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Water Security in the GCC Countries

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"Water security," as a term, emerged in the Arab world roughly four decades ago, when there was much talk regarding river water resource sharing, and the dependence of some downstream countries – such as Syria, Iraq and Egypt – on water from these rivers to meet their development plans.

Water security often occupied the headlines, creating a polarized atmosphere leading to political tension in the region; indeed, water began to be used as a political bargaining chip, and as a potential motivation for armed conflict.[1] A deterioration of water quantity and quality was experienced in the downstream Arab countries, owing to growing demand along the length of these water sources as a direct result of social, agricultural, economic, and industrial development. The water crisis in the downstream countries continues to grow, with expanding demand greatly outweighing supply.

Generally, the concept of water security is encompasses two different areas: the first is purely political, and is linked to concerns arising from the fact that a large proportion (over 60 percent) of Arab water (including form the Nile, Tigris and Euphrates, and Senegal rivers) comes from neighboring countries, rendering the Arab countries that rely on this water (e.g., Egypt, Sudan, Iraq, Syria, and Mauritania) vulnerable to the upstream countries; One example being the occupation of the Zionist entity, depriving the Palestinians, Syrians and Lebanese of their legitimate right to use their water.

The second area is purely related to the water security of the population, which is an issue that has emerged in the GCC countries in particular—

particularly after the liberation of Kuwait in 1990/1991. The water security of a population refers to the strategic reserves upon which a state can depend in the event that desalination plants are not operational (for example, as a result of the pollution of Gulf waters resulting from an oil spill or for any number of technical reasons, or even acts of sabotage, terrorism, or a military strike against desalination plants or oil tankers). This reserve can be measured in terms of the hours or days for which it is possible to continue providing people with water for drinking and hygiene.[2] For this purpose, a variety of measures have been put forward, ranging from developing underground strategic reserves (such as that proposed in Abu Dhabi), to protecting facilities and installations from sabotage.[3]

Contrary to the term "food security," which has been clearly defined,[4] no clear and precise definition of "water security" exists. Water has many uses, and the concept of water security may not carry the same meaning for each use. Consequently, water security in any country, or group of countries, can relate to a number of factors or elements. If all of these, or reasonable number of them, have been satisfied, it can be said that water security has been achieved.

Over the past twenty years, the concept of water security has evolved. Some definitions are comprehensive, while others focus on one or two specific elements of water security relevant to a particular industry or sector. The latter examples range from the provision of clean water for health and engineering purposes, to anti-sabotage and anti-terrorism measures to ensure the security of drinking water infrastructure (a security-centric view).

The first all-inclusive definition of water security was introduced at the 2nd World Water Forum in 2000, held in the Netherlands under the title "Water Security in the 21st Century," during which the Global Water Partnership (GWP) defined water security as follows:

> It is a world where every person has enough safe, affordable water to lead a clean, healthy and productive life. It is a world where communities are protected from floods, droughts, landslides, erosion and water-borne diseases. Water security also means addressing environmental protection and the negative effects of poor management.[5]

In the past few years, there have been increasingly comprehensive concepts put forward in the areas of economics,[6] hydrology,[7] and engineering.[8] Most of these definitions refer to the integrity of both water quality and water quantity, and link the role of water in the natural environment with the need for water to meet human needs. For example, water security has been defined as

> … [A] multi-dimensional concept that recognizes that sufficient good quality water is needed for social, economic and cultural uses while, at the same time, adequate water is required to sustain and enhance important ecosystem functions.[9]

The scope of governance and management of water resources comprise defining features of water security; certain definitions claim that water security should be considered on a national level, while others refer to regions or basins as being more suitable bases.[10] Some researchers[11] add a further dimension to water security; in addition to ensuring the supply of water, they also include the need for protection from the devastating effects of floods and tsunamis. Also, some definitions on water security focus on sustainability or sustainable development, with a view to achieving a balance between environmental, economic, social/cultural, and political needs.12 The most comprehensive definition, and the one that is most compatible with the principle of sustainable development, may be as follows:

> … the availability of an acceptable quantity and quality of water for health, livelihoods, ecosystems and production, coupled with an acceptable level of water-related risks to people, environments and economies.[13]

In recent times, the Arab world and the GCC countries have become particularly interested in water security in its broadest sense related to sustainable development. Initiatives have been adopted to achieve and strengthen water security by setting frameworks and general guidelines for concerted action that will likely be implemented nationally.

