

The Water-Energy-Food Conflict Nexus in MENA

Dr. Paul Sullivan

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Forward

We thank Dr. Paul Sullivan for allowing us to publish this insightful overview of the regional water problem. It is based on a superb presentation he made on a PMBF-sponsored panel at the Annual Conference of the Association of Opinion Journalist in Newport, Rhode Island on October 14, 2013.

Sullivan's work is the first in what we hope is a series of research papers exploring challenges and opportunities in the Kingdom of Saudi Arabia and surrounding Arab world. While shaped by geography, culture, economic development, and other unique circumstances, issues such as water, educational reform, energy use, agriculture, and job creation among the youth are not unique to the Arabian Peninsula. In fact, these same issues are in play in Florida, the United States, and across the globe. At the UCF Prince Mohammad bin Fahd Program for Strategic Research and Studies (PBMF), we hope – though the research we sponsor, partnerships we forge, and events we facilitate – not only to shed light on topics relevant to the Kingdom, but also to highlight common concerns, causes, and solutions to challenges shared by the Middle East region and United States.

With the Middle East rife with conflict today, the attention of regional experts has focused on purely political topics – what is happening, and how it is likely to play out. But history shows that political development and economics are largely shaped by non-political factors such as resource use. Water has long been critical to the survival of individuals and nations, and as Dr. Paul Sullivan shows, it is perhaps the most daunting challenge facing the Arab world today. Indeed, nearly all nations in the region face varying degrees of crisis in terms of water.

In addition to a desert climate, certain economic decisions, particularly in the agricultural sector, have exacerbated Saudi Arabia's water problem. Fortunately, the Kingdom has been blessed with petroleum which has generated the financial wherewithal to address this challenge. In recent years, Saudi Arabia has, for example, adjusted agricultural techniques and reshaped agri-business. And notably, it is in the process of developing cutting edge desalination technology that will produce more water in an environmentally friendly manner. But clearly, there is more to be done – and others facing water shortages, including here in the State of Florida, will watch with great interest how the Kingdom confront this problem.

Sincerely,

David Dumke

Director

Prince Mohammad bin Fahd Program from Strategic Research and Studies.

Dr. Paul Sullivan

Dr. Paul Sullivan is a professor of economics at the National Defense University. He is also an adjunct professor at Georgetown University, teaching on the subjects of security studies, science and technology, and international relations. He is an internationally renowned expert on the subjects of energy development, security and economic markets, as well as, international economic development, and political and military issues. Dr. Sullivan was invited to provide his expert advice in the United Nations Conference on Trade and Development, as well as multiple other several high level official meetings. He has published several books on the economy, security issues, resource development, water and energy security, and US-Arab relations. Dr. Sullivan is a member of the Global Expert list. He studied at Brandeis University, where he obtained his B.A., and obtained an M.A., MPhil, and PhD from Yale. Dr. Sullivan lived in Egypt for several years and was a professor at the American University Cairo. He travels regularly throughout the Middle East-North African region, and the world.

The Water-Energy-Food-Conflict Nexus in MENA

There is a scene in one of my favorite movies “Lawrence of Arabia” that could be played out time and again in the Middle East and North Africa, in both small and large scales, and still seems like normal:

Lawrence was in the desert with a man from the Hazimi tribe. Sherif Ali (played by Omar Sharif), saw the Hazimi getting water from the Harif well. The tribe Sherif Ali belonged to was the Harif (the actual Sherif Ali was from the Bani Hesham, but whatever). Ali shot and killed the Hazimi from a great distance.

Lawrence, being a westerner from England, a country which Lawrence described as not being desert and a flat country of fat people, was upset and flabbergasted at the murder. When Lawrence asked Sherif Ali why he killed the man he got the following answer: “He was nothing. The well is everything... The Hazimi may not drink at our wells. He knew that... Salaam.”

Water in the Middle East and North Africa is a precious commodity. Is it worth fighting over? Some believe it is. Will it become scarcer over time in the area? It will in many places. And that scarcity is not just because of a decline in the rains or over-pumping of the ground water, which has been happening for a very long time, but also because of the overuse of the water, the polluting of the water, and the growth in the population, agriculture and industry in the region.

