



Running on Empty

Worldwide population growth is sentencing millions to hydrological poverty.

BY LESTER R. BROWN

Now that drought in the United States, Ethiopia, and Afghanistan is in the news, it is easy to forget that far more serious water shortages are emerging as the demand for water in many countries simply out-runs the supply. Water tables are now falling on every continent. Literally scores of countries are facing water shortages as water tables fall and wells go dry.

We live in a water-challenged world, one that is becoming more so each year as 80 million additional people stake their claims to the Earth's water resources. Unfortunately, nearly all the projected 3 billion people to be added to the world's population over the next half century will be born in countries that are already experiencing water

shortages. Even now, many in these countries lack enough water to drink, to satisfy hygienic needs, and to produce food.

By 2050, India is projected to add 519 million people and China 211 million. Pakistan's population is projected to more than double, going from 151 million at present to 348 million. Egypt, Iran, and Mexico are slated to increase their populations by more than half. In these and other water-deficient countries, population growth is sentencing millions of people to hydro-

logical poverty, a local form of poverty that is difficult to escape.

Even with today's 6 billion people, the world has a huge water deficit. Using data on over-pumping for China, India, Saudi Arabia, North Africa, and the United States, Sandra Postel, author of *Pillar of Sand: Can the Irrigation Miracle Last?*,¹ calculates the annual depletion of aquifers at 160 billion cubic meters or 160 billion tons. Using the rule of thumb that it takes 1,000 tons of water to produce one ton of grain,

this 160-billion-ton water deficit is equal to 160 million tons of grain or one-half the annual U.S. grain harvest.

With an average world grain consumption of just over 300 kilograms or one-third of a ton per person per year, this would feed 480 million people. In other words, 480 million of the world's 6 billion people are being fed with grain produced with the unsustainable use of water.

Rising Demand

Overpumping is a new phenomenon largely confined to the last half century. Only since the development of powerful diesel and electrically driven pumps have we had the capacity to pull water out of aquifers faster than it is replaced by precipitation.

Some 70 percent of the water consumed worldwide—including what is diverted from rivers and pumped from underground—is used for irrigation, some 20 per-

cent for industry, and 10 percent for residential purposes. However, as competition for water among sectors becomes increasingly intense, agriculture almost always loses. The 1,000 tons of water used in India to produce 1 ton of wheat worth perhaps \$200 could instead be used to expand industrial output easily by 50 times as much, or \$10,000. This ratio helps explain why, in the American West, the sale of irrigation water rights by farmers to cities is an almost daily occurrence. (See "Western Groundwater Wars" in this issue of FORUM.)

Urbanization and industrialization also expand the demand for water. In developing countries, as villagers who traditionally rely on the village well move to urban high-rise apartment buildings with indoor plumbing, their residential water use can easily triple. Industrialization takes even more water than urbanization.

Rising affluence in itself generates additional demand for water. As people move up the food chain—consuming more beef, pork, poultry, eggs, and dairy products—they use more grain. A U.S. diet rich in livestock products requires 800 kilograms of grain per person a year, whereas diets in India, dominated by a starchy food staple such as rice, typically need only 200 kilograms. Using four times as much grain per person means using four times as much water.

Importing Water

Once a localized phenomenon, water scarcity is now crossing national borders via the international grain trade. The world's fastest growing grain im-

port market is North Africa and the Middle East, an area that includes Morocco, Algeria, Tunisia, Libya, Egypt, and Iran. Virtually every country in this region is simultaneously experiencing water shortages and rapid population growth.

As the demand for water in the region's cities and industries increases, it is typically satisfied by

be fought over water than oil. Perhaps, but given the difficulty in winning a water war, the competition for water seems more likely to take place in world grain markets. The countries that will win in this competition will be those that are financially strongest, not those that are militarily strongest.

The world water deficit grows larger each year, making it increas-

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diverting water from irrigation. The loss in food production capacity is then offset by importing grain from abroad. Since one ton of grain represents 1,000 tons of water, this becomes the most efficient way to import water.

Last year, Iran imported 7 million tons of wheat, eclipsing Japan to become the world's leading wheat importer. This year, Egypt is also projected to move ahead of Japan. Iran and Egypt have nearly 70 million people each, and their populations are increasing by more than a million a year, pushing the limits of their water supplies.

The water required to produce the grain and other foodstuffs imported into North Africa and the Middle East last year was roughly equal to the annual flow of the Nile River. That is, the fast-growing water deficit of this region is equal to another Nile flowing into the region in the form of imported grain.

It is now often said that future wars in the region will more likely

be fought over water than oil. If we decided abruptly to stabilize water tables everywhere by simply pumping less water, the world grain harvest would fall by some 160 million tons, or 8 percent, and grain prices would go off the top of the chart. If the deficit continues to widen, the eventual adjustment will be even greater.

Stabilizing Population

Unless governments in water-short countries act quickly to stabilize population and to raise water productivity, their water shortages may soon become food shortages. The risk is that water-short countries, including population giants China and India, with rising grain import needs, will overwhelm the exportable supply in countries with food surpluses such as the United States, Canada, and Australia. This, in turn, could destabilize world grain markets.

Another risk of delay in dealing with the deficit is that some low-

income, water-short countries will not be able to afford to import needed grain, trapping millions of their people in hydrological poverty and leaving them thirsty and hungry, unable to escape.

Although there are still some opportunities for developing new water resources, restoring the balance between water use and the sustainable supply will depend primarily on demand-side initiatives such as stabilizing population.

Governments can no longer

separate population policy from the supply of water. Just as the world turned to raising land productivity a half century ago when the frontiers of agricultural settlement disappeared, so it must now turn to raising water productivity. The first step toward this goal is to eliminate the water subsidies that foster inefficiency. The second step is to raise the price of water to reflect its cost. Shifting to more water-efficient technologies, crops, and forms of animal protein offers a huge potential for raising water

productivity. These shifts will move faster if the price of water more closely reflects its value. ■

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NOTES

1. Sandra Postel, *Pillar of Sand: Can the Irrigation Miracle Last?* (New York, NY: W.W. Norton & Company, 1999).