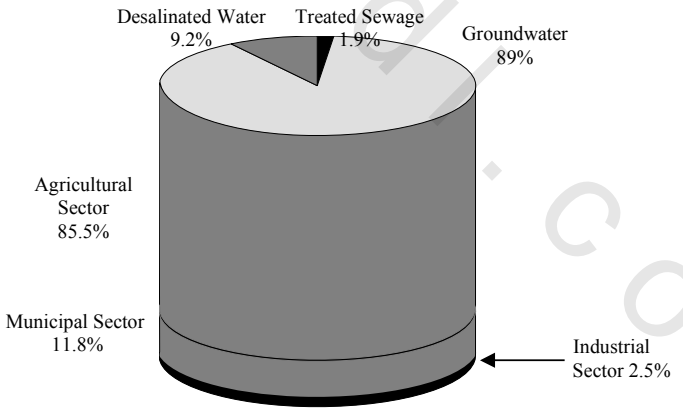
This chapter reviews the main water resources and their uses in the GCC, explaining the challenges and issues facing water resources management that directly affect water security, analyzing its most important determinants today

and in the future, and making key recommendations to promote water security in the region.

Water Resources and Uses in the GCC Countries

GCC countries are located in one of the driest regions in the world. With the exception of coastlines and mountain ranges, this region is essentially desert, and is characterized by low and erratic rainfall (70–150 mm per year), as well as high temperatures and evaporation rates that exceed 3,000 mm annually, preventing the existence of permanent or semi-permanent surface water. To meet their water needs, GCC countries depend greatly on groundwater resources (89 percent), desalinated water (nine percent), and less on the re-use of treated wastewater (two percent), while water use is concentrated in the agricultural (85.5 percent), municipal/domestic (11.8 percent), and industrial sectors (2.5 percent)..

Figure 4.1
Water Resources and Uses in GCC Countries, 2005



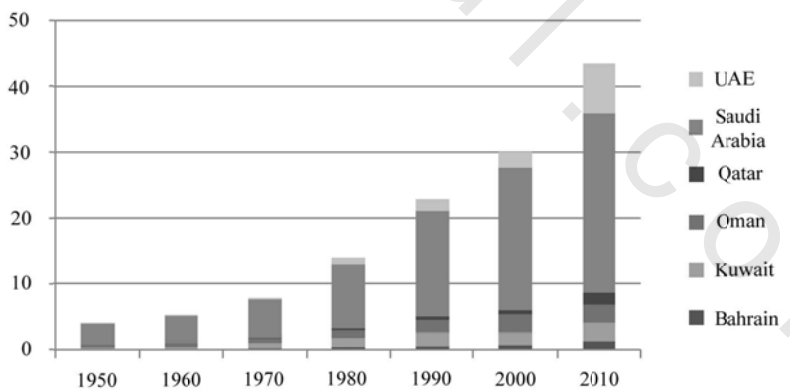
Source: prepared by researcher and based on data derived from: World Bank and AGFUND, "A Water Sector Assessment Report on the Countries of the Cooperation Council of the Arab States of the Gulf," Report No. 32539-MNA, March 31, 2005.

Since the beginning of the 1960s, and particularly in the mid-1970s, the GCC countries witnessed accelerated social, urban, industrial and agricultural development rates as a result of the discovery of oil in commercial quantities and the resultant boost in revenues. Over the past four decades, the populations of these countries have doubled more than five times; from about eight million in 1970 to around 43.5 million in 2010 (see Figure 4.2). The current rate of population growth in the GCC countries is nearly three percent,[14] which is considered one of the highest in the world.

At the beginning of the 1980s, the GCC's accelerated development and population growth was accompanied by rising water demand, which increased from about six billion cubic meters per year in 1980,[15] to more than 32 billion cubic meters in 2005.[16] In light of population growth and the increased demand for food, most GCC countries formulated ambitious agricultural policies to achieve food self-sufficiency.[17] The agricultural sector has become the largest consumer of water, accounting for over 85 percent of total water use in these countries. This sector mainly depends on renewable and non-renewable groundwater,[18] up to 60 percent (in Kuwait) or 92 percent (in Saudi Arabia) of which is used for irrigation.[19]

Figure 4.2

The Evolution of GCC Populations, 1950–2010 (Million People)

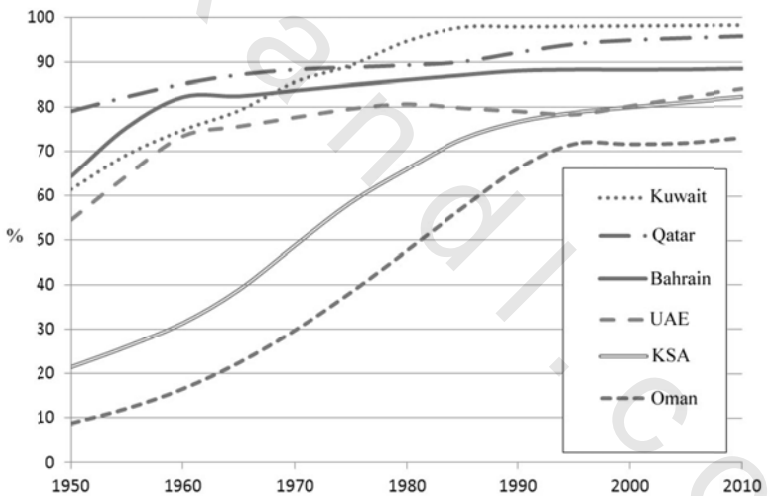


Source: United Nations Population Division (UNPD), *World Population Prospects*, 2010 Revision (New York, NY: UN Department of Economic and Social Affairs, Population Division, 2011), available at: (http://esa.un.org/unpd/wpp/index.htm), retrieved December 9, 2011.

