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Yemen, Factor 2: Water Scarcity

Yemen: Securing the "Moral Right" in a Drought-Stricken Nation

"We are witness to a humanitarian catastrophe in Yemen" discloses Johannes Van Der Klaauw, the country's leading UN relief organizer. His accounts of "death, hunger and utter desperation as mothers and fathers struggle to find safety" characterize the Yemen Houthi-instigated civil war all too well (Van Der Klaauw). His acerbic statement comes just hours after the UN Secretary General announced a five-day humanitarian cease-fire: a plan to deliver critically needed supplies to the country's wounded. Johannes continues his plea towards "all parties of the conflict," begging them to merely cease fire in order for relief organizations to deliver aid to the 23,000 civilians injured in rebel attacks (Childress). Little did he know, the ceasefire would last no more than a few hours.

At a poverty rate of 54% and an HDI index ranked at 160 out of 188 countries, Yemen is easily considered one of the poorest country in the Arab world (Childress). The recent civil war, where Houthi rebels of the Shiite Muslim sect attacked the Sa'dah Governate, only worsened these statistics. Over 5,000 Yemenites have been killed, and upwards of 23,000 have been injured due to continual airstrikes by both parties (Al-Muslimi). This chaos, though seemingly political in nature, can be traced back to the country's continual struggle over natural resources, some studies claim. The Yemen Interior Ministry estimates that 4,000 deaths occur each year from natural resource disputes – 75% of them directly related to the country's scarcity of water (Heffez). Unreliable rainfall, primitive irrigation, and climate change are all factors that contribute to the disastrous 900 million cubic-meter water deficit in the nation's capital (Sufian).

The scarcity of water begets a concern for the 61% of the population who are employed in agriculture and are affected by the rising costs of groundwater abstraction (*Agriculture and Food*). Due to poor irrigation methods and little rainfall, the average yields for major crops grown in Yemen are only 40%-50% of that in other Middle Eastern countries (Al-Eshlah). Consequently, 10.6 million people, or 41% of the population are food insecure, deeming it the 11th most food insecure country in the world (Childress).

The nation of Yemen, situated in the south-western corner of the Arabian Peninsula, is semi-arid country with topography varying anywhere from coastal plains to rugged mountains. Yemen's agriculture, which provides livelihoods to over 70% of the population, is most concentrated in the Red Sea coastal plain and terraced Western Highlands (Absali). These rural, agrarian areas consist of small communities with an average poverty rate of 54% (Childress). The inhabitants are usually small-scale farmers or sharecroppers that receive land and/or water from landowners, in exchange for up to 50% of their crop yield (Rural Poverty in Yemen).

In addition, education is often very minimal, as children are often needed to work in fields, and as a result, less than two-thirds of Yemeni children graduate primary school (Education). The conditions for women and girls in Yemen are even poorer, as Yemen is currently ranked the single worst country for gender empowerment. The literacy rate for women is staggeringly lower at 36%, and the income of an average

working woman is one-third that of her male counterpart. The water crisis only worsens womens' livelihoods, as most girls are never able to receive an education because their day entirely consists of bringing water from distant aquifers. Proper healthcare is rarely accessible as well, and subsequently, women give birth without healthcare assistance, leading to a maternal mortality rate of 3.7% (Women in Yemen).

The Yemen family, which has an average of 7.4 members, is entirely dependent on the food they grow for nourishment, as well as income (Taylor). In the Tihama coastal plains bordering the Red Sea, the staple crops grown are sorghum, millet, melons, and tropical fruit. These areas are marked by seasonal floods, which accumulate into the wadis, or flood plains, where crops are plentiful. This irrigation method, though natural and renewable, is very unreliable forcing farmers to dig wells and abstract groundwater at alarming rates. In the terraced Western Highlands the main crops are barley, wheat, sorghum, and legumes. These terraces, also known as "The Hanging Gardens of Yemen", use Bronze-Age, primitive stone walls on mountain slopes to prevent soil erosion. Unfortunately, this method is not reliable either, and farmers must intercrop grains with legumes or fruits in case of drought. (Absali).

The World Food Program states that Yemen is currently the 11th most food insecure country in the world (Childress). Yields for all crops, whether as basic as wheat or as recreational as Khat, are consistently lower than the Middle East's average. Poor agriculture has manifested into such an issue that 80% of the country's grain is imported from countries such as UAE, Saudi Arabia, and the United States (Alabsi). This has developed into a humanitarian issue; if worldwide food prices were to rise, the already poverty-stricken population of Yemen would face starvation. Perhaps the greatest barrier to adequate food production, however, is the rapidly declining water resources.

