

The Arab Gulf States and the Long Road to Water Security

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Abstract—Arab Gulf countries have experienced significant challenges in meeting their needs for water security. In this article, the six countries in the Gulf Cooperation Council are studied, namely Bahrain, Kuwait, Oman, Qatar, Saudi Arabia, and United Arab Emirates. Using a qualitative research methodology, we conducted a comprehensive assessment to study and evaluate the emerging drivers of water security in the region. The investigated drivers of water security include economic growth, population growth, water usage, extreme natural events, and political stability. The results suggest that all these countries are facing water resource insecurity, anemic water reforms, and weak management strategies.

Keywords—Water security, Arab Gulf States, water policy reforms, water management, political stability.

I. INTRODUCTION

The six Gulf Cooperation Council (GCC) countries (Bahrain, Kuwait, Oman, Qatar, Saudi Arabia, and the United Arab Emirates—UAE) cover over 2.6 million square kilometers (more than a million square miles). According to demographic estimates, the GCC nations have a combined population of more than 60 million people and a GDP of USD 3.464 trillion [24], [32]).

The history of water supply and sanitation has shaped the modern identity of the inhabitants of the Arab Gulf states. All the kingdoms of the Arabian Gulf expanded according to the availability of natural resources, the most important of which is water, centuries before the oil discovery. Water constituted a resource for power and control of human life by determining its fate, whether in welfare, misery, peace, or war.

Economically and socially, the Gulf countries have improved remarkably since the discovery and exploitation of the huge oil reserves. In the fifties of the last century, desalination plants began to appear, the first desalination plants were built on the Gulf coast of the Arab Gulf states in Kuwait and Qatar in 1953 with a combined production of 5,000 cubic meters per day [7]. In just a few decades, the Gulf states went from widespread poverty and being an insignificant region in the world to having rapidly growing, globally integrated economies with world-class infrastructure and providing a high standard of living to the native population, all due to the abundance of oil and natural gas [1]. Currently, 439 desalination units in the GCC nations generate 5.75 billion cubic meters of desalinated water each year [22].

Politically, the Gulf nations established the Gulf Cooperation Council (GCC) in 1981, an institution comprised of Saudi Arabia, the United Arab Emirates (UAE), Qatar, Oman,

Bahrain, and Kuwait. This political coalition enables many of these minor nations to unify their energy and diplomatic policy. They have launched joint efforts on water challenges in recent years. One such initiative is a 2013 deal to build a large \$7 billion desalination plant on the Arabian Sea (the Indian Ocean side) to prevent potential contamination from either a radioactive leak from Iran's nuclear facilities or an oil spill in the Persian Gulf trade lanes [1].

Currently, all Arab Gulf countries, without exception, depend mainly on desalinated seawater. The per capita drinking water in these countries is the highest in the world, as it exceeds 600 liters per person per day in a country such as Qatar, while the per capita share in the United States of America does not exceed 200 liters per day. The World Health Organization has made 150 liters of water per person per day a global standard that meets all the needs of the individual [25]. Therefore, it is not surprising that all scientific reports place the Arab Gulf states among the world's poorest countries in water, because natural water resources are absent or scarce.

However, the beginning of the twenty-first century carried events that led to deep changes in the dimension of global security, involving environmental challenges and climate change. Both are linked directly with water and security. Moreover, 'the war for resources', related to the water supply as a tool for struggle, is becoming progressively important [18]. According to analyses of the United States National Intelligence Director's Office, water will be the reason for many regional conflicts, the collapse of states, and cause instability in countries of strategic importance to US interests [21], in this case, the Gulf Cooperation Council (GCC) states.

This article has adopted the research question: What are the drivers impacting the water security in the Arab Gulf states and how to ensure a long-term water security and, for instance, regional political security? A hypothesis has been adopted emphasizing that water scarcity will contribute to the nature of future foreign policies in the Arab Gulf states. Unless the challenges of water security are addressed and resolved, there will be significant reasons for further foreign powers' interventions and political instability in the region.

The research focuses on the Arab Gulf states and more specifically on the Gulf Cooperation Council states. The rationale behind this choice is that this region is most affected by limited access to fresh water, with the consequences of potential political instability. Utilizing a qualitative research methodology and following the introduction, part two defines and explains the geopolitical situation of water security as a

global issue by highlighting the significance of water-related hazards in global and Gulf regional security. Part three deals with the main drivers impacting the water security in the Gulf states, for instance, population growth, economic growth, water usage, extreme natural and environmental events, and political stability. In addition to these drivers of water security, part four shed-lights on water management in the region. Part five explains the water foreign policy in the Gulf states with more emphasis on transboundary/shared hydrologic legacy, regulations, governance, and the importance of their activation to ensure political stability in the GCC region in the future. Our findings suggest that all these countries are facing water resource insecurity, anemic water reforms, and weak management strategies.

