Chapters 2 and 23.)

Second, we not only subsidize water use for agriculture, but we also routinely forbid farmers to sell or lease their water to other users, especially

nonagricultural users. This is a particular problem in the relatively arid American West, where farmers effectively own most of the rights to surface and groundwater but must "use it or lose it"—if they don't put it to beneficial use on their crops, they lose their rights to it. But often this water would be much more productively "used" if it were left in the streams to help support the spawning and other essential life activities of downstream species, such as trout or salmon. Laws are slowly changing to recognize environmental uses as being "beneficial" uses, but existing restrictions on the use of water still yield lower overall wealth for us.

Myth 3: Water is different from other goods. Many people seem to think that because it is essential to life, water is somehow different from other goods—or at least that it should be treated differently in some very specific ways. Let's first get rid of the notion that water doesn't obey the laws of demand and supply. In fact, although the demand for water in some uses is relatively inelastic, usage of water in *all* uses responds as predicted by the law of demand—when the price of water goes up, people use less of it. Similarly, although getting water from where it is to where people would like it to be is costly, the law of supply still holds true—when the price of water rises, suppliers of water provide more of it to consumers. Sometimes this process is as simple as diverting a stream or capturing rainfall. Sometimes it is as complicated as using reverse osmosis to convert seawater into freshwater. But even if the production technique is as esoteric as recycling urine into fresh, drinkable water (as is done on the international space station), the fact remains that when water becomes more valuable, people are incredibly ingenious in finding ways to make sure it is available.

Myth 4: Price controls on water protect low-income consumers. Some people claim that water should *not* be treated like other goods, specifically arguing that the price of water received by suppliers and the price paid by consumers should both be kept down by government decree. This, it is said, will protect people, especially those who are poor, from high water prices and will prevent suppliers from earning "excessive" profits. After all, some 1.1 billion people around the world currently do not have ready access to clean water, which makes an inviting target for anyone who might become a monopoly supplier to substantial numbers of these people.

It is true that governments can reduce the profits of the suppliers of water (or anything else) by limiting the prices they charge. But in reality, this does not protect consumers, particularly not the poorest consumers. Price controls on water *reduce* the amount supplied and, especially for the poor, generally make consumers worse off. They end up with less water than if prices were allowed to reach equilibrium levels, and they are

forced to undergo nonprice rationing schemes (ranging from limited hours of service to getting no clean water at all). In fact, if we examine places around the world where the poor have little or no access to clean water, we find that government efforts to "protect" people from potential suppliers of water are in fact a key source of this lack of access. In Brazil, for example, government limits on private water rates forced a major international water project company to cease operations there, reducing the supply of clean water. In India, the widespread insistence by many local governments that water be provided free of charge has effectively stalled most efforts to improve water distribution in that country. And in China, government price controls have discouraged water utilities from developing new water supplies and from upgrading water distribution systems. As we see in detail in Chapter 10, government controls on prices make goods *more* scarce, not less, and it is generally the disadvantaged members of society who suffer the most as a result.

Myth 5: The ocean is too salty to drink. As a practical matter, prolonged consumption of saltwater by species not specifically adapted for it is highly deleterious. But the technology for desalination of seawater is advancing rapidly, and the cost of desalination is falling just as rapidly—more than 95 percent over the past twenty years. In relatively arid parts of the earth (including Southern California) desalination has become price-competitive with other sources of supply, and large-scale desalination plants are in operation around the world.

The process yields highly concentrated brine as a by-product. To avoid damage to ocean species that are sensitive to excess salinity, this brine must be dealt with carefully (dispersed widely) when it is returned to the sea. Nevertheless, this is simply a matter of routine care. Moreover, if local conditions make wide dispersal impractical or expensive, the brine can be evaporated, and the resulting solid materials then either used or disposed of in ordinary landfills. The upshot is that with continued technological progress in desalination, water from the ocean will likely become cheaper than collecting rainfall in large portions of the world. Far from running out of water, people everywhere will then find themselves able to secure it as easily as, well, turning on the tap.

DISCUSSION QUESTIONS

1. How much water do people "need"? Is your answer the same if you have to pay their water bills?
2. 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? Explain.

3. During the droughts that periodically plague California, farmers in that state are able to purchase subsidized water to irrigate their crops, at the same time that many California homeowners have to pay large fines if they water their lawns. Can you suggest an explanation for this difference in the treatment of two different groups of citizens in the state of California?

4. If allocating water through nonprice means generally harms society, can you suggest why governments often do this?