



Management & Security of Municipal Water at the GCC Countries

Mohammad F. ALRASHED

Executive Director

Water Research Center



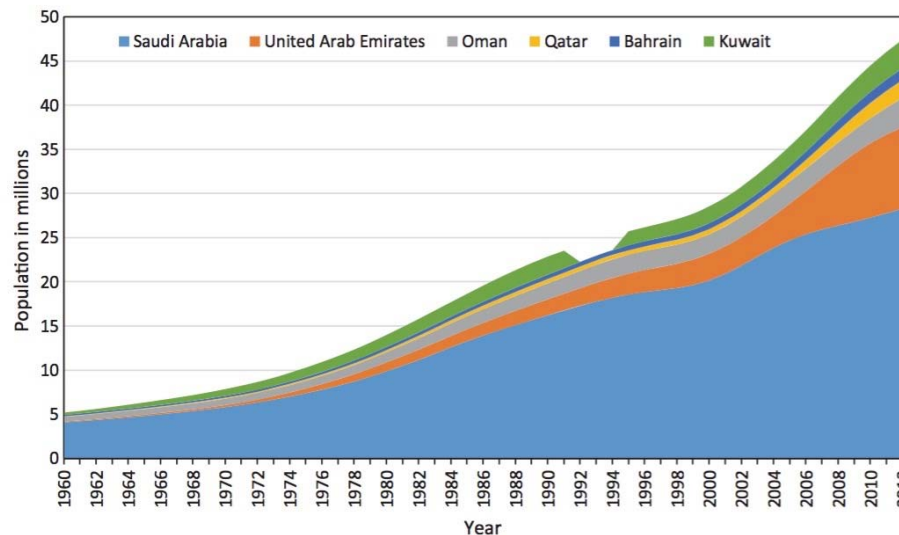


Overview

- × Introduction
- × Political Challenges facing Demand Management
- × Alternative Solutions for Addressing Water Scarcity
- × Investment in Water and Sanitation
- × Major Water Challenges Facing The GCC Countries
- × Threats to Municipal Water Security
- × Future of Municipal Water Security of The GCC Countries
- × Conclusions & Recommendations

Introduction

- Rapid growth on GCC oil revenues during the last few decades led to rapid increase in population and socio-economic development in the GCC countries,
- This led to a substantial increase in water demands in all sectors, especially, agricultural sector (60%-85%) and municipal sector (15%-70%).
- Flood irrigation is practiced on 80% of irrigated areas leads to the loss of more than 50% of irrigation water,
- Despite the Aquifer Storage and Recovery (ASR) limited practices and dams construction to collect, store, and utilize runoff and groundwater, continuous deterioration in its quantity and quality is witnessed all over the GCC c



adapted from World Bank Data 2014)



Country	Annual water availability (Bm ³ /year)			Annual water usage		% use by sector		
	Natural renewable resources	Desalinated water	Wastewater reuse	Bm ³	% of total water resources	Domestic	Industry	Agriculture
Bahrain	0.11	0.14	Neg.	0.25	170	26	3	71
Kuwait	0.11	0.65	0.12	0.76	87	37	2	60
Oman	1.6	0.12	0.02	1.22	74	9	1	93
Qatar	0.05	0.12	n.a.	0.28	n.a.	23	3	74
Saudi Arabia	2.5	2.28	0.15	17	506	9	1	90
UAE	0.2	0.95	0.14	1.6	180	24	10	67

Growth indicators of GCC countries (adapted from CIA World Factbook 2014)



Cont., Introduction

- In most of the countries, **unplanned groundwater mining** continues without a clear “exit” strategy
- To meet domestic water supply requirement, GCC countries have turned to desalination and have become collectively the **world leaders in desalination**, with more than 50% of the world capacity
- Costs of desalination in late 1970s were around US\$ 5.5 m³, but now vary between US\$ 0.5 and 0.6 m³, depending on the site and size of the desalination plant,
- In a recent report, **IRENA** stresses that worldwide **15% of global fresh water use is for energy production** (including oil extraction) and **55% of water utilities’ operating budget is due to energy costs.**
- Desalination remains an important technology, capital intensive and costly, and with negative environmental impacts
- Available treated wastewater are still not being reused to their potential; planning for full utilization of treated effluent are in the early stages.



