

GULF ANALYSIS PAPER



SUMMARY

The GCC's abundant oil wealth has allowed governments to make water seem plentiful. But growing water demand and the costs of meeting it could constrain governments' abilities to adapt to new economic challenges. Without comprehensive reform, water use could become a bottleneck for long-term progress in the GCC.

KEY FACTS

- The GCC has a fifth as much renewable water as the rest of the Middle East, but non-renewable sources of water have largely closed this gap.
- The GCC accounts for nearly 60 percent of global desalination capacity, and water demand is rising as quickly as 8 percent per year in some countries.
- The average GCC country uses 70 percent of its water for irrigation, but derives only one percent of its GDP from agriculture.

Scarcity and Strategy in the GCC

by Michael Dziuban

One of the Gulf Arab region's most pressing challenges over the next several decades relates not to national defense or conventional warfare, but to water. Policymakers traditionally think of the GCC in terms of defense sales and security umbrellas, and international conflict in the region remains a possibility. However, water scarcity and the domestic strains it will create are a certainty.

The GCC's water challenge is twofold. On the one hand, water is naturally scarce in the arid climate of the Arabian Peninsula. To provide enough water for human consumption, countries have to spend huge amounts of money and energy to desalinate seawater—and in some cases to pump it far inland. As populations continue to grow along with domestic demand for energy, current levels of investment in desalination and infrastructure will not suffice.

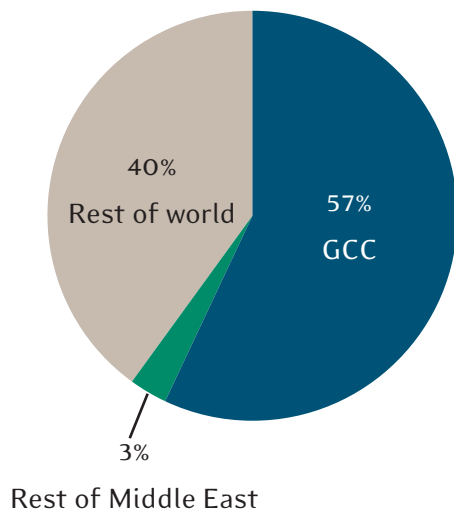
However, many GCC leaders and populations use water in a way that suggests they believe the resource is infinite. Agriculture, for example, accounts for almost 90 percent of water use in some GCC countries.¹ In some areas, people even use desalinated water for agriculture, as well as other activities like home landscaping and car-washing. Around the GCC, water metering and pricing are not robust enough to hold people accountable for how they use water. The fact that water is virtually free reinforces the public perception that it will never run out.

While GCC countries may never go completely dry, they will find it increasingly difficult to process and supply water under current assumptions of cost and availability. As these assumptions falter, so too will assumptions about how nations can continue to grow and develop in the long term. Governments have spent huge amounts of money and energy providing water, but sustaining such a high level of invest-

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In conjunction with its Gulf Roundtable series, the CSIS Middle East Program writes periodic policy papers addressing key economic and security issues in the Gulf region. The reports are distributed prior to a corresponding Gulf Roundtable to help inform the debate and generate discussion. Launched in April 2007, the Gulf Roundtable series convenes monthly and assembles a diverse group of regional experts, policymakers, academics, and business leaders seeking to build a greater understanding of the complexities of the region and identify opportunities for constructive U.S. engagement. Topics for discussion include the role of Islamist movements in politics, the war on terror, democratization and the limits of civil society, the strategic importance of Gulf energy, media trends, trade liberalization, and prospects for regional integration. The roundtable defines the Gulf as the United Arab Emirates, Saudi Arabia, Oman, Qatar, Bahrain, Kuwait, Iraq, and Iran and is made possible in part through the generous support of the Embassy of the United Arab Emirates. ■

Figure 1: Global desalination capacity



Sources: Banque Saudi Fransi; Escobar and Schäfer; World Bank.

ment could keep them from sustaining other economic initiatives with more long-term strategic value.