II. WATER SECURITY IN GULF STATES

A. Water hazards and global security

Water insecurity is jeopardizing global development. It is a growth obstacle that might cost the world economy more than \$500 billion every year. The pull is greatest in countries that are already suffering from water stress, as well as those with poor incomes and a large reliance on agriculture. A quarter of global Gross Domestic Product (GDP) is generated in areas where water scarcity is severe, about 35 percent of the world's population is affected by water scarcity, and more than 1.5 billion individuals are affected by water-related ailments each year [30].

Water-related hazards have continuously been placed among the top five global risks in the World Economic Forum's Global Risks report (Fig. 1), indicating growing awareness of the implications of water insecurity on human well-being and economic development [31].

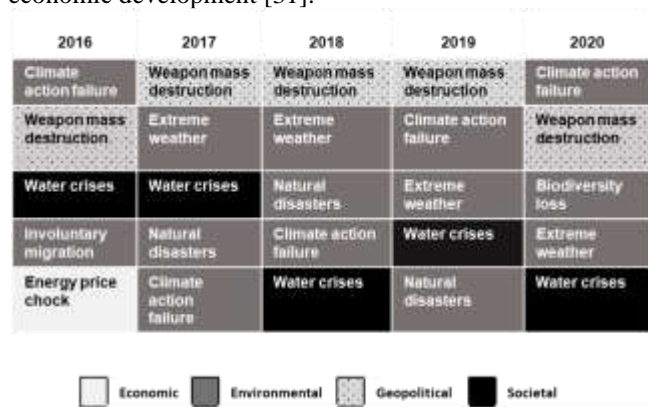


Fig. 1. 2020 Top 5 Global Economy Risks from World Economic Forum.

Water crises are one of the top 5 global risks alongside with weapon mass destruction for 5 years consecutively (2016-2020). According to the 2020 global risks report, the definitions are: Water crises: A significant decline in the available quality and quantity of fresh water, resulting in harmful effects on human health and/or economic activity; Weapon mass destruction: the deployment of nuclear, chemical, biological, and radiological technologies and materials, creating international crises and potential for significant destruction; Climate action failure: The failure of governments and businesses to enforce or enact effective measures to mitigate climate change, protect

populations and help businesses impacted by climate change to adapt; Involuntary migration: Large-scale involuntary migration induced by conflict, disasters, environmental or economic reasons; Biodiversity loss: Irreversible consequences for the environment, resulting in severely depleted resources for humankind as well as industries; Extreme weather: Major property, infrastructure, and/or environmental damage as well as loss of human life caused by extreme weather events; Natural disasters: Major property, infrastructure, and/or environmental damage as well as loss of human life caused by geophysical disasters such as earthquakes, volcanic activity, landslides, tsunamis or geomagnetic storms; Energy price shock: Significant energy price increases or decreases that place further economic pressures on highly energy-dependent industries and consumers.

“Water security” is the new term used in the discourse by water scholars. It was in the early-1990s when the first use of the term appeared in relation to the merging of water scarcity and political conflict in the Middle East.

The Global Water Partnership (GWP) has provided a definition of water security, which can be formulated as follows:

“A world enjoying water security is a world that combines both concern for the intrinsic value of water and the full range of its uses necessary for human survival and well-being, and such a world harnesses the productive power of water and reduces its destructive power. It is a world in which every person is blessed with enough safe, affordable water to lead a clean, healthy, and productive life, and it is a world in which societies are protected from floods, droughts, landslides, soil erosion and waterborne diseases.” [12]

Some experts believe that the concept of water security must be based on the indicators of the extent of water scarcity in quantitative terms (physical water scarcity) in the concept of the water balance [8]. This can be explained by the process of balancing between the total volume of conventional and non-conventional water resources (water supply) in a certain period, and the total volume of water needed to meet the various needs (water demand) during the same period. In other words, "determination of the quantities of water entering and leaving any water system."

In 2007, Grey and Sadoff showed that there are three factors influencing the scope of the ever-present social task of obtaining and maintaining water security. The first is the hydrologic environment, which is a natural legacy that a society inherits, and it includes the absolute level of water resource availability, its inter- and intra-annual variability, and its spatial distribution. Second, the socioeconomic environment, which represents the economy's structure and players' conduct, will reflect natural and cultural legacies as well as governmental choices. Third, the future environmental change, with a significant and growing evidence in which climate change will play a key role. These considerations will have a significant impact on the institutions and types and amounts of infrastructure required to ensure water security [13].

B. Water Availability and the Hydrologic Environment in Gulf States

The GCC countries constitute the majority of the Arabian Peninsula, this area of the world is characterized by scattered and insufficient rainfall with long dry summers reaching high temperatures up to 50°C, which makes their hydrologic legacy difficult.

Difficult hydrologies are those of total water shortage (deserts) and, at the other extreme, low-lying regions with significant flood danger. Even more challenging is where rainfall is markedly seasonal, a short season of torrential rain followed by a long dry season necessitates water storage, or where there is high inter-annual climate variability, where extremes of flood and drought pose unpredictable risks to individuals, communities, nations, and regions, necessitating over-year water storage [13].

