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United Arab Emirates; Factor 2: Water Scarcity

Water Shortages Face the United Arab Emirates

How much water do you drink or use each day? What would you do if there was a limit on how much you can drink or even use to take a shower? The United Arab Emirates suffers majorly from water scarcity. Most of the water in the UAE comes from groundwater. The total amount of groundwater is around 640 billion cubic meters. Here's the catch: only three percent of that is freshwater which is only about 20 billion cubic meters. Due to recent agricultural activities, the amount of groundwater has dropped from 80 to 60 meters. Over-abstraction of groundwater for the agriculture sector has put water scarcity at extreme risk (Fanack, 2017).

Demographics

The United Arab Emirates is located in the Middle East with a total land area of 83,600 km with a population of 5,927,482 people (Graphicmaps, 2018). An outstanding 86% of people live in urban areas while only 14% live in rural areas (World Bank Group, 2018). The UAE has a presidential, federal, and despotic monarchy. Some of the responsibilities of the government include public health, education, foreign affairs, currency, and security (World Atlas, 2018).

The President of the UAE, Sheikh Zayed Bin Sultan Al Nahyan said, "The greatest use that can be made of wealth is to invest it in creating generations of educated and trained people" (Embassy of the UAE, 2017). Since the start of the UAE education system in 1952, the literacy rates have risen immensely. Today the literacy rates are around 95% for both males and females. Now, education programs are offered for K-12 students. During the 2013-2014 school year, there were about 910,000 students enrolled in 1,174 public and private schools all across the UAE. The UAE is also now home to several respected universities at both the public and private level. Citizens of the UAE can attend government institutions free of charge. The UAE has a government-funded health service that allows them to fit the needs of their growing population. The health care is broken down into two categories which are the private sector and the public sector. The private sector is regulated by the federal level, while the public sector is overseen by different authorities including the Health Authority-Abu Dhabi (HAAD), the Dubai Health Authority (DHA) and the Emirates Health Authority (EHA). Since the health care is government funded, it has allowed them to reach an average life expectancy of 76.8 years (Embassy of the UAE, 2017).

The UAE suffers from a lot of obesity. This stems from them not having enough farmland to provide fresh and healthier options for everyone. A typical meal together usually consists of a type of fish, rice, vegetable, and a type of meat. Due to their religion, they follow very traditional ways which include not eating pork or drinking alcohol. The typical diet has improved immensely since the 1950s. Today, modern supermarkets offer a lot of imported foods from other countries (Advameg, 2018).

The family size differs depending on the area. The average urban family is around 7.2 persons per family. The average rural family is 12.4 persons per family. Families in the UAE usually have anywhere from 6 to 8 children, which is highly encouraged by the government. Over 80% of families live as nuclear

families, which means it includes a mother, a father, and their children. Since the mother and father work on the farm, they have servants raise the children. The typical rural family usually consists of two servants. Arranged marriage is also a very common thing among families. Families can receive up to \$19,000 from the Marriage Fund for young men who marry other nationals although it used to be a lot more common than it now (Advameg, 2018).

There is only about 81,000 hectares of cultivated area to grow crops on. This ground is used to produce crops such as vegetables, which make up 24%, fruit which is 30%, feed crops such as grains, which is only 10%, and the other 36% is made up of other plants such as flowers. The major crops include tomatoes, dates, and melons. One of the largest agricultural practices in the UAE is the use of hydroponics. Hydroponics allows them to grow plants without soil. Since they have a limited amount of cultivated soil and water access, this allows them to save 70% of water that would have been wasted due to traditional ways of farming (Advameg, 2018).

Major Barriers and Water Scarcity

One of the major barriers that the UAE is facing with the production of agriculture is the climate. The extremely hot conditions are not very suitable for the production of agriculture. The amount of land and available water is also a big issue when it comes to the production of agriculture. Only 7% of people in the UAE are employed in the agricultural industry (Nation Master, 2000). The UAE is currently trying to implement nutrition programs in schools to try to fight obesity and get adequate nutrition. Schools are being forced to follow more strict rules for their lunch programs. The government is trying to instill healthier eating habits for children to try to fight the obesity crisis that is taking place in the UAE right now (Mohammed N Al Khan, 2014).

The UAE is ranked as one of the ten most water-scarce countries in the world (Amir Dakkak, 2017). Over 70 percent of water in the UAE goes into irrigation for crops (Lauren Power, 2014). For food production, one of the ways they irrigate is spray irrigation. During spray irrigation, 60% of water intended for the plants evaporates before the plants even have a chance to absorb it. This leaves 40% of the water for plants to use, but with limited water resources, this water isn't very much. Drip irrigation is another way to water crops. This is a process that allows farmers to use 25% less water. It also cuts back on evaporation (Amir Dakkak, 2017). The government even has plans to try to reduce the amount of water that goes into agriculture in half. Since, agriculture only contributes to three percent of the GDP and only employs three percent of the labor force, they feel it is necessary to shorten the amount of water that goes into the agricultural industry (Lauren Power, 2014). At the current rate that the UAE is using their water, they will completely deplete their freshwater resources in about fifty years.

This is a huge problem that the UAE is facing right now. At the current rate that the UAE is using their water, they will completely deplete their freshwater resource in about fifty years. One way that the UAE has been trying to deal with this issue is by using desalination plants. Desalination plants are treatment plants that allow you to convert seawater to a water source that can be used for drinking and/or irrigation. The seawater that is used in these plants usually contain high amounts of boron and bromine which can cause more harm to the environment and a person's health than they can do good. These plants also remove rich minerals like calcium. They also harm animals and release harmful pollutants into the air.

