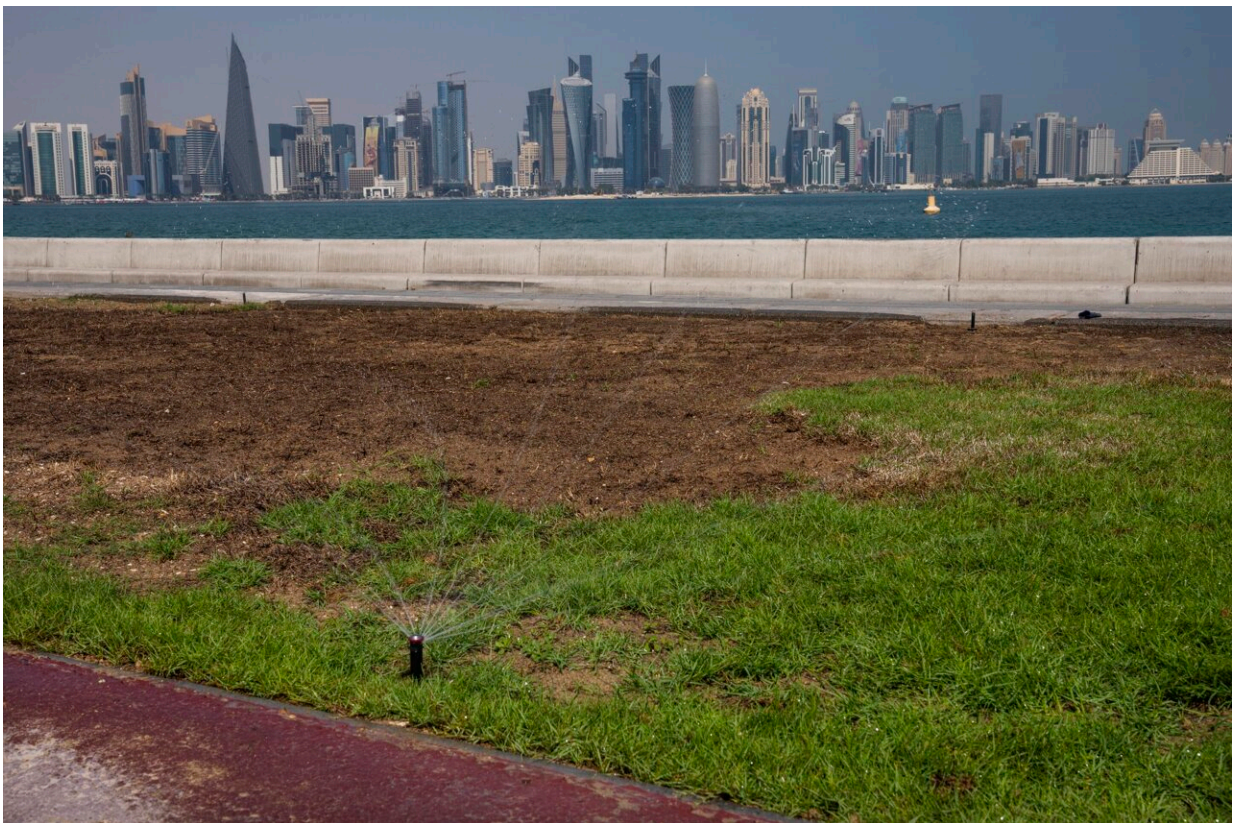


EXPLAINER: World Cup host Qatar relies on desalination

November 10 2022, by Suman Naishadham



A water sprinkler on the corniche, overlooking the skyline of Doha, Qatar, Wednesday, Oct. 19, 2022. World Cup host Qatar is among the world's most water-stressed countries. But it's a problem the tiny, wealthy Persian Gulf emirate has largely paid its way out of, thanks to expensive technology known as desalination that makes seawater drinkable. Credit: AP Photo/Nariman El-Mofty, File

Arid and surrounded by the salt waters of the Persian Gulf, World Cup host Qatar is among the world's most water-stressed countries. The nation of 2.9 million people has no rivers, and receives less than four inches (10 centimeters) of rain per year on average.

It's a condition the wealthy Persian Gulf emirate has largely paid its way out of, thanks to expensive technology known as [desalination](#) that makes seawater drinkable.

In doing so, Qatar isn't alone. Fellow Gulf Arab monarchies Bahrain, Kuwait, Oman, Saudi Arabia and United Arab Emirates also lack freshwater and depend on desalination. Israel does too. But the solution comes at a cost: Removing salt from seawater is energy-intensive, burning lots of fossil fuel. It also creates a byproduct that, when discharged into the ocean, can affect marine ecosystems.