WATER SUPPLY AND SCARCITY

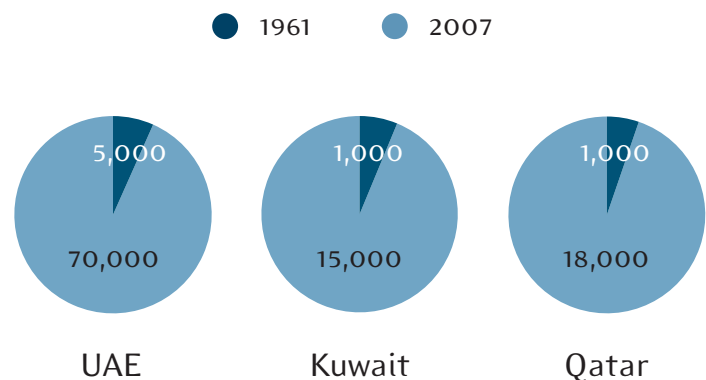
Water use in the GCC is the product of both remarkable scarcity and remarkable development. The GCC has about a fifth as much renewable water on average than the rest of the Middle East, but desalination and non-renewable aquifers have largely closed this gap.² They have done so at a remarkable rate: between 1970 and 2005, water demand in the GCC grew 30 percent faster than the region's population.³

The costs of boosting supply have been equally significant. The UAE, for example, has at times spent over \$3 billion per year on the production of desalinated water,⁴ and Qatar spent about \$46,000 per Qatari citizen on desalinated water and power production in the last decade.⁵ Desalination infrastructure has also brought high costs. Saudi Arabia, for example, spent about \$17 billion building desalination plants through 2008, and recently spent an additional \$4 billion on a single new plant for desalination and electricity generation.⁶ Due to investments like these, the GCC now accounts for more than half of global desalination capacity, with the Middle East as a whole representing a full 60 percent (figure 1).⁷

While they have been desalinating water for human consumption, many GCC countries have also been using groundwater for agricultural development, and the growth has been similarly immense. Saudi Arabia, for example, quadrupled its domestic food production during the 1980s and early 1990s,⁸ and at one point became the world's sixth-largest exporter of wheat.⁹ Even countries much smaller than the kingdom have witnessed remarkable expansion in irrigation, often for municipal landscaping and urban beautification. Qatar, for example, expanded its arable land area 18 times over between 1961 and 2007; the UAE and Kuwait expanded theirs by factors of 14 and 15 respectively (figure 2).¹⁰ As petroleum made profound levels of wealth available to the GCC states, leaders came to see domestic irrigation as a way of distinguishing their own prosperous nations from underdeveloped countries unable to manage their natural environments.

As the scale of agricultural and municipal water use continues to grow, however, the signs of water scarcity are becoming all too clear. Saudi Arabia, for example, has been forced to move much of its grain production abroad because the finite aquifer water it once used is severely depleted. Meanwhile, some Saudi farmers pushed away from wheat have switched to fodder crops that require as much as 16 times the amount of water that wheat does,¹¹ suggesting that the kingdom's limited groundwater may only continue to disappear. Saudi Arabia also still maintains the world's largest integrated dairy farm, which pours 2,300 gallons or more of finite

Figure 2: Arable land in the GCC, 1961-2007 (hectares)



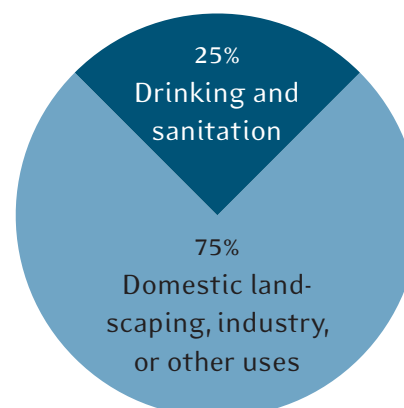
Source: World Bank.