The salt concentrate that is removed from the water is often dumped back into the ocean causing harm to the wildlife that live there (Alexandra Barton, 2018).

Currently, water scarcity in the UAE is not improving. As of now water consumption can be divided into three categories. These categories include private households, agriculture, and industries. Private households account for 24% of water consumption. Air conditioners play a huge role in the water consumption in private households. This is a result of high temperatures throughout the year. On average, households consume 285 liters of water per year. Those bottles are mainly filled with desalinated water which takes about 3 liters of water to make 1 liter of water to consume. Gardens are also a big issue. Without proper irrigation, people are just using spray irrigation which wastes about 12 to 15 liters per meters squared everyday. Since the UAE has such rapid growth in population, it is putting a lot of stress on the agricultural sector. Agriculture uses two thirds of the water available. This also stems from improper irrigation techniques. Even though the country has came up with more efficient ways to irrigate, such as drip irrigation, evaporation is still a huge factor. Industries take up 9% of the water consumption. This water is used to clean things like machines, which is transformed into runoffs and can hurt the economy greatly. In Abu Dubai, 600 million meters cubed of wastewater is produced each year and only a fraction of that can be cleaned and reused (Amir Dakkak, 2015).

Improving the water scarcity issue in the UAE can help immensely with farm family's income, quality of food, and could help improve the environment. In an attempt to try to conserve water in 2014 the government cut the amount of water the agricultural sector is allowed to use. Along with that, the UAE has been experiencing less and less rainfall each year. This little rainfall has caused several farmers to stop planting crops or even giving up farming as a whole which has lead to a drastic drop in the quality of crops that are being produced by these farmers. Crops like alfalfa and hay grass that require a lot of water aren't even being planted anymore. To even grow good crops it requires a lot of water. Therefore, the water cuts and the lack of rainfall are seriously hurting the quality of food that is being produced.

There are many other factors that affect water scarcity in the UAE. Population growth is a big factor that plays into the water scarcity issue. The population has more than quadrupled in the UAE since 1990 from 500,000 people to over 9.27 million people today and over 80% of those people live in urban areas. The spread of urbanization has caused a higher demand for water usage. Fady Juez a managing director at the Gulf Cooperation Council said, "We have the highest usage of water in the world and the lowest amount of renewable water in the world" (Sara Hamdan, 2013).

Solutions

As I stated earlier there isn't a lot of land for farming or a lot of water to grow crops with. A solution that could help this is hydroponics. Hydroponics is the process of growing plants without soil. These plants are grown in gravel, sand, or liquids with added nutrients. Since the use of hydroponic systems doesn't require soil to produce plants, this will help food production thrive in the UAE where they don't have much cultivated land for farming. The use of hydroponics would also allow people to better monitor the water that is being used and is more effective than traditional ways of irrigation on farms. On larger scale farms, the cost benefits completely outweigh the cost of a large hydroponic farm. The benefits to hydroponics include producing nutrient rich food for the growing population, less water being wasted, no

fertilizer is being used, no weeding takes place, and it's a great way to grow food that is also good for the environment. The costs however include some type of warehouse or greenhouse, trays or buckets for the plants, lights, ventilation, irrigation and rainwater harvesting systems, utilities, and many more variable costs go into the production of hydroponic systems (Adriano Pilloni, 2014).

Another way to help the water scarcity problem for farmers is desalination devices. Desalination is the process of separating salt and other minerals from water. This process allows people to use seawater for human consumption or farming. As of now this process is currently done in large facilities along the coast of the UAE, but my idea is to be able to make this process happen on a much smaller scale that helps farm families to be able to have freshwater for their crops that is produced in their backyard. This device would be small enough for you to fit in a medium sized box and would have several components that would allow it to turn seawater into fresh water. The water would first enter the boiling chamber, which would be hot enough to boil the salt out. The evaporated water would then enter the condensing chamber leaving the salt behind. This salt that is left behind can also be turned into things like table salt which could be another source of income. Once the water enters the condensing chamber it condenses and cools which produces a steady stream of water. This processes currently takes place at a larger scale around 5 to 10 minutes. Also at a larger scale, the cost to produce one cubic meter or 264 gallons of desalinated water is around \$1 to \$2. This amount is about how much two people go through in the average household per day (Scientific American, 2018).

There are a number of people that can help with water scarcity. The government can help play a role by offering money to help build buildings for the use of hydroponic farms. There are also a number of organizations that are willing to help countries with a water crisis. One organization in particular that I have researched is The Water Project. The Water Project is an organization that helps countries all around the world that have a water problem. They help countries by providing resources like building wells and by simply just educating them on proper hygiene. So far this organization has done most of their work in Africa but they are looking to expand to other countries in need. The UAE could possibly be the first country outside of Africa that they help (The Water Project, 2018). Another good organization that can get involved is the Water4. Water4 is an organization that has also had success with countries in Africa. Water4's mission is to give everyone access to clean water and proper hygiene. They are trying to share their passion for water by trying to give all countries a clean source of water (Water4, 2018).

The UAE may not be much to look at or one of the most fascinating places to go, but the people that live there still need water as much as everyone else. If we don't take action and act now then this problem is going to get much worse. Just imagine the difference we can make in this country and many other countries if we get involved and help now. We can make a difference and help with water scarcity in the UAE.

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