Supplying clean, safe water to a growing world population

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The challenge of supplying clean, safe drinking water to an expanding world population comes down to money, MIT economist Franklin Fisher says: We are surrounded by water—it covers 71 percent of Earth's surface—and industrial-scale desalination has operated successfully around the world for many years.

"Every country with a seacoast can have as much water as it wants, if it is willing to incur the costs," Fisher, the Jane Berkowitz Carlton and Dennis William Carlton Professor Emeritus of Economics, said yesterday in opening remarks at MIT's first-ever Water Summit, organized by the student-run MIT Water Club.

Of course, the reality is not so simple: Desalination costs are still high, and not everyone lives near a seacoast—so getting the water where it's needed, when it's needed, can be prohibitively expensive. Policymakers, farmers, business leaders, and ordinary people around the world face difficult choices and tradeoffs in meeting their basic needs for water.

In parched but wealthy regions, such as around the Persian Gulf, desalination is already the solution of choice: Saudi Arabia gets half its potable water that way, and in Dubai the figure is 90 percent, according to Leon Awerbuch, president of Leading Edge Technologies, who spoke on the first of four panels at the summit. But in less affluent regions, that may not be a viable solution.

Water-supply systems tend to have high upfront costs, and there has

been regional controversy about the ownership of such systems: in some places, publicly owned and provided at a subsidized cost; in others, privatized and sold at a profit. But according to Lawrence Susskind, the Ford Professor of Urban and Environmental Planning at MIT, "It's not useful to think of public versus private; everything has got to be thought of as partnerships."

Freshwater makes up just 2.5 percent of the planet's water, explained Kenneth Strzepek, a research scientist at MIT's Joint Program on the Science and Policy of Global Change. Of that small fraction, more than 98 percent is either frozen, in glaciers or icecaps, or is underground. Humans use about 15 percent of the planet's surface freshwater—70 percent of that for agriculture, 20 percent for industry (most of that for producing electricity), and 10 percent for domestic use.

Few uses of water actually use it up. "Very little is consumed," Strzepek said. "Mostly it's just dirtied up and put back"—either as with agricultural runoff or treated sewage, or by being heated up in an industrial cooling system and then dumped back in a river or lake at a higher temperature.

Virtually all of the world's major rivers now have their flows allocated, by agreement, among different municipalities and users: Some, such as the Colorado River, never make it to the ocean at all, and others, like China's Yellow River, run dry for several months each year.

These issues are only going to get worse with climate changes, and "these agreements assume amounts of water that aren't going to be there," Susskind said. In most places, "there is no involvement of civil society in making or changing these agreements."

But there are ways of addressing some existing or expected shortages of water: Timothy Griffin, director of the Agriculture, Food and

Environment Program at Tufts University, pointed out that a staggering 25 percent of water used in the United States goes to produce food that ends up being wasted, so more efficient distribution and use of food could have a significant impact.

Since energy production is a major consumer of water in the U.S., "the choices we make often have implications on both sides," said Kenneth Kimmel, commissioner of the Massachusetts Department of Environmental Protection. In some places, installing a desalination plant can be more energy-efficient than pumping water from afar. (In southern California, those costs are now about equal). But the energy for that plant may come from a coal-fired power plant, which uses water and generates emissions that could contribute to climate change and future drought.

Already, some power plants must shut down occasionally because the rivers they depend on for cooling are sporadic. Plants that use cooling towers, where water is evaporated and then recondensed, use up to 100 times less water than once-through cooling systems, explained John Rogers, a senior energy analyst at the Union of Concerned Scientists. And new air-cooled designs can essentially eliminate the need for water—but can have problems meeting the cooling needs on hot days. "It doesn't work as efficiently on days when you need it most," he said.

MIT President L. Rafael Reif shared sentiments that were read at the event, praising the MIT Water Club for its initiative in tackling the issue. "Traveling internationally over the last few weeks, I have encountered tremendous enthusiasm for MIT's activities around water, from technology to policy," Reif wrote. "The world needs you! So keep up the good work!"

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