aquifer water into producing a single gallon of milk.¹² Other countries such as Qatar are responding to groundwater shortages by pouring precious desalinated water into domestic agriculture, creating a huge additional demand for desalination that the state will have to meet by building additional energy-intensive plants.¹³ Still elsewhere, as in the UAE, aquifers are becoming too deep and too salty to use for agriculture, but governments still lack a declared policy against using desalinated water for growing crops. Some farms have been known to use desalinated water for actual cultivation,¹⁴ and some experts estimate that only 25 percent of Abu Dhabi's desalinated water is used inside the home for drinking and sanitation (figure 3).¹⁵

As these practices grow, industries and populations continue to boom as well. Overall, GCC countries are facing enormous investments to keep pace with growing water demand. In the emirate of Abu Dhabi, for example, water demand has doubled over the past decade,¹⁶ and is projected to double again by 2030.¹⁷ In response to this trend and to rising demand elsewhere in the country, the UAE government will likely increase its yearly investment in building, operating and maintaining desalination plants four-fold over the next six years.¹⁸ Elsewhere, in Saudi Arabia for example, demand for desalinated water is growing along with electricity demand at 8 percent per year,¹⁹ and the kingdom plans to invest over \$50 billion in new and upgraded desalination plants over the next 15 years.²⁰ Qatar faces a similarly ambitious shift: in the next decade it plans to spend double the amount on desalination that it spent in the last decade.²¹ In these countries and others, generous subsidy policies keep water free and lead users to demand it even more intensely. Governments see little choice but to continue making huge investments in water provision, and their populations continue to expect nothing less.

Yet governments are only making water harder to provide in the future by using it so abundantly in the present. Water for agriculture is finite and will eventually disappear. Desalination will remain expensive, as it depends primarily on the cost of energy and does not benefit from economies of scale as technology advances.²² Desalination and domestic agriculture may seem affordable now, but the GCC's natural environment and the economics of water are straining governments' abilities

Figure 3: Uses of desalinated water in Abu Dhabi Emirate



Source: Abu Dhabi water expert #1.

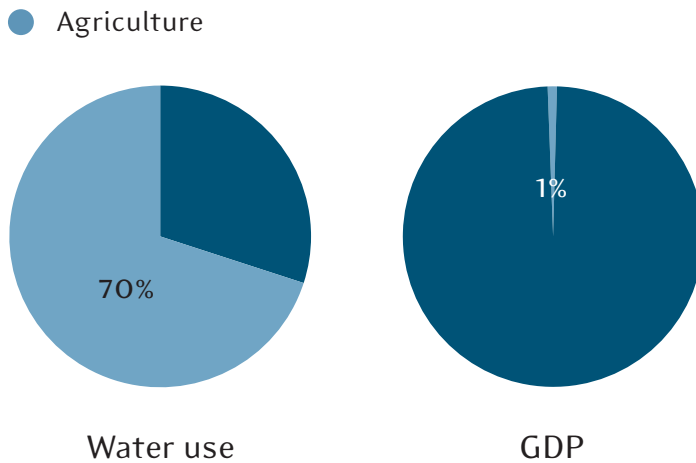
to maintain these practices indefinitely. People and governments continue to treat water as an infinite resource in an environment where it is naturally scarce, and governments are left to shoulder the rising costs that result.

WATER AND NATIONAL STRATEGY

Water has been an avenue for GCC countries to build crucial governance skills. Becoming adept at providing water has helped governments succeed in a harsh natural environment rather than merely survive it. While other Arab countries have struggled to tame floods and reverse droughts, GCC governments have ironically derived empowerment from their lack of naturally occurring freshwater. The seeming impossibility of hydrating large populations has galvanized governments to do precisely that, paving the way for the fulfillment of other ambitions. Yet the growing difficulties of providing water could make it harder for governments to think on such a large scale.

