

Feature: Conservation, Climate, Earth

## More than 2 billion people lack safe drinking water. That number will only grow.

*As populations grow and climate change shrinks freshwater stores, water scarcity takes center stage*

By Alexandra Witze 7:00am, August 16, 2018



**THIRSTY WORLD** A child drinks water at a well in South Sudan, a country in which only half the population has ready access to clean drinking water.

Stefanie Glinski/AFP/Getty Images

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**F**reshwater is crucial for drinking, washing, growing food, producing energy and just about every other aspect of modern life. Yet more than 2 billion of Earth's 7.6 billion inhabitants lack clean drinking water at home, available on demand.

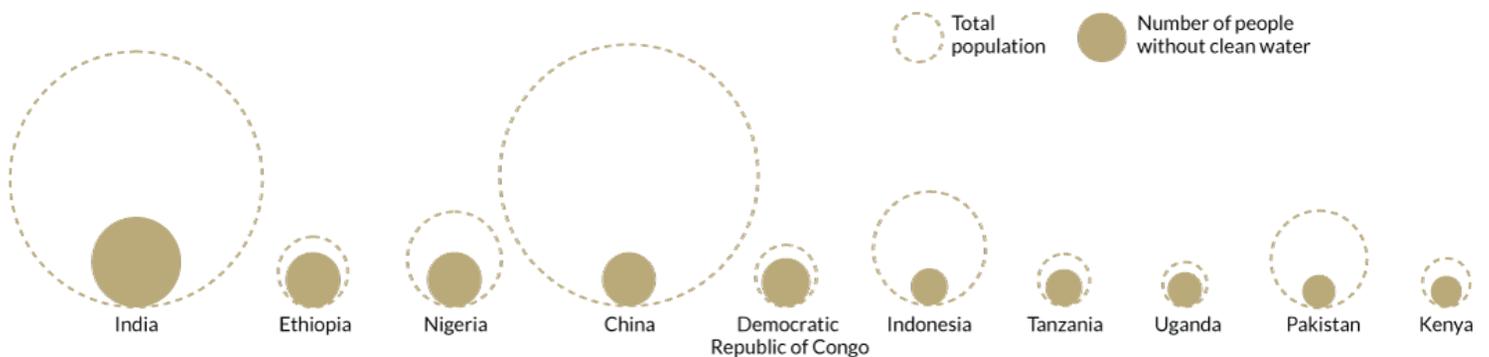
A major United Nations report, released in June, shows that the world is not on track to meet a U.N. goal: to bring safe water and sanitation to everyone by 2030. And by 2050, half the world's population may no longer have safe water.

Will people have enough water to live?

Two main factors are pushing the planet toward a thirstier future: population growth and climate change. For the first, the question is how to balance more people against the finite amount of water available.

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## Top 10 countries with lowest access to clean water near home



E. Otwell

Sources: *The Water Gap: State of the World's Water 2018*/WaterAid; *The World Bank*

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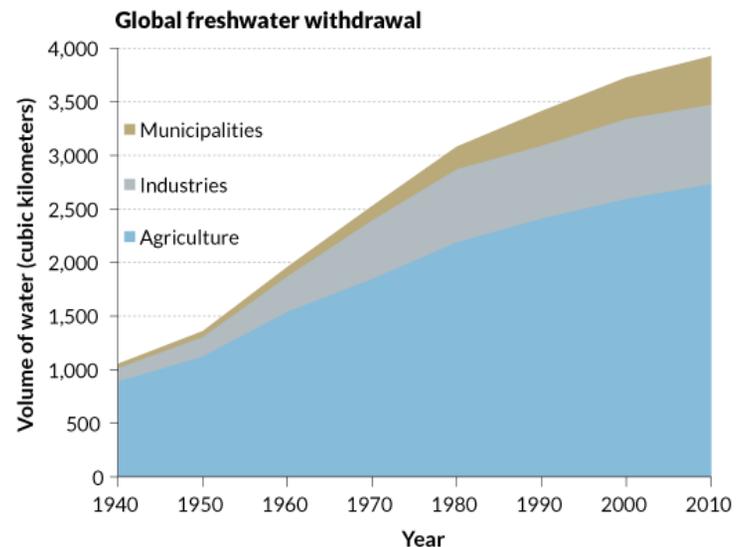
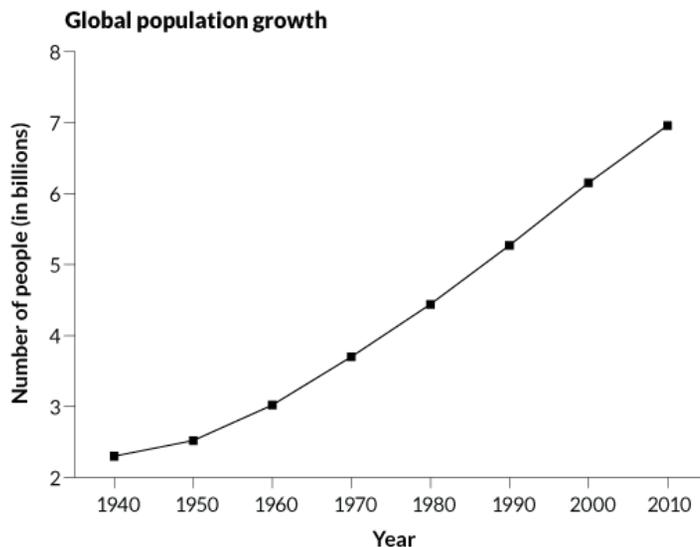
India has improved water access in rural areas, but remains at the top of the list for sheer number of people (163 million) lacking water services. Ethiopia, second on the list with 61 million people lacking clean water, has improved substantially since the last measurement in 2000, but still has a high percentage of total residents without access.