Much of the Middle East and North Africa is desert. Egypt is 96 percent desert. Libya and Algeria are mostly desert lands, excepting for the spare oases here and there and some green spots in the mountains and on the coasts.

Saudi Arabia is the place of the Rub Al Khali, the Empty Quarter. There is a reason why it is called that. It is dry and very hot during the days during most of the year. It is one of the harshest places on earth to live. The Western Desert of Egypt and the expanse of desert into Libya and beyond connected to the Western Desert and the Sand Sea above ground are dry and inhospitable.

However, underneath these desert lands of North Africa and going into even Darfur and beyond there is the massive Great Nubian Sandstone Aquifer. This is an underground sea of fossil fresh water that is there from the days when these deserts were tropical areas and even parts of a sea. One sad oddity from this is that there is a massive lake of water connected with a tunnel system and other porosity structures right under Darfur. As people die of thirst on the top of this unseen lake, cool waters sit below, as they have for tens of thousands of years.

There is a massive underground water system in the Arabian Gulf Region that connects across Saudi Arabia and into Kuwait, the UAE, Qatar and even under the Gulf to Bahrain. Bahrain, by the way, means “two seas,” one fresh and one salty. The pirates and warriors of old Bahrain knew that they could get fresh water under ground and under the sea.

There are giant fresh water aquifers in Iraq and Syria as well, parts of which are replenished by the Tigris and Euphrates. The desert aquifers in Saudi Arabia and in North Africa are only naturally replenished a tiny bit when the water is taken out. There are no such massive rivers like the Nile in the deserts of Libya or close enough to Darfur and the Western Desert of Egypt to replenish that water.

Mohammar Ghaddafi, as seemingly mad as he was, came up with the idea of the Great Man Made River to bring some of this fossil water of the desert in the south of Libya to the north of Libya. He wanted to green the country and make it food secure. This water is fossil water and not naturally replenishable. It will run out eventually and Libya will likely end up one of the world’s major exporters of large pipelines.

Yes, water in this region is fascinating, as it is the world over.

A full skeleton of a whale was discovered in the Sand Sea of the Western Desert in Egypt. When I walked in the Sand Sea near the oasis of Siwa in the far Western Desert of Egypt a few years ago I could see the remnants of sea shells. Where do you think the limestone for the pyramids came from: Home Depot? There are some paintings on cliffs and in caves in the deepest, most remote places in the Sahara Desert, where many tens of thousands of years ago the people who lived there drew hippos, elephants, giraffes, and more savannah and tropical animals. Why? Those animals and peoples lived in the then lush areas of the now desert.

Water and the lack of it have defined life, civilizations, and more since the first ice crystals merged with this then forming planet so many hundreds of millions of years ago. Without water, proper temperatures, etc. most flora and fauna, and certainly people, cannot survive.

When climate changes people move or die. It happened in the Harappa Civilization when the course of the Indus River shifted so long ago. It happened to the Mayans when droughts shattered their society. It happened to the Anasazi in what is now known as Arizona in the US. There are many examples of water cycles changing, climates changing, and river flows changing in the long history of the human race and before. The Nile has been in many places. Its flow was not the way it is now 10,000 years ago. As the Nile’s course changed so did the places where people lived and farmed over time. Many people moved from the desertification of north in Egypt to south in what is now known as Sudan. The deserts of the region as we know them now were not that way so many years ago.

Are we seeing such changes now?

The sort of epic changes in water systems of the past normally took some time. They were sometimes instigated by changes in wind currents, sea currents (even from very far away), and other such complex weather and climatic changes. I will not get into all of the complexities of climate change time, but will now turn to some of the most difficult water issues facing the region today.

Let's start with Syria.

Over the past few years, starting around 2006, there have been a series of tragic droughts in Syria and in the water-basin connected areas of Iraq.

The northeast of Syria was hit the hardest. About 85 percent of the livestock of the herders and farmers in NE Syria and even into central Syria were lost. Many farm lands did not just dry out and become difficult to crop. They are now desert. The wells have dried up.

Hundreds of thousands of people from the farms and rural towns connected with them moved to larger cities in towns to the west and south from 2008-2010, mostly. This put great stress on those cities. Wheat and other staple production in the country dropped like a rock. The supply of sheep, cattle and more also dropped. Food inflation became severe.