Political Challenges facing Demand Management

- Over the last few decades, most GCC states have focused their strategies on augmenting **water supply management**, without sufficient consideration to **water demand management**,
- **Water consumption** levels in GCC rank among the highest in the world: The **daily, per capita water consumption is 265 liters in Saudi Arabia, 500 liters in Kuwait and Qatar, and 550 liters in the UAE. United Kingdom, below 150 liters per capita.**
- **Water subsidies** represent an increasingly heavy burden on fiscal budgets, such that water subsidies are **expected to exhaust 10 percent of oil revenue in some GCC countries by 2025.**
- **Ranges in tariffs and subsidization rates** correspond to different customer segments (usually **citizens versus non-citizens**) that pay different tariff amounts

Country	Product	Production cost (USD \$)	Tariff (USD \$)	Subsidization rate (%)
Bahrain	Electricity	0.07/kWh	0.01-0.04/kWh	43-86
	Water	1.92/m ³	0.80-1.06/m ³	45-58
Qatar	Electricity	0.07/kWh	0.02-0.04/kWh	42-67
	Water	2.74/m ³	1.21-1.92/m ³	30-56
UAE	Electricity	0.07-0.09/kWh	0.01-0.04/kWh	40-88
	Water	2.48/m ³	0.60/m ³	76-100

Omar Saif, Toufic Mezher, and Hassan A. Arafat, "Water Security in the GCC Countries: Challenges and opportunities," *Journal of Environmental Studies and Sciences* 4, no. 4 (August 26, 2014): 329-46.



Cont. Political Challenges facing Demand Management

- Water demand management includes the development of market and non-market incentives, mechanisms, and regulations that would reduce water use through greater efficiency. One of the recommendations of the **Dublin Statement on Water and Sustainable Development in 1992** was that “**water** has an economic value in all its competing uses and should be recognized as an **economic good**.”
- There is a **misconception of being a Muslim country we have to avoid pricing water at its economic value** due to religious and moral beliefs that treat water as a “**free resource**.” However, this is an inaccurate conjecture because **Islamic law supports water tariffs**, as a tool for conservation, and up to full-cost recovery for water services. Furthermore, **Islam allows for the involvement of the private sector in water services, as long as it does not lead to private, exclusive “ownership over significant public water resources, or even long-term water use right.”**




Cont. Political Challenges facing Demand Management

- Most GCC countries prefer to rely on technological methods to save water, instead of getting residents to bear larger proportions of the financial burden for water and energy.
- All GCC countries are also investing in awareness campaigns encouraging water conservation. In the UAE took this initiative one step further by showing the true cost of water and electricity production on the water and electricity bills of customers and how much they are saving via government subsidies. The UAE is also leading the region in terms of partial privatization of the water and energy sectors.

Alternative Solutions for Addressing Water Scarcity

- Investing in Farmland Abroad:
- After the global food crisis of 2008, GCC countries have announced plans to invest in farmlands abroad in pursuit of enhanced water & food security, either through land lease or land ownership,
- Targeted countries are endowed with favorable agro-climatic conditions, have good economic and diplomatic relations with GCC states, and are geographically close to reduce transportation costs,
- **Benefits & Precautions:**
 - Reducing over-extraction of groundwater resources that are viewed as strategic reserves
 - Such investment is usually met with suspicions of “land grabbing” due to the lack of clear international laws governing the leasing or purchase of land across borders. Hence, GCC states need to take into consideration the need for the support of local populations.
 - As a result, some GCC countries are seeking to expand their agricultural investments in developed countries, such as the United States and Australia, A recent example was the purchase of 10,000 acres of farmland in Arizona by the Saudi food giant Almarai in 2014.



Investor	Target	Land acquired through purchase or lease (ha)
Saudi Arabia	Sudan	10,000
	Tanzania	500,000
United Arab Emirates	Sudan	380,000
Qatar	Kenya	40,000
South Korea	Sudan	700,000
Jordan	Sudan	30,000
Egypt	Uganda	860,000
	Ethiopia	20,000
China	Cameroon	10,000
	Democratic Republic of Congo	2,800,000
	Zimbabwe	100,000

Foreign direct investment by three GCC states in African farmland, benchmarked against:



Cont. Alternative Solutions for Addressing Water Scarcity

• Importing Physical Water

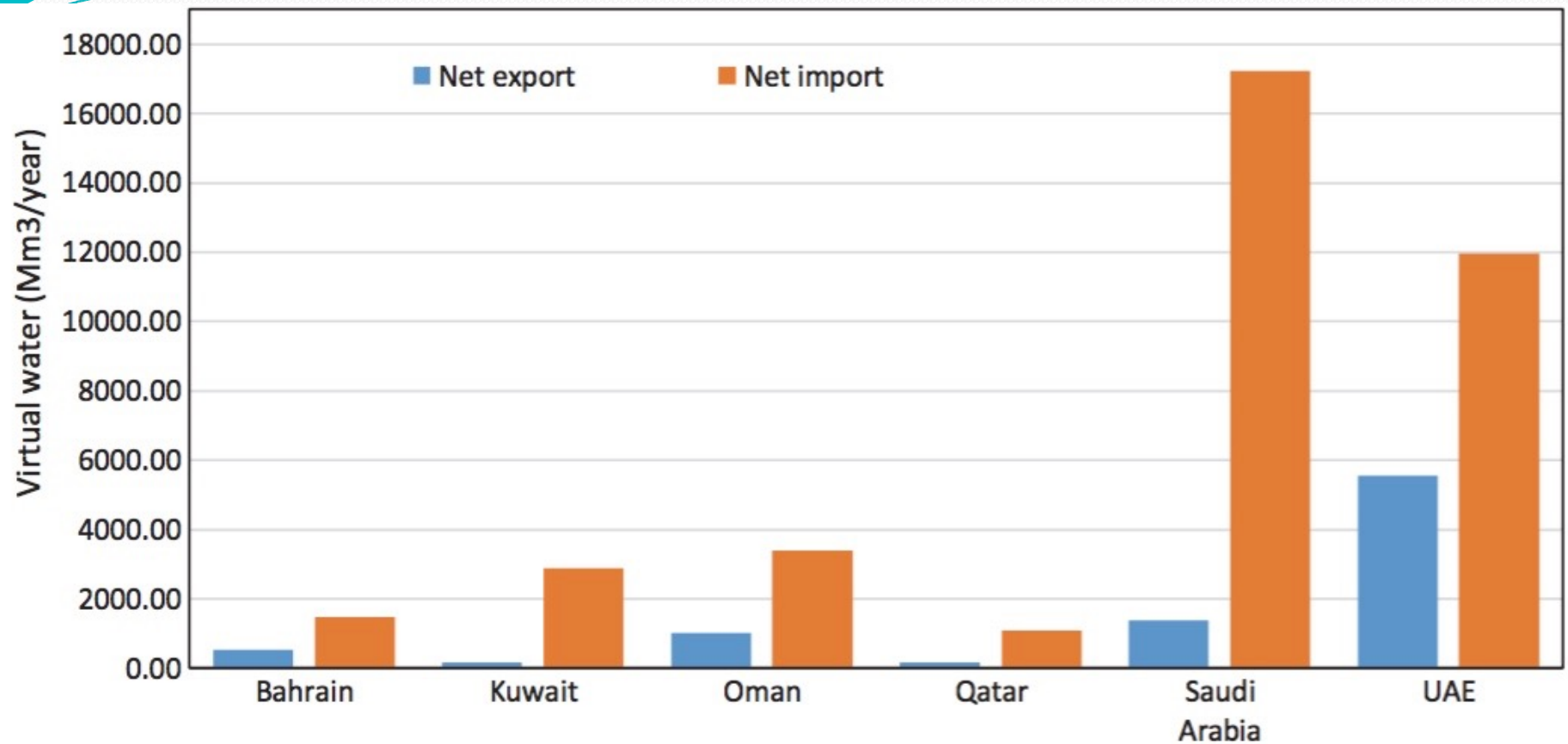
- Some GCC countries seriously considered several **proposals for importing water from neighboring countries**. Nevertheless, most of these proposals were **rejected as the geopolitical costs were thought to outweigh the potential benefits**.
- In the mid **1980s**, the **GCC countries negotiated a multilateral deal with Turkey**. Later, in **2009**, **Qatar executed a feasibility study for a bilateral water import project that would transfer water from Iran**
- **As an alternative**, GCC states sought to preserve their **water security by linking their water infrastructure and establishing a common water supply network**.