The GCC countries have the lowest per capita freshwater resources in the world, and they are rapidly declining [3]. Water is made available in the GCC countries via three sources: (a) groundwater, which is typically replenished by seasonal rains that are decreasing year after year due to climate change impacts and large, unregulated water consumption; (b) desalinated seawater, which is supplied via modern, high-tech desalination plants; and (c) wastewater treatment and reuse, which was introduced relatively recently and is obtained via wastewater and sewage treatment plans [24].

For instance, Fig. 2 illustrates the total freshwater available for use in each country in the GCC in 2018 [10]. For example, Bahrain, Qatar, and Kuwait are the least in having freshwater resources and almost completely dependent on unconventional water resources such as desalinated water. The amount of renewable water in groundwater reservoirs is severely limited, and shallow alluvial reservoirs provide some renewable groundwater only in these limited coastal strips. There are large deep aquifers in the region, which contain a non-renewable supply of fossil water, but their lifespan is limited, and their quality is restricted. Only Saudi Arabia possesses large quantities of non-renewable groundwater in deep reservoirs, but even this water is depleting fast.

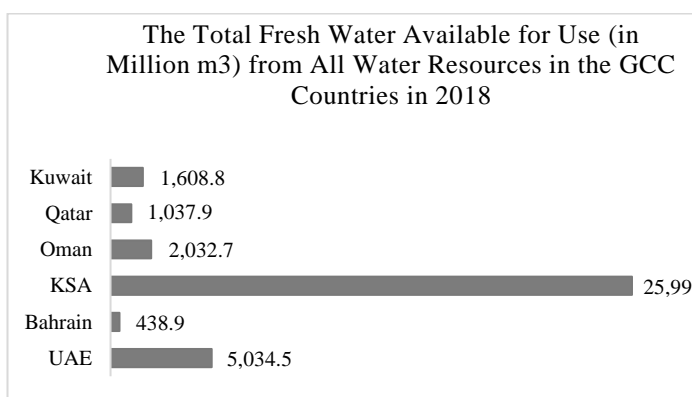


Fig. 2. The Total Fresh water resources in the GCC countries. The total fresh water available for use in each country in the GCC in 2018 according to the latest data GCC-statistics. (KSA: Kingdom of Saudi Arabia, UAE: United Arab Emirates) (Source: GCC-STAT)

Due to their geographical location, Bahrain, Kuwait, and Qatar have limited access to water. Saudi Arabia, Oman, and the United Arab Emirates, on the other hand, have made significant progress in increasing their water resources in recent years by building dams and other storages [22]. Therefore, Saudi Arabia has the highest annual renewable water resources (more than 25 billion cubic meters), followed by the United Arab Emirates (5 billion cubic meters) and Oman (2 billion cubic meters) (Fig. 2).

This accelerated socio-economic development and the accompanying rapid population growth has been associated with increasing demand for water, and the sustainable provision of water for the various development activities constitutes one of the major challenges facing the GCC countries.

It is expected that the GCC countries will witness an increase in water scarcity and the cost of water supply in the future, which may not only jeopardize the future development process in them but may threaten the development achievements [33]. Therefore, the means and methods of facing the challenges of the water sector, as a strategic vital resource and an essential input in the development process, will have a major impact on the sustainable development of the GCC countries over the coming decades.

Water availability is measured by experts in terms of the amount of annual renewable fresh water per person. A country is considered 'water stressed' when its total renewable freshwater resources range from 1,000 to 1,700 cubic meters/person/year. Water-scarce countries have an average annual renewable freshwater supply of less than 1,000 cubic meters/person/year [23]. Fig. 3 illustrates the decline in freshwater availability in the GCC region. The severity of freshwater scarcity, the increasing population, mainly through the influx of workforce, and the increasing urbanization in GCC countries are the main factors in this drastic decline in water availability.

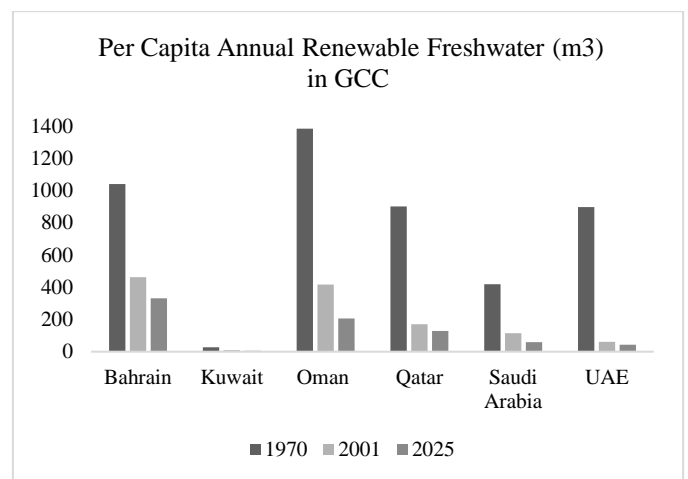


Fig. 3. Annual Renewable Fresh Water per capita in GCC (cubic meters). (Source: Based on analysis by the author using data from various sources)