With rapid population growth and urban development rates (see Figure 4.3), water demand in the municipal/domestic sectors of the GCC states witnessed rapid increases over time. To meet this growing demand the GCC countries resorted to desalination, upon which these states increasingly rely, as the region's groundwater quality continues to deteriorate. Desalination has become the main source of supply for the municipal sector, which accounts for around twelve percent of total water use in the GCC. Desalination capacity in the GCC countries increased from one billion cubic meters in 1980[20] to more than 9.5 billion cubic meters in 2010, and it is expected that this capacity will reach 19 billion cubic meters by 2016.[21]

Figure 4.3

Proportion of Urban Population, 1950–2010



Source: UNPD, World Population Prospects, op. cit.

At the beginning of the 1980s, treated sewage began to enter the GCC water mix, driven by an increase in water consumption in urban areas. This water began to be available for use thanks to the completion of wastewater treatment plants and sewage networks in most major cities. Presently, most countries in the region possess advanced wastewater treatment plants, and

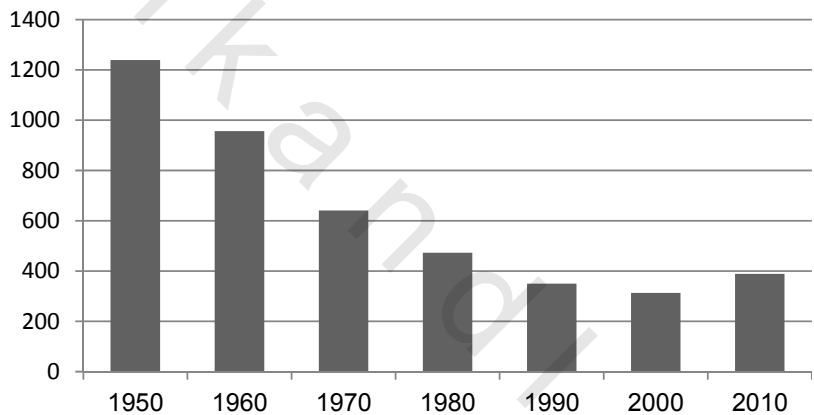
collectively in 2009 reached a processing capacity of more than 3.8 billion cubic meters per year.[22] Wastewater treatment plants process around 45 percent of the municipal water used in the GCC countries. Nearly 75 per cent of this water is treated, of which 50 percent is reused in agriculture.[23]

Water Challenges Facing the GCC Countries

The GCC states face a number of issues and challenges in terms of water sector management, as illustrated by their levels of fresh water per capita.[24]

Figure 4.4

Fresh Water Per Capita in the GCC (m^3/year), 1950–2010



Sources: population data from UNPD, *World Population Prospects*, op. cit.; data for natural and non-traditional water sources up to 2000 from ESCWA, "Updating the Assessment of Water Resources in ESCWA Member Countries," E/ESCWA/ENR/ 1999/13, 1999, and World Bank and AGFUND, "A Water Sector Assessment Report …," op. cit.; 2010 data for non-traditional sources of water from GWI Global Water Intelligence (GWI), "Water Market Middle East 2010" (Oxford, UK: GWI Publications, March 2009).

Figure 4.4 shows the continued decrease in individual share of fresh water in the GCC countries falling below 500 cubic meters per year (the severe water poverty line) since 1980. The relative increase in the index in recent years is attributed to an increase in desalination capacity (the index value excluding non-conventional sources was 114 cubic

meters per capita in 2010). Under GCC population growth projections, this value could be cut in half by 2030, when estimates put the total population of the region at around 60 million. The main challenge faced by the GCC countries is maintaining a balance between what is available and what is needed. In other words, to find a suitable, sustainable solution to bridge the gap between supply and demand both today and in the future. In addition to this general challenge, there are several specific, pressing issues facing water management and security in the GCC.

