

# How do we cope with demands for water as we enter an era of scarcity?

October 22 2018, by edmund L. Andrews

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The Hetch Hetchy Reservoir provides water to millions of people in the San Francisco Bay Area. Credit: Stocksy/Lucas Saugen

Urban water systems in California and elsewhere face a time of reckoning, warns Richard Luthy, professor of civil and environmental engineering at Stanford.

Groundwater aquifers are being depleted and rivers are drying up, even as demand for water keeps climbing. Yet cities can no longer meet society's thirst by importing more water from far away. Luthy, however,

is optimistic. As director of the National Science Foundation's ReNUWIt effort—short for Re-Inventing the Nation's Urban Water Infrastructure—he helps to develop alternative sources through wastewater recycling, stormwater capture and desalination.

"We will have to make big investments, just as we had to make big investments a century ago in dams and aqueducts," he says. "But with good decisions, we should be in good shape."

We sat down with him to get his view on the big picture.

## **Is California entering an era of water scarcity?**

Yes. We have more people, more jobs and more prosperity, and with all that we need more water. When the state's population was smaller, that water could be supplied from somewhere else. But for many reasons, importing water can't meet the demands of the 21st century.

We are also affected by climate change. More precipitation in the Sierras is falling as rain rather than snow, and that will change how we use dams and reservoirs. Historically, we used our water system both to control floods and to store water, and these needs used to occur at different times. During the heavy rains in early winter, we could use the system for flood control. By the time the snow melted in late spring, we could switch our focus to storage. But if we get more rain and less snow, that makes the timing difficult as we try to manage the system to meet these different needs of flood control and water storage. Also, climate change seems to be bringing greater extremes—drier dry periods punctuated by a very wet year.

## **What about groundwater depletion and de-watering rivers?**

In the 20th century we pumped more groundwater than was being replaced, particularly in the agricultural areas. Those days are over. The Sustainable Groundwater Management Act of 2014 requires that we manage our aquifers sustainably. Think of it like a checking account—you make deposits and withdrawals, but you can't go into a deficit. Different regions of the state have to come up with local sustainability plans by 2022 and attain sustainability by 2040 or 2042.

Major metropolitan areas like Santa Clara County, Orange County and Los Angeles already have plans, but the agricultural areas do not. I believe the law will be enforced, and that the state will do the job if local districts don't. This is a big deal.

Environmental sustainability also means leaving enough water in rivers, streams, lakes and marshes. If you divert too much water, the river runs dry and cannot support fish and wildlife.

## **Is that what people mean about "giving the fish a voice"?**

California has a long-standing "Public Trust Doctrine," which holds that we have to protect the "common heritage" of streams, lakes, rivers and marshlands. Following a 1983 case about how Los Angeles was diverting water from Mono Lake, the California Supreme Court ruled that "common heritage" meant protecting recreation, aesthetic values and the ecology. The decision meant people had to leave more water for ecosystems and for fish.

Put all this together, and it means that we need to set aside more groundwater for our aquifers and more surface water for our rivers, streams and lakes—even though the state's population and economy are still growing. These aren't just challenges for California. The same issues

are arising in the Southwest, in Texas, in parts of Florida and in Atlanta. We are experiencing it first, but we're hardly alone.

## **How can we cope?**

One important way is by reusing water. There are two types of water reuse schemes: potable and non-potable. Let's start with the easier task.

Here on the Stanford campus, we are studying energy-efficient ways to recycle water, which would then run through separate pipes and serve non-potable uses such as irrigation. We get our potable water from the Hetch Hetchy Reservoir, and it's ideal for reuse and irrigation. Recycling water to make it fully drinkable is possible but it requires extra steps. One exciting opportunity is through indirect potable reuse. The state is doing this now in Orange County. We take used water and treat it to the point where it's nearly potable. Then we put it back into the ground, where it stays for some time and mixes with the existing groundwater. From there, the water takes an indirect route to your tap. Redwood City is considering this idea of advanced water treatment for indirect potable water reuse. The Santa Clara Valley Water District is thinking about the same thing. San Jose, Palo Alto and Sunnyvale have their own ideas.

We can learn from all of these efforts, but we should also be thinking of regional solutions. In the 21st century, we simply won't be able to import all the water we want from other places. We'll have to augment the water we get from reservoirs like Hetch Hetchy with recycling, stormwater capture, desalination and other strategies.

**A lot of your work is on management and planning—how to integrate different systems. Can you talk about that?**

We have to make investments, just as we had to make big investments a century ago in dams and aqueducts. But we have to do things differently. We can reclaim water where the water is needed. If you re-use water, you can do it in a decentralized plant that is more compact and more energy efficient. But to make investments on the scale of hundreds of millions of dollars, we need to figure out the most cost-effective way. Cities and water districts need to realize that it's crucial to work together. I'm helping Bay Area water suppliers start laying the plans for a reliable regional [water](#) supply. One challenge is to figure out how to make investments that work for all the various groups. I'm an optimist, but our thinking will have to become more regional and less parochial.

Provided by Stanford University

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