Cont. Alternative Solutions for Addressing Water Scarcity

Importing Virtual Water

- A vital component of GCC water security is the **import of water embedded in water-intensive products – referred to as “virtual water.”**
- According to the World Water Council, **“Virtual water is the amount of water that is embedded in food or other products needed for its production”**. Trade in virtual water allows water scarce countries to **import high water consuming products** while **exporting low water consuming products** and in this way **making water available for other purposes.”**
- As a result of population growth and increasing demands for food, **virtual water trade is gaining momentum in the Arab region**; it is estimated that around **50 percent of all food consumed in the Arab world is imported from regions that have sufficient water to produce beyond their domestic needs**. Generally, the amount of virtual water imported by Arab countries **doubled from 148 BCM in 2000 to 310 BCM in 2010**. **Saudi Arabia and the UAE** are among the highest net importers.



Virtual water imports and exports for GCC countries
(data from Mekonnen and Hoekstra 2011)



Cont. Alternative Solutions for Addressing Water Scarcity

- Investment in Water and Sanitation
- Although **domestic wastewater is about 4860 Mm³** and there are **significant treatment facilities** in most countries, while the amount of **reused treated wastewater is only 324 Mm³** and the amount **reused in agriculture** is very small and almost negligible in all countries (about **2% of total water use**).
- Assuming that 50% of the municipal water can be treated and reused for agricultural purposes in the future, an amount of 2428 Mm³ can be deducted from the agricultural demands, which represents about 11% of the irrigation water, or about 17% of the extracted fossil groundwater.

Country	Treated wastewater (MCM/year)	Reused wastewater (MCM/year)	Wastewater treatment rate (%)	Treated wastewater reuse rate (%)
Bahrain	24	17	32	71
Kuwait	260	182	62	70
Oman	12	8	22	67
Qatar	44	31	33	70
Saudi Arabia	240	98	23	41
UAE	265	159	39	60
Total	845	495	36	59

Treated and used wastewater for GCC countries (adapted from World Bank 2005)



Threats to Municipal Water Security

- A substantial threat to water security at the GCC is that:
 - **Water shortages become more severe** due to **supply management** being applied rather than **demand management**,
 - **Vulnerability of water infrastructure** is a concern due to extensive delivery networks comprising **tens of thousands of pipelines** that deliver desalinated water from the shore to population centers hundreds of miles away. Pipelines of that length are vulnerable to **technical failure or deliberate attacks**,
 - **desalination technology** remains an **imported technology** for the GCC countries, with **very limited support to R&D**. At the same time There is a **very limited application to successful R&D outputs**. According to international reports, **water resources have been adversely affected by climate change** in the Arab world in general and **in the Arabian Peninsula in particular (UNDP & UNE)**.



Future of Municipal Water Security at the GCC Countries

- there is an urgent need to improve water efficiency by reducing wasteful use to sustain water supplies in all the water consuming sectors,
- Micro-catchment rainwater harvesting systems are advantageous because they are simple to design and cheap to install; they are therefore easy to reproduce,
- Alternatively, GCC states have recently switched to “**outsourcing farming & virtual water**” in order to save their limited groundwater resources and maintain food security.



Cont. Future Municipal Water Security of The GCC States

- Expediting a comprehensive strategy for the **development of water resource management policies in all the GCC countries.**
- Expediting **water interconnectivity projects between the GCC countries**, along the lines of existing projects linked to electricity,
- Investment in **scientific research to improve desalination/treatment technologies and groundwater development and protection,**