III. DRIVERS IMPACTING THE WATER SECURITY IN THE GULF STATES

A. Economic growth

The standard central theme of discussions on the 'water-energy nexus' is simply that the water and energy sectors, or

water and energy security, are interconnected in a variety of ways, with water being critical to energy production and energy supplies being critical to water provision. Revenues from oil and gas exports are widely used to transform, mobilize, and often decimate natural waterscapes and natural water resources [27].

The Middle East's enormous oil resources have boosted the region's economic growth rate. However, economic growth is not the same as economic advancement or sustainable development. Economic structure is crucial, especially with more vulnerable economies requiring greater investment to attain water security [13].

Hameed *et al.* (2019) highlighted the fact that the Middle East's financial sector weakness and unstable economic growth are the factors most affecting the region's long-term economic development. Gross domestic product (GDP) is a measure of total products of a country. The GDP growth is inextricably linked to investment in oil and natural gas in the Gulf region (Fig. 4) [29]. Since 2000's, the GCC countries' reliance on oil has grown.

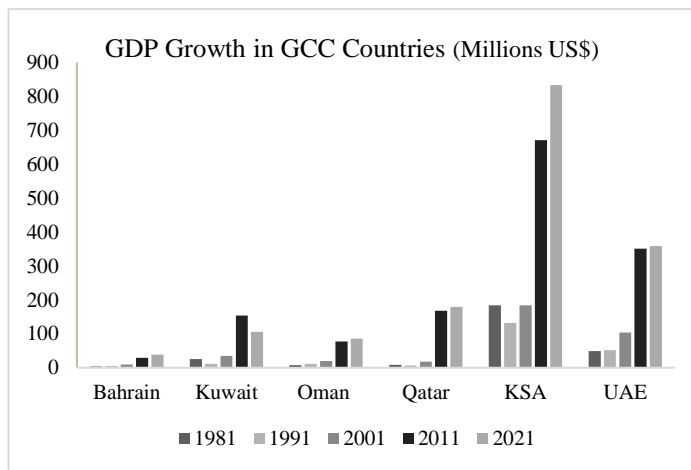


Fig. 4. GDP Growth in GCC Countries (Millions US\$).

(Source: World Bank Data).

The countries of the GCC are also searching in the West for new markets that will bring them profit by investing their own massive sovereign wealth funds [28]. This openness (or reliance) has economic and political obstacles, including political interference in the internal affairs of the countries of the region because of the volume of foreign investment in the oil and gas sector. In addition, external investors represent political pressures on the work and stances of foreign Gulf governments as a result of their economies' dependence on the profits arising from the oil sector invested by the world's great power investors.

It is clear that there exists a prevalent tendency for fossil fuel rents to be mobilised to drive hydraulic development, at least within arid and semi-arid post-colonial states like the GCC countries, the economic growth provides resources to invest in water management to reduce water-related risks but at the same time it may rise jeopardy by increasing the value of assets exposed.

B. Population Growth

The GCC countries have witnessed a remarkable improvement since the discovery and exploitation of their huge oil reserves, the water supply and sanitation services reached a large proportion of the population that achieved levels that are among the highest in the world (Fig. 5). During the past four decades, the GCC states have witnessed an unprecedented economic and social transformation, characterized by an increase in population and accelerated rates of urban and industrial expansion.

Human development indicators increased during this period, such as life expectancy, education rates, and per capita income, and many indicators of human well-being rose to the standards of developed countries. This accelerated socio-economic development and the accompanying rapid population growth have been associated with increasing demand for water, and the sustainable provision of water for the various development activities constitutes one of the major challenges facing the GCC countries. The pace of this challenge is expected to increase over time due to many driving forces including population growth, lifestyle changes, consumption pattern, high food demand, prevailing public support systems, projected extreme weather impacts, and many other driving forces compelling the GCC countries.

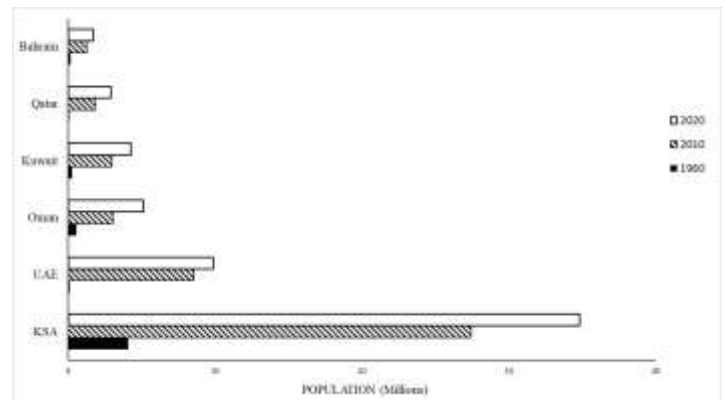


Fig. 5. Population growth of each country in the GCC (in Millions).