Even energy systems were hit in Syria. Energy exploration, production, refining and so forth needs lots of water. Electricity production needs lots of water for cooling towers and steam generation.

A country with massive drops in water availability from the sky and rivers usually tries to make up for that with drilling in the ground for water. Syria is no different. Thousands of wells were dug and exploited as the sky dried and the cattle died.

According to NASA and others who took seismic "photos" of the water underneath Syria over the last decade or so the equivalent of a small sea, like the Dead Sea but fresh water, has been drained and dried out in Syria where fairly good underground aquifers existed before. Without a serious set of monsoon like years for many years to come it will be pretty much impossible to replenish these underground aquifers at any reasonable costs and rates.

If Turkey has some very good rains in its south east, and if Turkey allows much more water to head toward Iraq and Syria via the Tigris and Euphrates this would help a lot. However, the politics of water in Turkey are complex and may not allow this to happen in the best ways possible for Iraq and Syria.

Turkey developed a policy to help “pacify their Kurdish Southeast.” The implementation of this policy was manifested in the building of massive dams, reservoirs, and irrigation systems to keep more of the water flows from the rains in its southeastern mountains within Turkey --and not flowing to Iraq and Syria via these great river systems.

There were times when the lights went out in Damascus and other cities when the flows of the Euphrates were slowed due to this GAP project in Turkey. Why? A good part of the electricity production of Syria is from hydropower that uses the flows of water on the Euphrates in particular. When the water flows are less, electricity production is less. These days electricity production, transmission and distribution, have other problems due to the civil war, but that is another talk for another time.

Some believe that the droughts that repeated over many years prior to the vicious civil war in Syria were important drivers towards the civil war. I agree. But there were also other factors like the behavior of a brutal dictator, repression, poor and backward economic policies, a moribund banking systems, massive corruption, ethnic tensions, and so many more factors.

The weather changes and maybe we will see that these are climate changes, ended up being threat creators and threat multipliers for the Syrian situation. The declining supply of water and the resultant loss of livelihoods, increased prices, massive migrations from rural areas and so much more added up to a tipping point.

Are there lesson here for leaders in the future? Yes. When you see droughts building over years deal with them and help your people, otherwise you may end up with a bullet in your head.

Iraq also has some severe water problems. These have led to some violence in the country both directly and indirectly via the water-food-economy-security nexus. Iraqis in the north also got hit with those horrible droughts. Iraqis in the very south saw Saddam Hussein the butcher also become Saddam Hussein the water stealer. The “Marsh Arabs” saw their lands dry up and their very civilization dry up as Saddam drained the swamps, created irrigation canals upstream that diverted water away from the south, and also built a massive lake in his own honor as he built a dam in his own honor. That sort of hydrological megalomania made him many enemies.

He may have killed, sickened and injured more people with his water policies than he did with his other notoriously vicious ethnic cleansing, murders and imprisonments.

I have already mentioned a couple of water systems that were connected with hydropower dams and irrigation networks in the Syria-Iraq-Turkey water corridors. Let us now switch to Egypt, Sudan, South Sudan, and Ethiopia.

As I mentioned earlier, Egypt is a desert land. It does not rain much there. I lived there for six years and have been visiting for often extended periods in other years over more than 2 decades. Rarely did I see it rain. It does on the coastal areas in the winter times. However, the Nile runs from south to north. And the rains in the northern delta and Alexandria are really a trickle compared to the torrents of water that come from the rains that feed into the white and blue Niles.

Egypt is hugely reliant on water from outside of its country. The sharing and lack thereof of the Nile is a complex and often tense history. I cannot get too much into that now, but let's just say that for many years the only two countries in the region that had any treaty rights to the waters of the Nile were Sudan and Egypt. This goes back to the days when the British had power to do such things in the region. Now we have a group of countries that have signed a separate treaty that gives rights to the Nile waters to many countries along its water course and within its basins. Egypt continues to claim that the effective treaty is the one that gave Egypt and Sudan all of the power over the water – and left the others to fend for themselves. Even today when Uganda is building a hydropower dam there will be Egyptians on a hill over it looking down to see how things are going.