Short of any major but unlikely breakthroughs, such as new techniques to desalinate immense amounts of seawater (*SN*: 8/20/16, p. 22), humankind will have to make do with whatever freshwater already exists.

Most of the world's freshwater goes to agriculture, mainly to irrigating crops but also to raising livestock and farming aquatic organisms, such as fish and plants. As the global population rises, agricultural production rises to meet demand for more varied diets. In recent decades, the increase in water withdrawal from the ground or lakes and rivers has slowed,

whether for agriculture, industries or municipalities, but it still outpaced the rate of population growth since 1940.

## Water withdrawal is outpacing population growth



E. Otwell

Sources: AQUASTAT/FAO; I.A. Shiklomanov/Water International 2000

That means every drop is increasingly precious — and tough choices must be made. Plant your fields with sugarcane to make ethanol for fuel, and you can't raise crops to feed your family. Dam a river to produce electricity, and people downstream can no longer fish. Pump groundwater out for yourself, and your neighbor might just want to fight over it. Researchers call this the food-water-energy nexus and say it is one of the biggest challenges facing our increasingly industrialized, globalized and thirsty world.

“There just isn't enough water to meet all our needs,” says Paolo D'Odorico, an environmental scientist at the University of California, Berkeley whose team analyzed [the food-water-energy nexus](#) in a paper published online April 20 in *Reviews of Geophysics*.

Overall, the energy sector is expected to consume more and more water in decades to come. And sometimes what sounds like a good idea — such as switching to renewable energy sources to reduce carbon emissions — might help in one area but hurt in another. For example, it can take more water to grow biofuel crops than to consume fossil fuels.

# Water consumption\*\* by energy sector

E. Otwell

*\*\* Water consumption is defined as water that is used and not returned to its source. These projections are based on nations' stated commitments to phase out fossil fuel subsidies and reduce emissions of greenhouse gases.*

*Source: World Energy Outlook 2016 Special Report: Water-Energy Nexus/IEA*

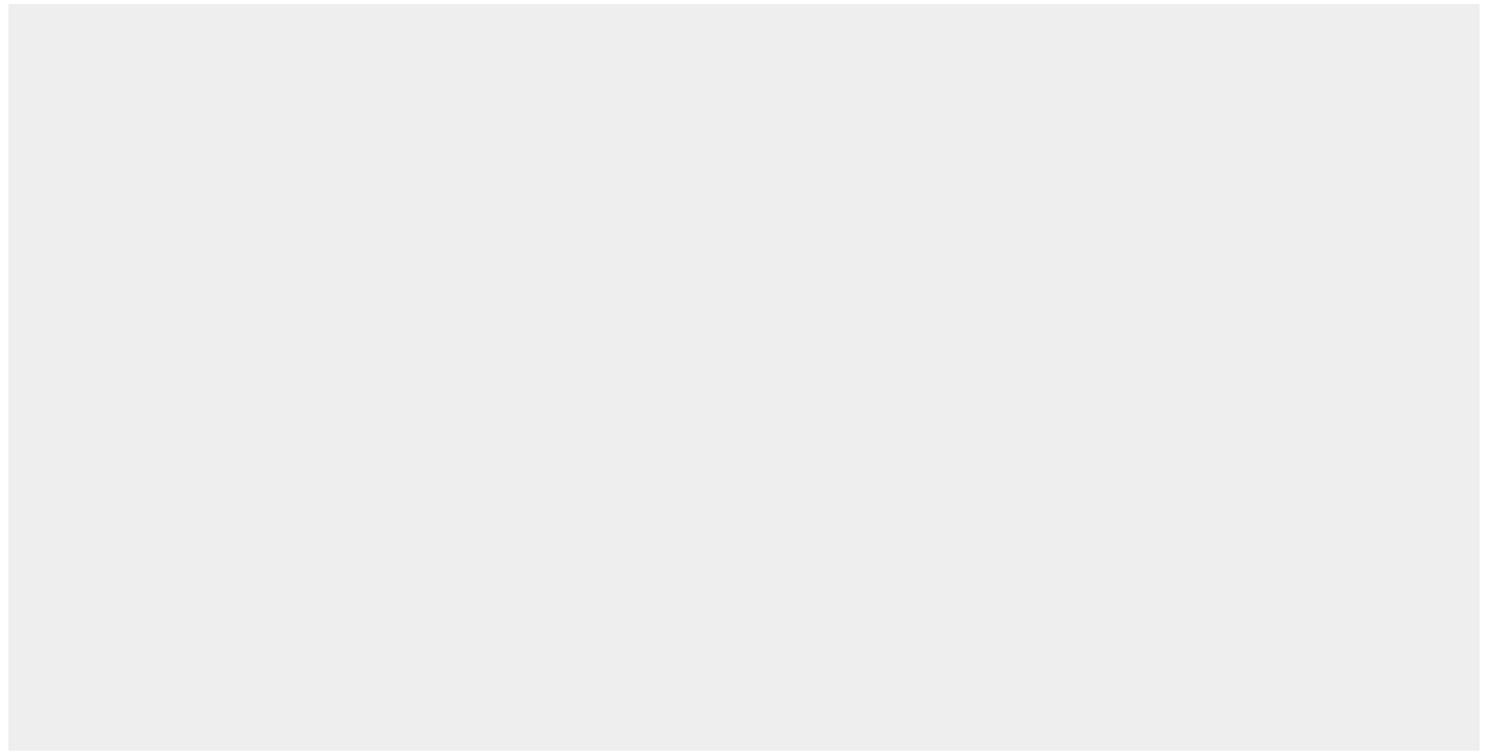
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Then there's climate change. As greenhouse gases build up in Earth's atmosphere, trapping heat and altering the planet's weather and climate, water will become more precious. Rising global temperatures alter weather patterns and change how water cycles between the ground and the atmosphere. Freshwater stores can shrink. Extreme events, such as flooding and drought, are becoming more common on our warming planet (SN: 1/20/18, p. 6). That means more water in places where people don't need it, and less water where they do.