Rapid Increases in Water Demand in the Municipal Sector

One of the most important achievements of the GCC countries has been their ability to deliver high levels of drinking water to their populations, with 100 percent of people enjoying access to safe drinking water, representing a significant contribution to the quality of life and health in these states.[25] However, accelerated demand has strained GCC water resources, forcing greater reliance on desalination and recycled wastewater, and depleting national budgets. This is due to three main factors, namely: rapid population growth and urbanization, above average per capita consumption, and a high proportion of unaccounted-for water and leakage from municipal networks. Rates of population growth (currently three percent) and urbanization (currently 87 percent) are the most important driving forces of municipal water demand in the GCC. It is expected that these rates will continue to rise in the future. Although population growth is expected to fall to around one percent by 2030, population size will remain influential as it will have reached 60 million by this time, with 90 percent inhabiting urban areas.[26]

The higher average per capita consumption (between 300 and 750 liters per day in the GCC countries)[27] reflects a variety of factors including: rising standards of living, falling awareness of water wastage, and low or non-existent water tariffs. Meanwhile, unaccounted-for water and uncalculated leakage ranges from 22 percent (Bahrain) to 40 percent (Kuwait) in the GCC countries, and in some GCC cities reach 60 percent.[28] The latter two factors (per capita consumption rate and losses) have a direct impact on gulf water security and represent the highest cost to municipal supply in the GCC countries.

Rapid Depletion of Aquifers and Deteriorating Water Quality

Heavy reliance on groundwater – both renewable and non-renewable – and the absence of appropriate water management strategies, has resulted in random use and over-exploitation of this resource, leading to reserve depletion, low water levels, and water quality degradation as a result of saltwater inflow. Currently, all GCC countries – without exception – extract groundwater resources in an unsustainable way. For example, one study suggests that the severe exploitation of non-renewable groundwater in Saudi Arabia has depleted this resource by one third.[29] In Kuwait, the United Arab Emirates, Qatar, and Bahrain, withdrawal rates of groundwater exceed their replenishment rate by between 200 to 1,400 percent.[30]

Loss of groundwater has led to many direct and indirect costs that affect Gulf society today—at the top of this list is the loss of groundwater itself as a natural asset, stripping the Gulf states of the ability to use this resource in various forms of socio-economic development activities. Other costs include: the effects on large quantities of agricultural land that must now depend on government support because of the depletion, salinization and desertification of reserves; the loss of groundwater-related features such as natural springs, the degradation of environments and habitats that rely upon them, and the lost opportunities for tourism, education, culture, arts, and scientific research associated with these natural areas.[31] Finally, the loss of groundwater sources directly affects Gulf water security, as it has resulted in the loss of a sizeable strategic reserve with which to provide drinking water for the population in times of emergency.

Inconsistency between the Agricultural Sector Requirements and the Available Water Resources

Population growth, coupled with prevailing food and agricultural policies in the GCC states, is among the main driving forces behind the increase in demand for water in the agricultural sectors of these countries, accounting for more than 85 percent of total use in these states. Withdrawal rates in the agricultural sector have swollen due to traditional irrigation methods,

low irrigation efficiency (30–45%), high crop water consumption, and the absence of tariffs for agricultural water consumption.[32]

Despite this vast consumption of natural resources, agriculture represents only 2–7 per cent of GDP in Saudi Arabia, the United Arab Emirates and the Sultanate of Oman. In Bahrain and Qatar, the agricultural sector is even less important, contributing less than one percent of GDP. However, the majority of the GCC countries offer generous subsidies[33] for agriculture in a bid to increase self-sufficiency in certain products, and as a means to redistribute oil revenues. Despite these subsidies, the performance of the agricultural sector is generally low.[34] The low quality of local products mean that they are unable to compete with imported produce; this is largely due to the lack of modern irrigation technology, as well as inadequate quality control, post-harvest techniques, and marketing.[35]

The agricultural sector is the main source of groundwater depletion and quality degradation in the Gulf countries, and the current use of groundwater resources for irrigation is simply unsustainable. The problem stems from the fact that the GCC has no clear strategies to provide alternative water sources once they are fully exhausted. Hence, there is an urgent need to implement realistic agricultural policies that reflect resource availability and renewal capacities, fully utilize treated wastewater, reduce wastage, and promote modern irrigation and farming methods such as hydroponics to reduce water consumption in the agricultural sector and increase yields.

The Financial Burden of Water Support

All GCC governments adopt policies to provide cheap access to water, but such policies are invariably counterproductive, as "non-directed public support" often leads to an exacerbation of demand and imposes a heavy financial burden on national budgets, monopolizing funds that could be directed to more dynamic sectors such as education, health, and human development. This support, manifested in ultra low water tariffs, encourages excessive domestic consumption and discourages rational municipal use.

Some studies suggest that merely by meeting the demand from the municipal sector via desalination, water subsidies alone could absorb about ten percent of oil revenues in some GCC countries.[36] In Saudi Arabia, the

Minister of Water and Electricity, Abdullah bin Abdurrahman Al-Hussein,[37] indicated that 25 percent of oil and gas production in the country is used for power generation and the production of desalinated water, and that if water demand continues to rise at the same rate, this figure would reach 50 percent by 2030. In Kuwait, desalination plants are responsible for 50 percent of domestic energy consumption, and if demand continues to rise, the energy needed to power this desalination will equal oil production by 2035.[38]

Wastewater Recycling and Treatment

As in the drinking water sector, the GCC countries have achieved significant progress in providing basic sanitation to their populations. Their efforts are commendable, taking into account the accelerated population growth and urban development that these countries are witnessing. Despite the increase in the wastewater collection rate from roughly 30 percent of overall municipal consumption in the GCC countries in 1995,[39] to 45 percent today, this rate is still low according to the best practices and standards applied in developed countries. The result of this level of recovery poses threats to human health, owing to the resultant pollution of groundwater and coastal areas, and rising groundwater levels in urban areas causing damage to building foundations.