(Source: www.worldometer.info)

This resulted in the expansion of more costly investments to increase the water supply and infrastructure resources, mainly represented in increasing the capacity of desalination plants, treating, and reusing wastewater, building dams, and increasing the withdrawal of already depleted groundwater.

C. Water Security

Water demand is typically increased by population growth in all sectors of the economy: agricultural, industrial, and domestic [23]. Water demand is rising at an exponential rate as cities grow and people's living standards rise. To relieve demand on groundwater supplies, the GCC countries are heavily investing in desalination and wastewater treatment. Groundwater is used for agriculture, while desalinated water is used for home and industrial reasons [22].

The Gulf water sector's experts have called for the use of modern means to reduce energy consumption in production considering the increasing growth in water consumption. They pointed out that Saudi Arabia represents the highest percentage

of water consumption among the countries of the world, which increases the need for action to take measures to address the situation and limit the high consumption rates. Despite the severe water scarcity, agriculture consumes more than 80 percent of renewable water resources. Currently, surface water harvesting and groundwater exploitation account for 78 percent of water usage in GCC member states, desalinated water accounts for 16 percent, and treated city wastewater accounts for 6 percent. Fig. 6 shows the past and projected increasing water demand that is proportional to its domestic, agricultural, and industrial usages in the Arab Gulf states from 1995 to 2025 [6].

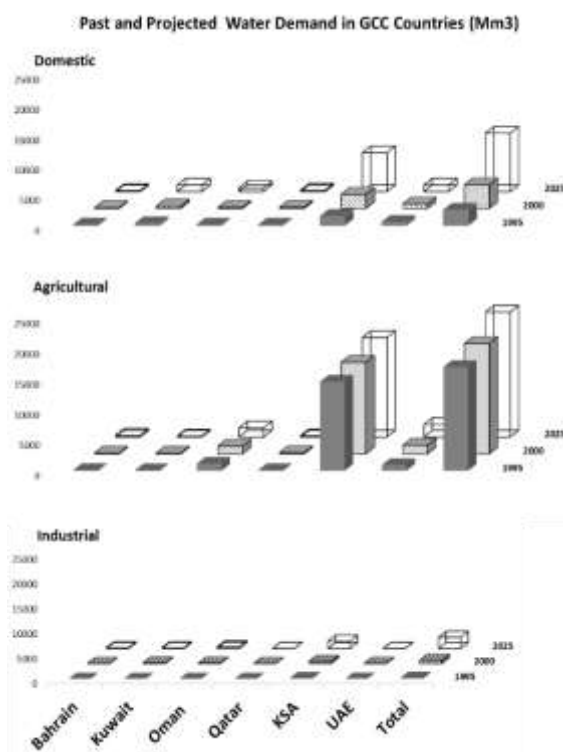


Fig. 6. Projected Water demand in GCC Countries (Mm3). Domestic, Agricultural, and Industrial water demands are represented for the six GCC countries in the past (1995, 2000) and the projected future (2025) in Millions of cubic meters (Mm3).

The Arab Gulf states have increased the total capacity of desalination of sea water by about 40 percent by 2020 as part of their efforts to meet the increasing demand for potable water in the region.

D. Political stability

Desalinated water was manufactured, subsidized, and distributed in large quantities after independence as part of a political strategy aimed at dispersing oil rent to encourage tribes' support of the regimes and justify the new governments' growing authority. The current trend of water privatizations in the area, such as in Abu Dhabi, Doha, and Riyadh, illustrates a strategy of gradually streamlining the rentier nations and liberalizing their economies from a post-rentier viewpoint [11].

Water supplies in the Arab Gulf states depend heavily on the desalination plants of the Arabian Gulf - except for Oman and western Saudi Arabia [22]. These stations are exposed to high risks and great threats that may occur in the waters of the Arabian Gulf because of various human activities and natural disasters, including, pollution of seawater by oil and chemical spills, red tides, nuclear pollution, and sewage and industrial water. Annually, more than 45,000 ships enter the Gulf waters - more than half of them are oil tankers, while the rests are cargo ships and chemical container ships [34]. In the future, the number of ships crossing the Arabian Gulf is expected to increase which raises the level of pollution and the possibility of accidents.

Climate change is a key driver of involuntary migration. It is estimated that, by 2050, more than 200 million people could displace due to frequent and extreme weather events (fires, droughts, and floods). Water scarcity is a key driver of migration because of its impact on societal issues such as health and livelihoods as well as on geopolitical issues such as the conflicts it risks triggering [31]. The primary constraint to secure global food production remains water scarcity [16].