Conclusion & Recommendations

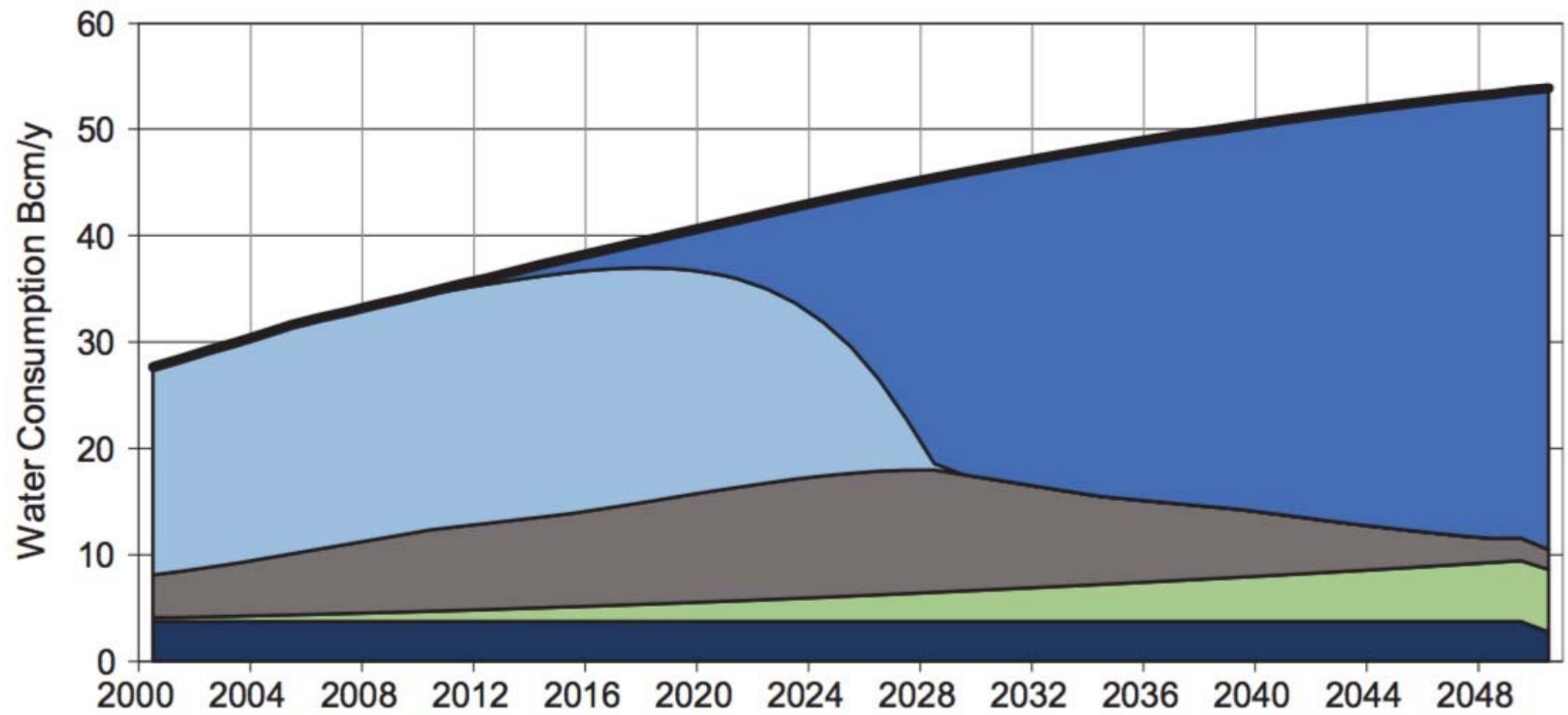
- Any disruptions of water supply would have direct consequences for the **political and social stability** in the affected countries, this can be avoided by Transparency.
- At the same time, **preventative and mitigating procedures** must be put in place to ensure water security for all, and **plans to counter threats to water security should be expedited.**
- Supporting **Research & Development** and application of its successful outputs is essential for the **Future Water Security.**