At the heart of the problem is the relationship GCC governments have built between their two most precious resources: petroleum and water. When it comes to these resources, the Gulf Arab region is one of stark contrasts: GCC countries have abundant oil to generate wealth, but very little water to sustain basic human life. This disparity has created a situation in which governments use the more plentiful resource to make the less plentiful one more accessible. "Turning oil into water," as historian Toby Jones puts it,²³ has become one of the most fundamental

Figure 4: Agriculture's share of water use and GDP in the GCC



Source: Authors' calculations based on FAO-Aquastat and CIA *World Factbook*.

aspects of GCC governance over the past four decades. This process by itself has created modern nations where developing countries once languished under poverty and hunger. Before GCC countries were lands of indoor ski slopes and sprawling man-made islands, giant crop pivots and thriving cities fed by desalinated water were the most important signs of governments' strength. In all of this, petroleum wealth has been so abundant that no amount of investment in water provision has been too ambitious. When it comes to water, GCC development has not been a matter of mitigating environmental constraints, but rather of conquering them decisively. Moreover, doing so has paved the way for GCC governments to set ambitious goals for other sectors like tourism, real estate, and industry. Turning oil into water has both signified governments' strengths and allowed those strengths to grow.

But just as oil and water differ in abundance, they also differ in kind. Scientists and economists may debate the limits of continued petroleum extraction, but total depletion is still far off, and in any case there are many alternative sources of energy well within GCC countries' means. Water is different. It is cheap in its natural state, but expensive to process and transport, and generates negligible wealth. In Saudi Arabia for example, water is billed at only 1 percent of the cost of production.²⁴ Around the GCC, agriculture contributes an average of

less than 1 percent to GDP but accounts for an average of 70 percent of water use (figure 4).²⁵ As water demand in the GCC increases, governments will be spending progressively larger sums of money on water provision without recouping their investments. The urgency of doing so may only increase as well. Water has no substitutes, and the scarcer it is perceived to be, the more precious a commodity it will become for both people and governments.

As this progression unfolds, its costs could challenge governments' abilities to plan their economic futures. While the oil boom that began in 2002 has enabled massive investments in real estate, construction, tourism and commercial ventures, it has also seen critical investment in economic diversification and human capital development. Two visions, old and new, drive this multifaceted progression. The old vision emphasizes vast physical growth and massive government spending; the new vision prioritizes private investment and development of the human capital that drives and sustains growth. GCC governments see the first vision as short-term security but the second as their only long-term option—yet their ability to transition from one to the other is still uncertain. GCC workforces are still dominated by expatriate labor, education systems still do not train enough native citizens to be competitive in their home economies, and private sector growth and foreign investment have proceeded in fits and starts.²⁶ Governments know what they must do to secure their economic futures, but so far they have had difficulty actually turning the vision into a reality.

Water scarcity makes reversing this trend both more urgent and more difficult. GCC countries are using water according to the old economic vision of boundless growth. Both agriculture and desalination hinge on the idea that GCC governments can conquer their natural environment regardless of cost. But the new vision of economic longevity and sustainability is leaving progressively less room for these sorts of assumptions, and growing water use could in turn put the new vision increasingly out of reach. GCC governments are making strategic investments on the assumption that oil depletion is their critical if far-off turning point, but water scarcity presents a much more immediate and persistent threat to the ability of GCC economies to evolve and endure.

The heart of the challenge is that desalination demand is set to increase on several levels, and with it the energy required to maintain water supplies. For one thing, domestic agriculture has severely depleted countries' finite groundwater resources. Agriculture itself may not evolve wholesale toward using desalinated water, especially in larger countries where water is more expensive to transport. But areas that have counted on aquifers to buttress their supplies of drinking water will increasingly require desalinated water to fill their needs. On another level, even where desalination is already a popular source of water, it is growing ever more so. And not only is water demand growth outpacing population growth in many countries, but the briny byproducts of desalination mean that desalinating the same quantities of water will require a growing amount of energy to begin with.²⁷

As these trends intensify, governments will have no easy choices for how to adapt. Desalination relies primarily on natural gas, which is an efficient resource but an increasingly hard one to obtain. Most GCC governments either import natural gas already or expect to start doing so in the near future. Even in countries with significant domestic gas reserves, extraction is often costly and geologically challenging.²⁸ As water demand continues to grow, it could magnify all these strains on natural gas to unprecedented levels.