Despite the potential role of treated water in reducing the stress on water resources in the GCC countries, the recycling process is still slow and reuse rates are low compared to the quantities treated (43 percent of treated water was reused in 1995,[40] rising only to 50 percent today). There are several reasons for this, including social obstacles to the use of recycled water (health warnings, psychological dislike, and religious beliefs), and technological constraints (inefficient purification plants and fears of accumulation of heavy metals in groundwater).

In most of the GCC countries, recycled water is used in agriculture and irrigation for some feed crops, while the remaining water will is drained into valleys or the sea. This process fails to exploit water's true economic value in the region. The recycling process for the re-use of treated sewage is still in its early stages in the GCC countries. All of these states have grand, ambitious plans to re-use treated sewage, and to use it in agricultural irrigation instead of groundwater to reduce depletion rates; this option is especially appropriate, as quantities of sewage are directly proportion to the

size of the growing population. Therefore, there will always be enough wastewater to process.

The Environmental Impacts of Desalination Plants

The issue of drinking water in the GCC countries has received much political attention. In the 22nd session of the GCC Supreme Council, which was held in Muscat in 2001, the recommendations on water strategies presented by the Advisory Board of the GCC Supreme Council were discussed. This was a time when issues surrounding population increase and water security were considered top priorities, and numerous options available to the GCC countries were reviewed, including importing water from abroad. The advisory body recommended that the focus be on the desalination industry as a strategic option, and this was approved by the GCC Supreme Council at the meeting. Indeed, in view of current indicators charting the continuing deterioration in the quality of groundwater – rendering it unsuitable for household supply – the growing demand for water in the municipal sector, and the ever-increasing share of desalinated water in that sector, it is expected that desalinated water will eventually become the main source of supply for this sector throughout the GCC.

Currently, the GCC countries are experiencing significant expansion in the desalination industry, buoyed by their substantial financial means and their obvious access to the energy required to run desalination plants. Today, combined GCC desalination capacity represents more than 40 percent of global desalination capacity,[41] and the GCC countries have the highest share of desalinated water per capita in the world (desalinated water per capita ranges from 85 (Oman) to 1,000 (UAE) liters per capita per day.[42]

However, not only does such expansion carry a high financial price in terms of investment and running costs, it also has significant environmental effects. The few available studies undertaken in the Gulf region on this issue indicate that desalination plants have major, negative effects on the area surrounding them, including through air pollution which affects nearby urban areas, and harmful effects on the marine environment due to the discharge of concentrated saline solution and chemical wastes used in water treatment.[43]

Potential Effects of Global Climate Change on Water Resources

Global climate change is now a reality, after having been mistaken for random climatic changes affecting certain regions of the world. A recent report issued by Intergovernmental Panel on Climate Change,[44] suggested that the Arab region in general, and the Arabian Peninsula in particular, will be greatly affected by climate change, and the future outlook for rainfall in most global climate models shows a reduction over the coming fifty years that will have a negative impact on natural water levels in the GCC countries. Furthermore, high temperatures will lead to increased demand for water for human use and agriculture, exacerbating water crisis. The report also pointed to an increase in the frequency of unusual climate events, such as droughts and floods, and rising sea levels that may result in the inundation of coastal areas and increase the salinity of groundwater. In addition to the enormous challenges facing the management of the water sector in the GCC countries, the phenomenon of climate change introduces even more uncertainty into planning and water management.

These challenges are compounded by other several factors prevailing in the GCC countries, the most important of which are: a lack of awareness on water issues both among individuals and communities; a lack of community involvement in the decision-making process; low efficiency in utilization of water in consuming sectors; an absence of any holistic approach to managing the water sector; a failure to integrate agricultural and energy policies with water policy; weak institutional and capacity in water sector; the weak contribution of scientific research and an almost complete lack of technology transfer to develop the water sector; and, finally, weak legislative frameworks.[45]

Water Security in the GCC Countries

The Evolution of the Concept of Water Security in the Region

The concept of water security was first referred to in the Arab world at a meeting dedicated to water issues in Kuwait in 1986 entitled: "Water Sources and their Use in the Arab World," which was jointly organized by the Arab Fund for Economic and Social Development (AFESD), the Kuwait Fund for Arab Economic Development (KFAED), and the Arab

Center for the Study of Arid Zones and Dry Lands (ACSAD). The seminar aimed to accurately determine the water situation in the Arab world at that time, as well as the future prospects for water in the region. The seminar also aimed to identify obstacles to development in the water sector and the means with which to address them, as well as joint Arab efforts to secure a better future for the coming generations. The seminar addressed the issue of the limited nature of water resources compared to demand, and the problem of the agricultural sector as the biggest consumer of water in the Arab countries.