E. Extreme events: Floods, Droughts, and Environmental Challenges

In the twenty-first century, the water landscape is facing profound changes for several reasons, the most prominent of which are: the speed of scientific and technological development, the continuous globalization processes of production and global markets, climate changes, cross-border dependencies, the changing social and political context in dealing with water challenges. Meanwhile, water resources are planned and managed under a high degree of uncertainty. Hence, the water became not only a weak resource but a more complex issue.

Given the semi-closed nature of the Gulf, the impact of high rates of thermal desalination is a unique case, where the potential impacts of extensive desalination on the marine environment are clearly seen:

- Impingement and entrainment in seawater intakes: a large quantity of microorganisms is being drawn into intakes and either caught on screens and filters (impingement) or driven through the initial screening and entering the water stream within the plant (entrainment),
- Thermal discharges of heated water: a large amount of hot water issued directly from thermal desalination plants or water destined for cooling of power plants,
- Brine discharges accumulation: the discharge of concentrated brines in the residual outflow water following the removal of purified water is leading to an increase in the salinity of the Gulf waters, which in turn increases the cost of desalination in the future,
- Chemical discharges: including various chemical treatments that are used to condition water to control biofouling and remove suspended solids using antiscalants [7].

According to estimates by the Food and Agriculture Organization (FAO), "seven percent of the world's population will experience a decrease of 20 percent or more in terms of renewable water resources for every degree of global warming"

[9]. Unfortunately, the Arab Gulf states already suffer from a dry desert climate, which will increase the suffering of these countries in their struggle for fresh water.

Disaster risk management is one of the GCC region's main priorities. Floods and droughts are the most severe natural disasters in the region, threatening growth and resource security. In most arid regions, flash floods are a natural phenomenon because rainfall can be very intense in a short time, especially when these events are accompanied by dry or low infiltration capacity soils in the region. The flash flood events in 2009, 2010, and 2011 in Saudi Arabia were documented as the worst since the 1980s [15]. In 2021, tropical cyclone Shaheen caused very high amounts of precipitation and severe damage to the infrastructure of several regions in the Sultanate of Oman [17].

IV. WATER MANAGEMENT IN THE GULF STATES

A. *Water Infrastructure and Institutions.*

Water security nearly always necessitates investments in water infrastructure and systems. Countries with difficult hydrology will always require more infrastructure and stronger institutions, with the development of each of these being made much more difficult where waters are trans-boundary. To obtain, store, manage, transfer, and save water, infrastructure is required [13].

The non-sustainable mining of local groundwater aquifers, which are currently threatened by contamination and depletion, is becoming increasingly critical in all GCC countries. As a result, non-conventional water resources must be seriously considered to realize their full potential. Alternative water suppliers that are economically viable, socially equitable, and environmentally sound are being sought. According to several researchers, the only possibilities for meeting the region's current and future water demands are long-distance water imports or transfers from neighbouring nations, or investment in large-scale seawater desalination technology [5].

For instance, the GCC countries' vision of water security is united in three principles: water availability, the adequacy of current resources to cover demand, and finally the existence of another non-traditional source to cover the deficit (i.e., the desalination technology).

B. *Anemic Water Reforms*

The Gulf governments' provision of freshwater for free or at a large discount has gradually encouraged cultural norms of excessive water use and poor water practices (e.g., flood irrigation). This dry region is unique because it has one of the highest per-person water use rates and one of the lowest water prices on the planet. The senior economist of the Saudi based bank NCB Capital, Jarmo Kotilaine, believes that increasing water costs is the best way to decrease use, but in some Gulf countries, "even the concept" of doing so "provokes demonstrations" [19]. Discussion of major water-subsidy reforms that would impact the local population is off the table in all Gulf states, preserving the status quo.

Ironically, this suggests a political system of governance that is cautious—possibly too so—but not static. This is demonstrated by Saudi Arabia's initiative to produce its own wheat. A few years after the Arab oil embargo of 1973, Saudi

Arabia started a program to achieve wheat self-sufficiency, which by 1984 had surpassed its objective and allowed the nation to begin exporting wheat to 30 nations. Saudi Arabia's government spent over \$85 billion on subsidising wheat farmers during a 25-year period (1980-2005). It was an enormous ecological and hydrological disaster as the rate of utilisation of groundwater supplies for wheat irrigation was ten times faster than the replenishment rate.

After consideration, the government decided in 2003 to stop subsidies on barley production and in 2008 to phase out the wheat program by reducing the area of its cultivation. As a result, wheat cultivation has been gradually declining. The majority of Saudi Arabia's wheat is presently imported from countries such as Australia, Brazil, Germany, the United States, Poland, Lithuania, and others. Following diplomatic difficulties that began in 2018, with a tweet from Canada's previous Global Affairs Minister demanding for the release of a human rights activist in Saudi Arabia, Saudi Arabia blocked Canadian grain imports for nearly four years. In order for Saudi Arabia to meet its food security demands, the Saudi government issued a food security plan. One of the focal pillars of the plan encourages Saudi companies to invest in foreign countries to export part of their agricultural production to the Kingdom [20].