Burning crude oil directly for desalination and power generation is a tempting alternative, but ultimately a

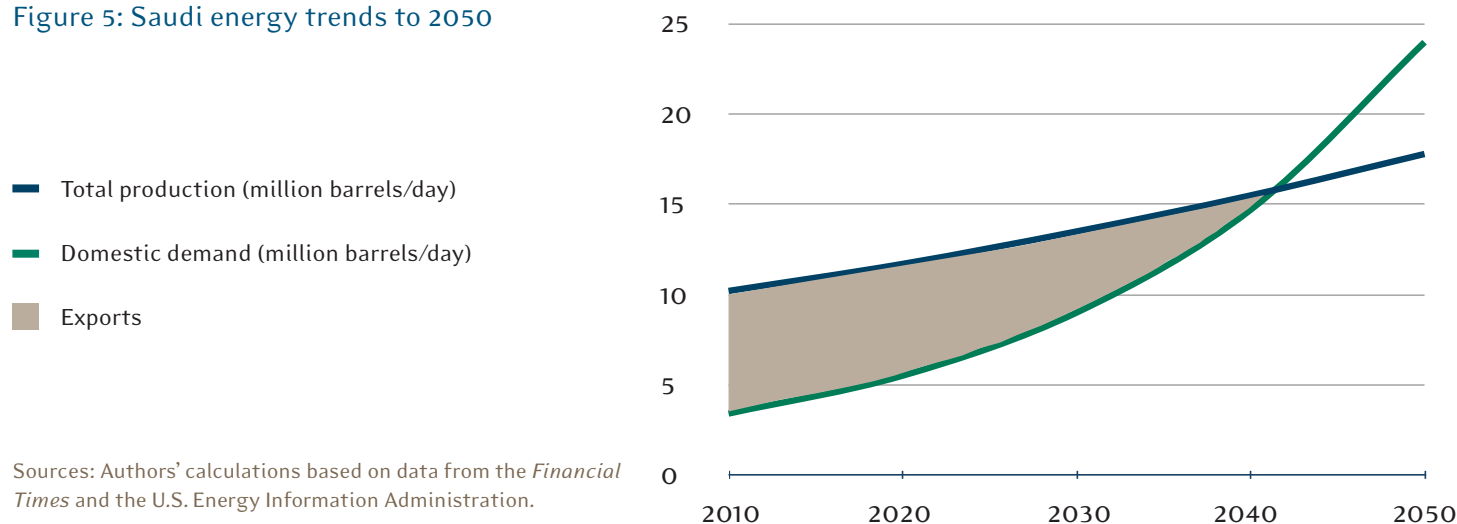
difficult one even for high-volume oil producers. Diverting oil for domestic use threatens governments' export revenues, and increasing production to make up for the loss also requires significant and steady investment. Other alternatives like nuclear and solar power are efficient but expensive, and no GCC country yet has the proper infrastructure to exploit them effectively.

Even for governments that can afford advanced technologies or provide seemingly infinite fossil fuels for desalination, other costs exist. Desalination carries significant capital requirements in addition to operating costs, and its brining effects on source water present environmental challenges that will only grow as desalination itself intensifies.

Ultimately, all these signs point to the emerging reality that the costs of producing abundant water are growing beyond governments' abilities to do so indefinitely. Governments will be expending more energy resources on water production, but will not be reaping anything in return as long as they keep water free for consumers. The sunk costs and opportunity costs of water production will increase dramatically, and GCC countries will find it harder to have both plentiful energy and plentiful water at the same time.