The Egyptians are quite anxious about their water from the Nile. They have a good reason. They are already using about 99 percent of the water coming down from the Nile. They have considerable reserves in the aptly named reservoir called Lake Nasser. However, if a significant percentage of water is cut off from flows to Egypt over many years by either the development of irrigation systems and hydropower dams in the upstream states or via climate and water cycles (read that rain cycles) changes, Egypt is in trouble. Egypt's population growth rate has picked up not dropped during the revolution, which I consider ongoing. It also is in dire need of industrial and agricultural development.

The countries to the upstream directions from Egypt want to develop industry, grow more food, and use more water for human and economic development, but there is just so much to share. Also massive amounts of the waters from the Nile evaporate every year in a big swamp called The Sudd in South Sudan. Many have thought about digging a river or set of rivers through the Sudd to get the water moving more quickly in order to slow evaporation. However, a set of civil wars between the south and the north erupted in part due to these ideas, such as the Junglie Canal. The dredging and digging machines that were to be used for this are still rusting in the swamp.

John Garang, one of the leaders of the southern rebellions in these vicious civil wars was an economics Phd from Iowa State who wrote his thesis on the waters of Sudan. South and north Sudan split. One of the many reasons was water sharing.

South Sudan is one of the poorest, least developed countries on earth. It has massive water sources via the Nile, the Sudd, gigantic underground water aquifers and more. It has amazingly good farm land. Yet its people starve and are mostly illiterate and face massive poverty, endemic diseases, including huge numbers of children dying of cholera and other water borne diseases – and, of course, many die and get sick from malaria, which is also related to water.

When South Sudan left Sudan it also left the Arab League. Southerners do not consider themselves to be Arabs. When that happened the Arab League “lost” 25 percent of its water. The water that used to flow from the South Sudan upward to Sudan and Egypt is still flowing, but now it starts outside of the Arab League. That must be a weird feeling for the people in the Arab League.

There is a lot more to say on this, but let us switch to some other fascinating water issues.

The UAE and Qatar have about 2-3 days of fresh water reserves if their desalinization plants go out. Bahrain relies almost entirely on desalinized water. Kuwait gets about 75 percent of its fresh water from desalinization. Qatar and the UAE get about almost all of their water from desalinization. Some of the desalinized water is used to replenish underground reserves, which are in decline. Qatar has imported water from as far away as Japan. Oman relies a lot on desalinization of water as does Saudi Arabia.

Saudi Arabia is the biggest market for desalinization plants in the world. The UAE is not far behind. The Saudis, as a side bar, drained massive amounts of their mostly non-replenishable underground aquifers to grow wheat in the desert at many times the costs of importing the wheat on the open world trade markets. They have mostly stopped that.

However, the biggest dairy farm in the region is in Saudi Arabia. Saudi Arabia is a major food and dairy products exporter to the Gulf region and North Africa – and to many other countries. How can they do this? The water is subsidized for irrigation and food processing. The desalinization costs to get some of that water are subsidized. The fuel for desalinization, farming, transport and the electricity etc. for food processing is subsidized. For Saudis the purchases of the food are also subsidized. So what we have is a completely distorted agricultural, food, water and energy system that can only add up to big trouble in the future without some serious policy changes.

Other countries in the Middle East and North Africa also make sure that the water is cheap, aka, subsidized directly or indirectly. Throughout MENA fuel is subsidized and food is subsidized. Therefore, waste is subsidized and resource threats in the future are subsidized.

So what do we have as one of the results? Some of the largest percentages of obese diabetics in the world are in the Gulf oil exporting states. In Egypt we have diabetes and obesity rates that

are very high, but at the same time there is malnutrition, but that is another story that will be heard when the next revolution comes around. These countries are also driving themselves toward greater water, food and energy stress through irrational subsidy systems.

Back to Desalinization, a technology that will be increasingly important for the survival of the MENA region. About 50 percent of the world's desalinization capacity is in the Middle East. Many new plants are being built as I speak. The GCC region, Egypt, Libya, Algeria, Syria, Iraq (near Basra at their small connection with the Gulf), Iran, and more in the region will likely rely more and more on desalinization plants. Their food, energy, and water subsidy programs will push further growth in desalinization. This will likely lead to both budgetary and social stress coming sooner than it would otherwise without the subsidy programs.

