

Qatar's fight for future water security

Qatar is possibly the most water-stressed country on Earth. According to a recent report from the U.S. World Resources Institute, it is one of 17 countries classified as suffering from extremely high water stress. In those countries, demand from agriculture, municipalities, and industry uses more than 80% of the available freshwater supply, making those nations vulnerable to even temporary shifts in rainfall patterns.

A history linked to water and oil

Water—how to get it and how to manage it—has been a major concern for all of Qatar's history. An arid country, Qatar averages just 82 mm of rainfall annually. As recently as the 1950s, a British observer noted that "Doha was a big village in which everyone knew one another ... There was hardly enough water for washing or cooking, and the little there was came from wells in the desert, which we used to boil and filter."¹

Discovery of vast natural gas and oil resources led to a dramatic change in Qatar's way of life. When Qatar gained independence in 1971, its population was just under 120,000. Now, many of its 2.8 million people live in conditions that would be utterly unrecognizable to those alive in the 1950s. With rapid development has come dramatic growth in water use: 595 L per capita per day in 2018, roughly on par with the United States.

Qatar's first desalination plant was commissioned in 1953, and water was stored and delivered to consumers in tankers. Despite the Gulf nation's ever-increasing investment in desalination plants (that today supply 98% of the country's potable water), until recently it had just three days' supply in reserve. So it's no surprise that improving water security has been one of the country's top strategic goals.

Its plans to improve water security include massive infrastructure projects to boost water storage and management. The state utility, Qatar General Electricity and Water Corporation (Kahramaa), in 2018 opened the world's largest potable water mega-reservoir, which increased the country's reservoir capacity by 155%. Consisting of

15 concrete reservoirs, each holding up to 100 million gal. and situated at five sites connected to desalination plants by 650 km of large-capacity pipes, the \$4 billion project is designed to ensure seven days of reserve supply through 2026. Future expansion plans will increase capacity to 40 reservoirs holding a total of 4 billion gal.

Innovation as a solution

As demand for water continues to increase, innovative thinking is required to bring the goal of increased water security within reach. "It's key to tackling the country's water budget," says Dr. Huda Al-Sulaiti, senior research director at the Qatar Environment and Energy Research Institute (QEERI) and head of its water program. "Our work focuses on water resources as well as new materials and methods to make it more sustainable and more efficient to produce the water we need."

In addition to rising demand from a growing population, there is an increasing need to support expanded food production. Agriculture has been the country's biggest user of scarce groundwater resources. The aquifer under Qatar is shared with neighboring Saudi Arabia and Bahrain, with recharge rates across the region far lower than extraction rates, causing the water table in the area to drop by about a meter per year.

Groundwater is being extracted for irrigation to grow crops and fodder for livestock at a rate of more than 220 million m³ per year. Treated wastewater is injected to help replenish the aquifer and makes up about 20% of the water used by the agricultural sector, but is insufficient to balance extraction rates.

In recent years, the situation has become even more challenging. In June 2017, neighboring countries Saudi Arabia, Bahrain, and the United Arab Emirates, along with Egypt, imposed an economic and trade blockade on Qatar. This disrupted existing supply chains for a wide variety of imported staples, including meat, vegetables, and dairy products. In response, Qatar worked to quickly increase its own food production by, for example, importing dairy cows that are housed in air-conditioned enclosures.