The seminar issued a statement characterizing the various dimensions of the water problem, including high population growth, accelerating social and economic development, and the disruption of the relationship between resources and demand, referring to the fact that one of the reasons behind water degradation was the lack of appreciation for the various aspects of the problem, as well as the lackluster actions taken to address the situation. The statement outlined proposed solutions at the national, regional and international levels, and noted that the ambiguity of water policies and the limited capacities of institutions working in the field were among the most important obstacles facing Arab water security. The statement stressed the need to give water attention and importance commensurate with its role in the economic and social development. Nationally, the seminar's recommendations focused on: adopting national water policies; preparing plans for water development; creating a central body with responsibility for overseeing the implementation of water policies and coordination between the relevant authorities; supporting and building capabilities of institutions operating in the water sector; preparing leading human resources in the field; and providing higher education opportunities in the field of water management. Regionally, the seminar recommended that joint water projects be undertaken, and that inter-Arab cooperation in the field should be strengthened.[46]

This seminar was the first of its kind to be held at the pan-Arab level, and exceeded – in terms of its themes and ideas – the prevailing global thinking on the topic at the time. It generated the concept of a link between water and social and economic development before the release of the Bertrand Report on Sustainable Development in 1987, which led to the emergence of the concept of sustainable development. The seminar also dealt with the issues of water policy and institutional structure in the water

sector, calling for all relevant authorities to improve coordination between them and support and build human capabilities; this was far in advance of the Dublin conference in 1992, which called for the same principles and ideas. Therefore, this can be considered the true origin of the model and an approach for integrated management of water resources worldwide.

Two decades after this seminar, in 2008, the leaders of the Arab states established the Arab Ministerial Council for Water at the Arab League, in response to the changing water and food security situation, and the latest developments in climate change and their impacts on the region.[47] Hence, the Arab agenda for joint action in this area is progressing, and reflects the political will of the Arab countries to encourage the discussion of water issues from the technical to the political levels, and to promote and coordinate Arab cooperation within a joint strategy to meet water challenges and enhance Arab water security.

The Arab economic summit, held in Kuwait in 2009, tasked the Arab Ministerial Council for Water with devising an Arab strategy for water security. A strategy draft was subsequently prepared after being reviewed by a committee of experts from Arab countries and organizations in December 2010, and was approved by the Executive Office of the Arab Ministerial Council for Water in June 2011. Arab finance and economy ministers meeting in Baghdad in March 2012 also recommended the draft be approved. The strategy sets goals in the three fields.[48]

First, the economic and developmental field: providing drinking water services, agriculture and sanitation, including funding and investment or technology localization, applying the basis for the integrated management of water resources and developing non-conventional water resources.

Second, the political field: protecting the rights of Arabs to water in the occupied Arab territories, or when sharing water with regional neighbors, and promoting cooperation between the Arab countries to manage their shared water resources, in addition to implementing the obligations of the Arab countries within the Millennium Development Goals.

Third, the field of institutional development: developing human and technical capabilities, as well as social and individual awareness of the water problem in the region, including scientific research, and greater civil society participation in decision-making with environmental implications.

It could be argued that the draft of the strategy has dramatically elevated the issue of water on the regional agenda, particularly in light of the realization that achieving water security is a basic prerequisite for achieving sustainable development. The concept has evolved from the issue of securing the reserves of water required by the population and the agricultural sector, and protecting the rights of Arab countries to natural water sources, into a broader concept that is also concerned with macro-level issues and challenges surrounding water, their driving forces, and appropriate solutions including improved governance, water management, building institutional and human capacities, developing scientific research, and transferring and localizing modern technology. Hence, the issue of water security is no longer one of external interference, but is now primarily a domestic issue concerning governance, efficient resource management, and the pursuit of sustainable development goals.