Getting a handle on demand management issues, cutting back on the use of water, yet keeping output the same is quite possible in industry, energy, agriculture, residences and commercial buildings. The technologies are there. Many policy options used by other states are also there for consideration towards positive change.

The political and social will to change needs to be developed. The people of the region also need to be better educated on water and on the importance of the water-energy-food-security nexus. Policymakers and leaders need to focus on creating overall policies to look at the entire nexus or they will not solve the problems. The water-energy-food-security nexus is not linear. There are often systems within systems that are connected in recursive and complex ways – and if they are not looked at in that way to solve the problems --- the problems will not be solved.

There are solutions to all of the water issues facing the region. A lot of creativity and a lot of investments are needed. The desalinization systems in the region today are mostly fueled by oil and gas. The desalinization systems of the future will need to be fueled by the sun, wind, geothermal sources, and even sea and tidal energy. This is both to make the desalinization plants more sustainable, but also to reduce the pollution and other issues associated with oil and gas-based desalinization plants. This will also allow budget-strained countries to get more hard currency from exporting their fossil fuels.

Nuclear desalinization is also an option. They UAE, Saudi Arabia and others are looking into this. Nuclear plants, however, carry different political and strategic baggage than solar plants, for example.

Desalinization plants that are massive and serve an entire city or village are likely not the way to go in the future in the places that may become more unstable and violent. Distributed desalinization in smaller plants that are quickly replaceable or fixable if attacked or damaged

may be the way to go in the most risky areas. Big plants are big targets. The economies of scale of larger plants lose worth when the chances of a missile going through the plant are quite high.

The region needs to focus more on getting a better handle on demand management. The subsidies, other distortions, including sometimes absurd cropping patterns and irrigation methods, add up to a culture of waste of water and energy --- and food—that has developed especially in the richer states. This culture of waste is not sustainable.

Even the poorer states have some odd results. About 60 percent of Yemen's declining water table goes to growing the narcotic Qat. Yemen, a country that could have taken care of a lot of its food needs with proper use of water, land, etc., is now importing most of the food it could have grown if it had policies developed over time to consider fully the importance of the water-energy-food nexus.

Qat has taken over large swaths of the best land in the country. Why? Water becomes very expensive to get at even with subsidized fuels when the water table is dropping. Deeper wells need to be dug as the water table drops. Farmers need to grow profitable cash crops to make up for these increased costs. Tomatoes and sorgum are not as profitable as qat.

The population of Yemen is growing. Yemen's water resources are not. The management of water, land and energy is distorted and unsustainable. A lot of Yemen's problems, including food inflation and other inflation that helped drive the country to its civil war, find a good part of their basis in water waste and mismanagement.

Curiously, in Yemen much of the water for the poor in Yemen's many villages is trucked in just a few days a month and at a higher price than the richer people who have access to municipal water pay for it. Sana'a, the capital of Yemen may need to move. The salt water of the Red Sea, The Gulf of Aden and the Arabian Sea, which could be used for the needed for desalinization, is far from Sana'a. Transporting the desalinated water from the sea to where the people live, mostly in the mountains and plains up high where the weather is not as oppressive as at sea level, will likely prove to be gigantic. The costs of water overall after the costs for desalinization and transport are calculated in will likely prove to be deal breakers for any such massive public works project in such a poor country.

Yemen will need to either move the people to the sea or the sea water desalinated to the people. Either way, Yemen, the poorest country in the region, faces dire straits in the water-energy-food-security nexus. I doubt it will be stable enough to solve the problems. Not solving the problems will make things more unstable. This is a vicious circle.

Indeed, water is a vital security interest and a potential insecurity and instability driver in the region. It is vital to develop future policies that consider fully the overall water-energy-food-

security nexus and other connected systems within systems. The region neglects the complexities and importance of these nexus issues at its peril.

That peril could quite easily find its way to the shores and lands of the US, the EU, East Asia and so forth. Water stress in this region should be a concern for us all. And it will likely get worse.