The fact that water is under-priced, farmers are unintentionally encouraged to use water wastefully and to grow lucrative, non-food crops, which all serve to hasten the groundwater depletion [26]. The problem is that growing these crops like Alfalfa requires a lot of water, especially in desert areas. If the war between Russia and Ukraine continues for an extended period of time, it may have a negative impact on global wheat supply, forcing the Saudi government to compel farms to allocate more land to wheat production in order to meet the country's food security needs. However, because alfalfa is more profitable than wheat, the government has found it difficult to persuade local farmers to produce wheat at the maximum authorized output level [20].

Another illustrative case is the Emirates Golf Club, the GCC region's first all-grass course, that was established by the city of Dubai in 1988. It did not pay for the drinkable water necessary to maintain the lushness of the fairways and greens. Although adding these facilities has aided in luring wealthy visitors to this emerging global city, by 2007 the 69 hectares of grass were consuming 2.68 billion liters of water annually. Fortunately, the club's new management has implemented salt-resistant grass, a cutting-edge, more effective irrigation system with over 2,200 sprinklers, and begun using treated sewage effluent provided by the city of Dubai. Annual water consumption in the course had decreased to 1.36 billion liters by 2013. Today, treated wastewater is used on numerous golf courses throughout the GCC, notably the Almouj course in Oman ([1]. In recent years, the Gulf states have begun paying more attention to the potential environmental and economic advantages of cleaning and reusing wastewater.

V. WATER FOREIGN POLICY IN THE GULF STATES

A. *Water Transboundary/Shared Hydrologic legacy*

A hydrologic and political legacy of transboundary waters can considerably make the management and development for water security complicated. This is due to inter-jurisdictional competition both within and between nations. In the case of international transboundary waters, it is very serious, as many of today's trans-boundary basins are cut across watersheds because of the twentieth century colonial borders [13]. Water scarcity can lead to conflict, especially in places with shared or transboundary water resources. These resources account for a major component of the Arab Gulf region's transboundary/shared groundwater resources (**Error! Reference source not found.**).

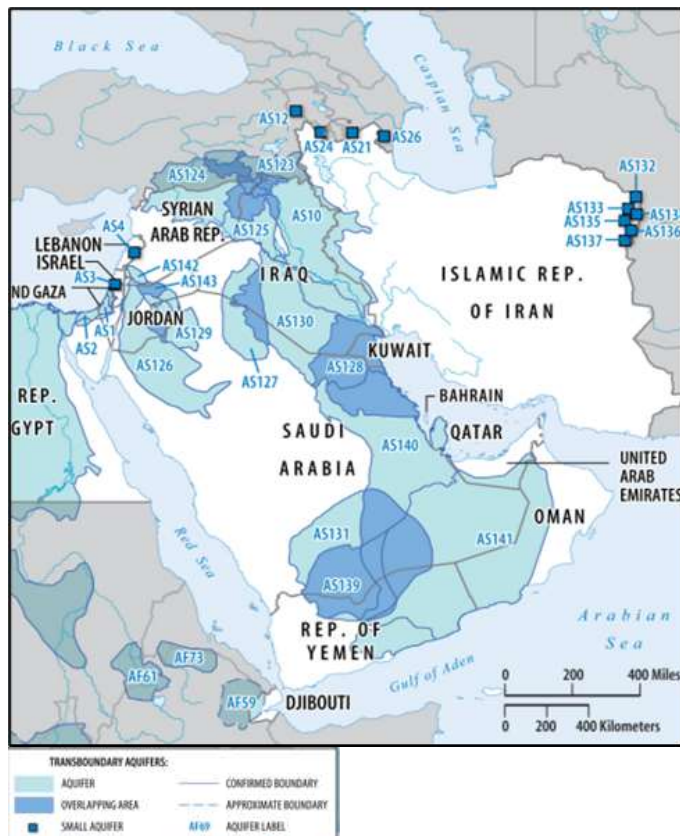


Fig. 7. Major Transboundary Aquifers in the GCC.

(Source: International Groundwater Resource Assessment Centre)

The Arab Gulf nations made little attempt to define their territory before the discovery of oil, and the notion of formal borders meant nothing to them. Loyalty to a political unit was not a benefit for the Gulf states, and organized power was confined to jurisdiction over ports and oases. The signing of the first oil concessions in the 1930s prompted a drive for the delineation of state borders, but the failure to do so early enough left open the possibility of violence, particularly in the areas where the richest oil fields were located. Following the withdrawal of British soldiers from the area in 1972, ancient territorial claims and ethnic animosities resurfaced ([2].

¹ Anonymous informant, in discussion with one of the authors, February 28, 2021. The interviewee wishes to remain anonymous.