These costs could in turn constrain governments' abilities to adapt to new economic challenges. Some governments in the GCC still derive up to 95 percent of their revenues from the energy sector,²⁹ and the stay-

Figure 5: Saudi energy trends to 2050



ing power of new economic initiatives depends on the steadiness of this revenue stream. This dynamic could break down as water demand continues to limit the way governments allocate and exploit energy. GCC economic and financial frameworks are already difficult to manage given the volatility of energy markets, and water demand could introduce an even more persistent strain on governments' abilities to sustain strategic investments. In some countries, such as Saudi Arabia, the stakes could be very high. Should Saudi energy and water consumption continue to accelerate at their current rate—and every estimate suggests the growth will taper off—Saudi Arabia's domestic oil consumption would match its current production by around 2040 (figure 5).³⁰

For a group of countries that already find it difficult to maintain progress on a range of strategic economic initiatives, water scarcity could divert even more of governments' attention and finances away from making plans for the future. In other words, water scarcity could make it much harder than it already is for GCC governments to focus on the important rather than the urgent—to implement new economic visions rather than fall back on old ones. The GCC's economic future hinges on this ability to parlay past gains into something new and sustainable. Water scarcity could make it much more difficult to achieve this in the coming years.

Overall, the challenges water presents highlight an uncomfortable yet important truth about governance in the GCC: past successes are ripe for future consolidation but also have the potential to create future vulnerabilities. For decades, providing abundant water meant governments were competent. Now, the definition of competence is changing fundamentally, and the way governments use water is constraining their ability to adapt to this shift.

RECOMMENDATIONS AND CONCLUSIONS

Reversing this trend requires significant reform, both in the way governments provide water and in the way they and their citizens think about water as a resource.

In charting this path, there is a temptation to conflate the specific initiatives GCC governments might take on water with the necessities of GCC economic reform more

broadly. For example, the need for general private sector expansion could suggest an opportunity to place more water management processes in the hands of private companies. Particularly when it comes to desalination, perhaps industry experts, not governments, are best positioned to decide how plants are built and water produced. Governments are only making use more unsustainable with continued investment, so why not try to minimize their role?

Such an approach is valid but ultimately misguided. Private expertise will be a significant part of water reform in GCC countries, but initiative on policy and governance will be more important. Governments need to oversee not only investment in new and sustainable technologies, but also a fundamental shift in the way their countries use water. Doing so will require governments to think creatively about how to balance water's benefits with its pitfalls. Current strains on water have sprung from ambitious development and sporadic strategic planning, and Gulf Arab states can no longer afford this imbalance.

Many supply-side solutions are within reach, and GCC states have plenty of money to invest in technologies for wastewater treatment and reuse, alternative energy for desalination, and general infrastructure repair. On the first front, GCC governments could create substantial water and energy savings by using treated wastewater for industry, municipal irrigation, or even traditional agriculture. The use of treatment technologies is increasing worldwide, and policymakers and industry experts seem to agree that the Middle East is a particularly promising market. Alternative energy for desalination is a more complicated prospect, but desalination fed by solar or even nuclear energy could ease existing burdens on oil while preserving desalination itself as a durable long-term option for water production. Saudi Arabia is already piloting a solar desalination project,³¹ and Abu Dhabi's foray into civilian nuclear technology is enabling it to consider the possibility of nuclear desalination.³² Finally, infrastructure repair, while not as glamorous an option, could save some GCC countries as much as \$1 billion worth of water every year currently lost through leaky pipes.³³

Demand-side reform is a more complicated prospect, since governments are not keen to suffer the political backlash that could come with a more robust wa-

ter tariff system. At the same time, GCC governments could afford to make technical advances—like installing advanced water metering systems and water-saving irrigation technologies—that could start heightening public awareness of water scarcity and make pricing reform less painful in the long term. GCC countries take pride in their ability to innovate, and future shows of government austerity are more likely to succeed if preceded by a showing of government savvy and will.

Ultimately, though, pricing reform will have to occur, at least so governments can start recouping the rapidly growing costs of water production. Keeping water free or nearly so in the GCC has created the perception that water is infinite, but the future will only show how limited it is. No amount of political trepidation can change a stark reality: the time has come for governments to change the way their societies view water, using as creative a suite of incentives and disincentives as possible. Popular backlash to such policies may make it harder for governments to spur their populations to make positive economic contributions to national life. But waiting to address water challenges would magnify the difficulty much further. The sooner GCC governments deal with water scarcity and water demand, the sooner they can resolve the broader strategic challenges that the future holds. ■

NOTES

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