In 2010, the 31st GCC Summit, held in Abu Dhabi, focused on water, energy, and food, and resulted in the issuance of the Abu Dhabi Declaration. The declaration referred to "... the importance of [the] water sector in the GCC countries and the necessity [of preparing] … a future strategy, taking into account the needs of the three axes of sustainable development," stressing that the GCC countries were currently experiencing a "significant developmental renaissance in all sectors and areas accompanied by many enormous challenges [*sic*]." The document tackled the scarcity of water resources in the GCC countries, and called for:

> … serious and concentrated steps towards a comprehensive, long-term strategy on water, to be approved by the Supreme Council of the GCC countries … taking into account the possible effects of … change on the water resources sector … the rationalization of consumption in various development sectors, mutual influences between [the] agriculture and water sectors, [and] the potential impacts of desalination operations and activities on the quality of sea water, climate change, and [the] strategic storage of water.[49]

The declaration also made a number of important recommendations in the field of water resources management, with the aim of achieving sustainability. One of the most important of these was the "linkage between insurance of water security and diversification of energy sources and food security as a vital necessity and a strategic priority for the future of the GCC

countries." It recommended that the GCC states "conduct a comprehensive review of the agricultural development in the GCC countries, and … focus on the development of national agricultural policies [aimed] … at preserving water and [creating] … added value for the economy." The declaration posited that the satisfaction of these recommendations would lead to strategic advantages safeguarding the region's long-term water and energy security. It could be argued that the issuance of Abu Dhabi Declaration by the leaders of the GCC countries has made water security an issue of the highest priority for these countries.

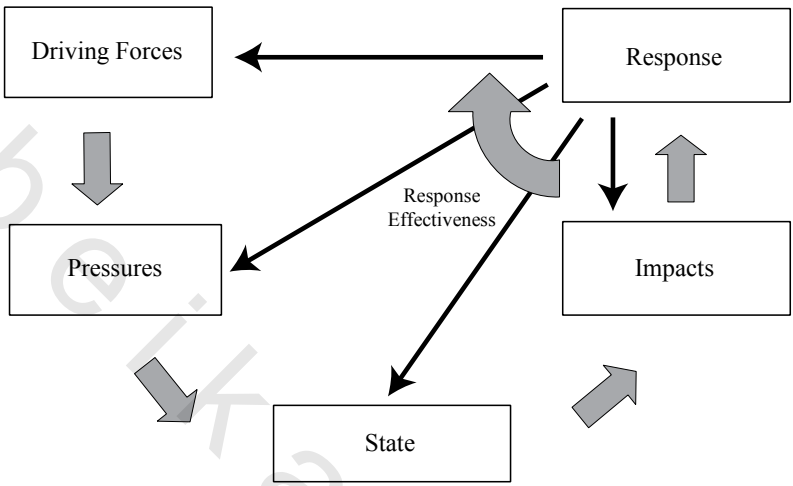
Determinants of Water Security in the GCC Countries

There are many challenging factors facing GCC communities in their pursuit of water security in its broader sense. They can be divided according to three major themes,[50] namely: the natural and hydrological environment; availability and distribution of natural water; and the socio-economic environment, comprising national economic structures and the conduct of water consumers, the various policy options adopted to deal with the water issue, and the future of the environment in light of the growing evidence that global climate change will play a major part in deciding environmental composition, in addition to other variables such as population size, development, and the impacts of the local and global economies. These factors play important roles in determining the institutions and infrastructure needed to achieve water security.

The DPSIR (driving forces–pressures–state–impacts–responses) analytical framework has been used to analyze the challenges facing the GCC water sector, and the efficiency of responses. The DPSIR model was designed to determine the effects of human activities on the environment, as well as ways to mitigate the related effects on natural resources.[51] This framework is widely used in environmental studies to gauge the impact of human activities on sustainable development.

According to this framework (see Figure 4.5) social and economic factors (such as population growth, agricultural policies, and technological advancement) are the driving forces (D) causing different types of direct pressure (P) on the state of natural resources (S), leading in turn to various environmental, health, economic and social impacts (I), to which a response is posed (R).

Figure 4.5
DPSIR Analysis



Source: UNEP, "DPSIR Framework for State of Environment Reporting," UNEP/GRID-Arendal Maps and Graphics Library, available at: (http://maps.grida.no/go/graphic/dpsir-framework-for-state-of-environment-reporting_379f), retrieved on: 29/04/2012.

The efficacy of the response to a particular problem varies, according to its application on the different parts of the analytical system. Generally speaking, responses targeted at the driving forces will be more effective. For example, when a response is directed toward the "impact" side (such as beach clean-ups and compensating fishermen working in polluted waters), it will be less effective and less sustainable than one applied to, say the "pressures" element (such as lower rates of consumption in the municipal sector, or reducing raw sewage flow into plants, etc.).

Table 4.1 applies the DPSIR analytical framework to the water sector in the GCC countries. In the table, it is noted that the most important driving forces in the water sector are: accelerating population growth; over-ambitious agricultural policies; a system of public subsidies which fails to encourage rational water consumption; weak legislation; lack of efficiency in use; and increasing wastage. These driving forces lead to a deterioration in the quantity and quality of water, a continuous increase in the cost of water supply and treatment – affecting the national budget – and to a number of health, environmental, financial, economic and social impacts.