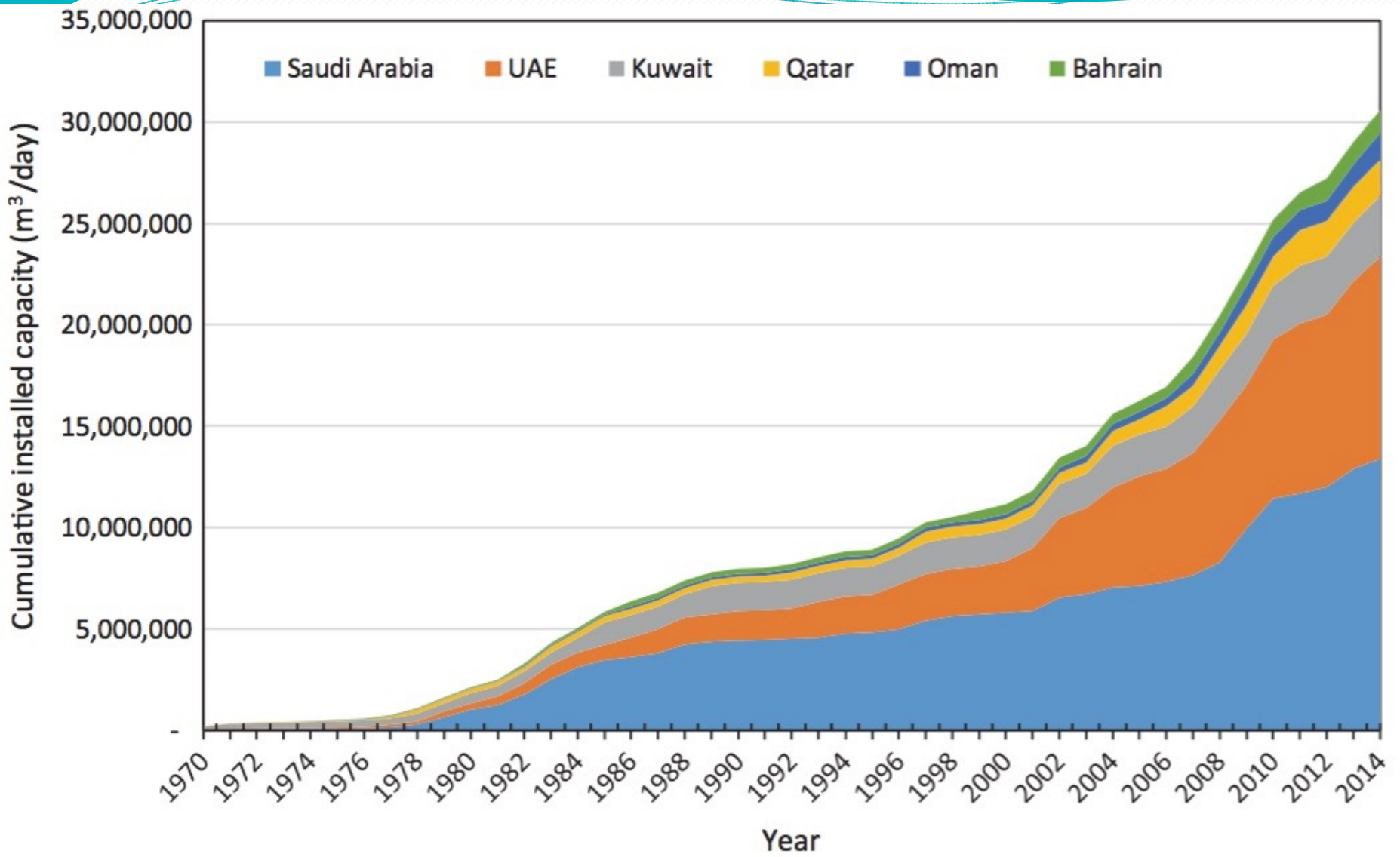
Cont. Conclusion & Recommendations

Policy Recommendations for the GCC Countries:

- **Enhance cooperation and coordination among stakeholders** in the management of water, energy, and food sectors. It is crucial to **establish a national inter-ministerial council that encompasses a water-energy-food nexus** approach in resource management.
- **Diversify the mix of energy sources applied in desalination. Renewable and environmentally safe energy sources** such as wind and solar energy have strong potentials in the GCC region, which is located in the world's "sun belt."
- **Increase water tariffs in order to decrease demand.** While socially unpopular and politically sensitive, water and electricity subsidies should be **gradually shifted to reflect the real economic cost of water provision.** A new pricing mechanism ; which imposes progressive tariffs on drinking water while **demanding water pricing at actual cost for industrial and commercial activities** – should ensure that **basic human needs for fresh water are met at a low price, while excessive use is priced at a tariff that reflects cost.**



- Natural Water Used
- Fossil Fuel Desalination
- Alternative Energy Powered Desalination
- Wastewater Reuse
- Groundwater Use
- Total Demand GCC





Cont. Conclusion & Recommendations

- **Improve water efficiency in local food production.** Given the high rates of water use by the agricultural sector in GCC countries, **increased irrigation efficiency coupled with better crop choices could result in more than 70 percent water savings in the region,**
- **Address climate change challenges in a dynamic and science-based approach.** Climate change is likely to make the Arabian Gulf region more susceptible to extreme hydrological events.
- **Interdependence between water, energy, and food security necessitate a high level of policy coordination at the national and regional levels.**
- **To preserve water security in the GCC countries, the long-term sustainability and perseverance of water management policies should be given more weight in evaluating alternative solutions for water scarcity.**



THANK YOU