Here's a look at the country's water supply and the role of desalination.

WHAT IS DESALINATION?

A process that makes freshwater, which humans can consume, from seawater.

Desalination plants draw water from the ocean through large pipes and blast it through fine membranes that allow [water molecules](#) to pass, but keep the salt out. That process is known as reverse osmosis.

There are other types of desalination but [reverse osmosis](#) is the most common. Inland brackish waters can also be desalinated.



A boy plays football in a park in Doha, Qatar, on May 4, 2019. World Cup host Qatar is among the world's most water-stressed countries. But it's a problem the tiny, wealthy Persian Gulf emirate has largely paid its way out of, thanks to expensive technology known as desalination that makes seawater drinkable. Credit: AP Photo/Kamran Jebreili, File

WHERE IS IT USED?

Desalination plants are scattered along coastlines across the world, but the highest-capacity plants are located in high-income, water-starved Middle Eastern countries with ample coastline, such as Saudi Arabia, the United Arab Emirates and Israel. Saudi Arabia is home to the world's largest plant.

Reverse osmosis technology has been around since the 1950s. Gulf Arab nations were among the first to embrace it. After soaring oil revenues in the 1970s and '80s transformed them into some of the world's wealthiest countries, they began investing heavily in the infrastructure. Israel got serious about desalination in the late 1990s following a severe drought.

There are nearly 16,000 desal plants worldwide, according to a [2019 estimate](#) by researchers at the United Nations' Water and Human Development Program. About half the water they produce is in the Middle East and North Africa.

Qatar is highly reliant on desalinated water from the Persian Gulf. The desalted water makes up about 60% of its total supply and nearly all of its household water, according to 2019 data from the country's planning and statistics authority. The government heavily subsidizes water for its residents. Groundwater makes up an additional quarter of the country's supply and is mostly used by farms. It is over-pumped and rapidly depleting.

WHAT ARE THE ENVIRONMENTAL CONCERNS?

Desalting [ocean water](#) at scale uses a good amount of energy. Often, the electricity comes from burning fossil fuel.

"It simply takes a lot of energy to pull salt out of water," said Peter Gleick, president emeritus of the California-based Pacific Institute, who has studied [water resources](#) for decades.



A man sleeps on a bench before his early morning shift, in front of Khalifa International Stadium, in Doha, Qatar, on Oct. 15, 2022. World Cup host Qatar is among the world's most water-stressed countries. But it's a problem the tiny, wealthy Persian Gulf emirate has largely paid its way out of, thanks to expensive technology known as desalination that makes seawater drinkable. Credit: AP Photo/Nariman El-Mofty, File

The process has become more efficient in recent decades. But it still takes between 3.5 and 4.5 kilowatt hours of electricity to desalinate 264 gallons (1,000 liters) of water, according to an 2019 [analysis by Korea University researchers](#) of more than 70 large-scale facilities. A U.S. refrigerator uses about 4 kilowatt hours of electricity per day.

Then there's the brine, or highly salty sludge left behind by the filtration.

Some facilities dispose of it on land or inject it underground. But most desalination plants send it back into the ocean. Some dilute it before doing so.

Brine also often contains [heavy metals](#) and chemicals used to treat seawater on the front-end. Its [high salinity and temperature](#) can hurt seaweed, coral reefs and seagrass habitats. Worldwide, Saudi Arabia, the UAE, Kuwait and Qatar account for [55% of desalination brine](#), according to researchers at the U.N. Water and Human Development Program.

WHAT ABOUT WATER FOR THE WORLD CUP?

Qatar expects to increase its water supply by 10% during the World Cup, a spokesperson from Kahramaa, the country's water and electricity utility said. That means it will draw from its large desalinated reserves and could even increase how much ocean water it filters each day, said Amin Shaban, a hydrologist at Lebanon's National Council for Scientific Research and expert on Middle East water systems.

That water will be used to accommodate an expected 1.2 million fans and maintain thousands of acres of grass grown for soccer fields and training sites.

The energy cost of desalination and Qatar's heavy reliance on it add to questions about [Qatar and FIFA's promise](#) that the World Cup will have almost no effect on the climate.

Officials respond that toilets and dust control in the eight World Cup stadiums are using recycled water. But the actual soccer fields that groundworkers have been watering for months—including through the country's blistering hot summer—are using desalinated water.

"The water footprint will increase," for the World Cup, said Mohammed Mahmoud, director of the climate and water program at the Middle East Institute think tank. He said the increase would still not rival the [water](#) used by Qatar's farm sector, however. "They're nowhere near the same scale."

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