The complexity of managing resources in the Arab Gulf states is increasing gradually with the growth in demand, leading in the emergence of political and organizational challenges that, in extreme cases, might lead to violence. Water resources frequently create border disputes, particularly when transboundary water resources are shared by several countries. As a result, the border water issues arose invisibly beneath the political demarcation disputes among the six Arab Gulf governments. In the Arab Gulf area, the phenomenon of the development of autonomous political entities began to take on the image of the state in the modern sense during the 1960s.

The first important water resource in the Arab Gulf region is groundwater, which is fed by rainfall in shallow and deep strata inside or beyond borders. In Bahrain, Oman, the United Arab Emirates, and Saudi Arabia. Groundwater accounts for more than 80 percent of total water pumping to meet rising demand [4].

B. Joint Water Legislation, Laws, and Water Governance in GCC

Overall, the water politics has been switching between 'high politics' and 'low politics' agendas of the Arab Gulf states' region since the political existence of its six states. Before the oil, the water politics had been a priority in high politics agendas. While after the oil discovery, the water politics has not been a priority and considered water issues in the low politics agendas.

"In fact, at the beginning of the twenty-first century, the water politics has got a very huge attention in the high politics agendas of world hegemonic countries due to the increase of global water scarcity crisis that will have a direct political impact on their interests nationally, regionally, and globally. While all the Arab Gulf states' foreign policies are still not realizing the importance of water politics again- as a priority in their high politics agendas."¹

The Gulf region's decision-makers are now conscious that their freshwater resources are limited and need to be managed wisely.

The Gulf's long-term comprehensive strategy on water started from a vision based on the premise that, by 2035, the GCC countries will have a sustainable, efficient, equitable and safe water sector that contributes to sustainable social and economic. The strategy includes five main areas: water resource development and sustainability, efficient and equitable use of water resources, strengthening of municipal water supply security, effective governance and awareness, economic efficiency, and financial sustainability. The GCC states have worked through the specialized committees in the water field to draw up joint water policies among them. This framework was able to accomplish a number of important projects in this field [14], which included:

- a) Preparation of joint water legislation and laws (Figure 8),
- b) Localization of the desalination industry, c) Monitoring and managing shared groundwater reservoirs, d) Preparation of a joint Gulf water emergency plan, e) Monitoring the quality of drinking water, f) Reuse of treated wastewater.



Fig. 7. GCC Joint Water Legislation and Laws.

However, on the national level of the Arab Gulf states, there is no clear, publicly announced official water policy that includes specific objectives and actions that work to achieve water sustainability and entrust it to a single regulator that achieves integrated water management.

The responsibilities for managing, organizing, and developing water supplies, and setting policies and measures related to water resources and their use are divided between several governmental and non-governmental agencies, as the institutional framework indicates poor coordination between them. Although the magnitude of the required projects related to water resources - both during the past decade and the next - requires more cooperation and coordination, developing relevant institutions and providing national capabilities in them.

VI. CONCLUSION

This article investigated the main drivers impacting water security in the Arab Gulf states and how the rentier nature of their policies on water has affected their water, energy, and food sectors over the past decades, leading to their current condition of dangerous unsustainability, water insecurity, anemic water reforms, and weak management strategies.

The current challenge facing the Gulf countries is to achieve water security thus socio-political stability, especially due to their reliance on water desalination as a main source of drinking water and household and municipal uses. These countries are facing the most severe water shortages posing serious threats to the region's security. These threats include the possibility of a cyber, terrorist, or military attack targeting critical infrastructure (such as major desalination plants) and water supply networks. Consequently, water security is a national security priority for the governments of these countries.

Considering the reality of the water issue in the Arab Gulf states, it has become known that they are the least safe in this area due to the scarcity of water. It is evident that the future landscape of water (in)security will be significantly shaped by future patterns of fossil fuel extraction and availability. In addition to the interconnectedness between energy and water production in the Gulf, a pressure on food security that may be used as a counter-weapon against these countries. Therefore,

experts predict that the GCC countries will witness an increase in water scarcity and the cost of water supply in the future which may not only jeopardize the potential development process in them but may also threaten their development achievements. Then, the means and methods of facing the challenges of the water sector, as a strategic vital resource and an essential input in the development process, will have a major impact on the sustainable development of the GCC countries over the coming decades.

The water issue is crucial for the future of the people of the Arab Gulf states. There is a need to store water for future generations' use of dwindling natural wells and aquifers. There is an urgent need to prioritize water sensible usage, and a total reconsideration of agriculture policies. That said, the contemporary political ecosystem of fossil fuels in the rentier economies of GCC countries is quite different from that of water. Actually, fossil fuels, oil and natural gas, are the "prime movers" of mass industrial production, mass consumption, and exchange. They generate far higher rents and profits and have far weightier and broader political and economic consequences, including facilitating elite enrichment, militarization, and the hyper-exploitation of water resources. Water is currently the secondary and dependent variable in the oil-water relationship in the GCC region.

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