Table 4.1

DFPSIR Analysis of the GCC Water Sector

Driving Forces	Pressures	State	Impacts	Response
• Limited natural resources and prevailing drought conditions. • High population growth rates and FDI policies. • Agricultural policies to achieve food security and socio-economic development. • Public policies encouraging water use; subsidized water tariffs. • Increase in standard of living and improving per capita income. • Inadequacy of environmental and water awareness. • Weakness and non-enforcement of water and environmental legislation. • Weakness of public institutions in water sector; multiplicity of bodies responsible for water in most countries, and lack of effective coordination among them. • Insufficient human resources in the water sector. • Technical development in water desalination and treatment, and cost reduction over time.	• Increasing water demand from various sectors. • Low water-use efficiency. • High wastage in consumer sectors. • Irrational consumption patterns, and high per capita consumption. • High volumes of waste water (sewage).	• Quantitative and qualitative degradation and depletion of groundwater due to sea water encroachment. • High cost of desalination and municipal water distribution, and low rate of cost recovery. • High cost of sewage treatment; non-recovery of costs. • Constant reduction in per capita availability of water over time.	• High salinity and periodic disconnection of drinking water. • Low productivity and eventual degradation of agricultural sector. • General budget drain of building desalination and treatment plants. • Loss of strategic reserves of groundwater for emergencies. • Depletion of oil reserves and natural gas used to power desalination. • Pollution of coastal and marine environment by effluent from treatment plants, with related health, environmental and financial effects. • pollution of coastal / marine environment surrounding desalination plants, poor ambient air quality, and increasing GHG emissions. • Excessive use of fertilizers and chemicals in agricultural sector, and related effects on health and the environment. • Desertification of agricultural land and loss of productivity due to salinization of groundwater used for irrigation.	• Expansion in desalination plant construction. • Expansion in treatment plant construction and water reuse in agriculture. • Increasing withdrawal of groundwater. • Privatization of desalination and water treatment plants to reduce costs. • Awareness campaigns to rationalize water use. • Installation of water-saving devices.

The main response is to increase the supply of water via expansion in various sectors (desalination, re-use of treated sewage water, ground water withdrawals) – paying no attention to demand and rationalization management or cost reduction – as well as awareness campaigns to reduce water wastage in both the municipal and agricultural sectors. Hence, most of the responses are directed towards reducing the impacts of the problem, while only one concentrates on pressures (awareness campaigns).

The analytical framework shows that many of the driving forces are beyond the control of the water sector, and can only be altered by policy- and decision-making at the national level. Therefore, water security and sustainability should be considered at the highest levels in the GCC countries, as a security issue rather than a civil matter.

Conclusion

In the past few years, the issue of water security in the GCC countries has attracted increasing attention, from just being a matter of securing and protecting sufficient reserves for the population and agricultural sector, to a broader concept that encompasses additional challenges, driving forces, and potential solutions. Water security is now a domestic issue primarily dependent on governance and water resources management with the aim of achieving stable supply to serve goals of sustainable development. This shift in focus was illustrated by the Abu Dhabi Declaration in 2010, which called for a number for measures to ensure water security in the GCC countries, and for the participation of all the GCC countries in developing a common vision, framework and set of guidelines to achieve Arab water security (the *Arab Water Security Strategy*, 2011), which can then be applied at the national level in these countries.

Generally, water security is determined by conditions in three distinct environments: the hydrological environment, the social and economic environment, and the environment of the future, including its demographic variables as well as the effects of technological progress and climate change. All three provide unfavorable conditions for achieving water security and sustainability in the GCC. These states are located in a water-scarce area where natural reserves suffer from spatial and temporal volatility; yet it is also an area which is experiencing one of the highest economic growth rates in the world. The GCC countries are heavily dependent on water for certain

development activities (particularly in the agricultural sector). Major industries consume water irrationally and inefficiently, and there is generally a low awareness of water issues throughout society. Solving water issues, however, is one of the responsibilities of government, not consumers. Existing implemented water policies, if any, are not integrated. Most of the GCC countries enjoy a good deal of flexibility in dealing with this situation – albeit at a heavy economic and environmental cost – represented by the ability to expand their desalination infrastructure to provide water for their populations, thanks to the strength of their economies, as well as their substantial financial and energy resources. However, the continued depletion and deterioration of groundwater quality will ultimately deprive the agricultural sector of a vital resource, and the economic and environmental costs of desalination will continue to mount—resulting in an accelerated drain on oil and gas resources and encouraging increasing demand from consumers.

As most of the challenges facing the GCC water sector are caused by driving forces outside the control of water sector, water security must be considered at the highest levels in these countries, taking into account population, economic and agricultural policies, in addition to public subsidies adopted by the GCC countries.

Addressing the water challenges faced by the GCC countries in order to achieve water security in its broadest sense, requires radical intervention in the social and economic environment of the GCC countries. It also requires political will, and cooperation at the administrative, scientific, and technical levels. Above all, water security requires improved governance to change the prevailing culture of wastage, transforming society from being a major part of the water problem into an essential part of its solution.