The map below shows how water stress — the ratio of water use to water supply — is expected to look by the year 2040. It assumes a “business-as-usual” scenario in which carbon emissions rise steadily. The highest stress is expected in areas where water supply is vulnerable because of already arid climates and growing populations.

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# Water stress by country in 2040



*Aqueduct Water Stress Projections/World Resources Institute*

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Cities will bear the brunt of future water shortages. Early this year, it looked as if the more than 4 million people living in Cape Town, South Africa, were going to run out of water. Officials calculated a “Day Zero” in April when the taps would run dry. Only through belated and desperate conservation measures, such as slashing the amount of water for irrigating crops, did city residents eke through until the rainy season began in May. That Cape Town crisis is almost certainly the first of many.

By 2050, some 3.5 billion to 4.4 billion people around the world will live with limited access to water, more than 1 billion of them in cities. Among 482 cities, more than a quarter will face demands that outpace supply, according to a study that analyzed water sources and demands. In general, urban growth is the main driver of cities’ future water deficits. Los Angeles tops the list because its population is expected to boom even as climate change dries up its water sources. Cities will be worse off if other sectors get priority for water access.

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## Top 20 cities with the largest urban water deficits in 2050

E. Otwell

Source: M. Flörke, C. Schneider and R. McDonald/Nature Sustainability 2018

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In the face of such inexorable changes, it's easy to despair. But science offers hope, in the form of alternative paths forward. Computer modelers at MIT, for example, find that policies to fight climate change, such as the 2015 Paris agreement that the United States announced its intention to pull out of last year (*SN Online*: 6/1/17), can reduce the severity of future water shortages. If nations follow commitments similar to those in the agreement, 60 million people across Asia could avoid dire water scarcity by 2050, the team wrote in June in *Environmental Research Letters*.

But the Paris agreement is not enough. As research increasingly makes clear, there are trade-offs and decisions to be made. Cape Town's experience shows how governments need to better prepare for the competing demands on water supplies. Municipalities may need to raise the cost of water to the point where people value it enough to conserve it.

"We can address the problem by thinking about technological solutions, but we also have to think about changing our behavior," says Martina Flörke, a hydrologist and environmental scientist at the University of Kassel in Germany. "If we can make clear ... that water has value, that it's an ecosystem service that we use and have to take care of — then we are really thinking about how to adapt."

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*This article appears in the August 18, 2018 issue of Science News with the headline, "Thirsty World: Globally, more than 2 billion people lack access to clean water."*

## Citations

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## Further Reading

C. Martin. [To combat cholera in Yemen, one scientist goes back to basics](#). *Science News*. Vol. 192, August 19, 2017, p. 4.

T. Sumner. [New desalination tech could help quench global thirst](#). *Science News*. Vol. 190, August 20, 2016, p. 22.

T. Sumner. [Many of Earth's groundwater basins run deficits](#). *Science News*. Vol. 188, July 25, 2015, p. 13.

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