In a recent report published by the Carnegie Foundation for Peace, experts frankly stated, "'Sana'a [the Yemeni capital] ..., may become the first capital city in the world to run out of water" (Fitch). Due to inefficient rainwater harvesting and an unreliable climate, the majority of Yemen's population has resorted to drilling wells, and extracting natural groundwater. One of the most widely used water sources, the Tawilah Sandstone Aquifer, is regenerated at a rate of 3.5 million cubic-meters per year; however, the extraction rate is a staggering 200 million cubic-meters per year (Al-Eshlah). Unfortunately, over 30% of Yemen's water is supplied by this method, which means that water tables throughout Yemen are decreasing at 1-7 meters per year (Absali).

This rapidly declining natural resource is now a precious trading commodity, which is often controlled by landlords willing to sell it at considerable prices to the rural farmers. One report states that "Ownership of a water source is correlated with higher income, and development of groundwater resources contributed to growing income disparities" (Ward). The government in Yemen, even before its political turmoil, has done very little to halt this illegal drilling of water. One study claims that up to 99% of water extracted from wells is unlicensed (Whitehead). Even if the government or international organizations were to take action, it would be very difficult, since Yemen's Sharia Law states that a landowner who digs a well on his property owns the water supply (Sufian).

The water supply in the nation's capital, Sana'a, is no better. Merely 40% of urban families have access to the city's municipal water supply, and the remaining must make daily trips to the city's public fountain, carrying large plastic jugs to water their sparse gardens with. However, even the municipal water supply is very primitive, as water only flows from the tap once or twice per week. The archaic pipework is also

very inefficient, and loses up to 61% of the water through leaks (Whitehead). Those who are fortunate enough to own their own aquifer are often supplied with very polluted water, which is chiefly replenished with the runoff of domestic wastewater (Sufian).

Perhaps the greatest threat to Yemen's water crisis is the recent, almost explosive production of Khat, an un-nutritive plant chewed for its narcotic effects. Up to 90% of men and 25% of women chew Khat daily, and after a recent increase in food prices, many Yemen farmers deserted their staple grain crops for the socially-integral Khat, which fetches a much higher price. Unfortunately for Yemen's ecosystem, Khat is a very water-exhaustive crop, which consumes up 30% of Yemen's total water supply (Socio-Economic). The already poverty-stricken farmers are hardly to blame, however, as some aver that the crop earns them up to 20 times more than typical cereal grains. One Yemeni reporter stated "The farmers have little choice: *qat is the only way to make a profit"* (Worth).

As a nation that is already water-scarce, Yemen is hardly adept to handle the illegal groundwater abstraction, primitive irrigation, and water-thirsty crops that plague the country. In consequence, each Yemeni must subsist on 125 cubic meters of water per year, while the Middle Eastern average is 1000 cubic meters per year. The issue is not receding either, In Sana'a, the water tables in 2000 were merely 30 meters below sea level, while in 2012, they have decreased to an alarming 1,200 meters below sea level (Sufian). As one impoverished rural Yemeni farmer states "For us, the future is lost; there is no hope" (Al-Muslimi).

Even though Yemen's water tables are decreasing at alarming rates, another statistic that is equally making headlines is the amount of foreign aid pouring into the country. Nations around the world such as the United States, Germany, Saudi Arabia, Great Britain, and the Netherlands are supplying Yemen with millions of dollars in aid and strategic plans for reviving the nation’s water supply. These countries have developed plans such as the National Water Sector Strategy, which, in the words of Yemen's Director of International Planning, “will have a great impact on poverty alleviation in rural areas of Yemen." (New Programme).

The first, and most promising, water sector solution is the government construction of wadi dams. Currently, 30% of Yemen's agriculture is located in small flood-plains, or Wadis, which are filled with water during flood seasons in the spring. During these seasons, the farmer's produce flourishes; however, the floods are very brief and do not allow enough time for crops to mature. The practice of constructing dams to retain flood-water and replenish wells downstream has been instituted in select areas of Yemen, and with promising results. Ideally, these flood-plain dams will collect water during the flood seasons and replenish the surrounding underground aquifers which farmers abstract water from (Al-Eshah). One experimental dam, the Arisha Qutran, increased the local groundwater level by 30 meters in just one year. Another Wadi-dam, the Beyran, supplied surrounding wells with water for 3 years, when typical irrigation methods only lasted for 3 months. Numerous wadi-dams are in production with the funding of domestic and external organizations such as USAID, European Union, and the Social Development Fund. These organizations provide anywhere from 30%-100% of the cost of construction. The AFPF, for example, often provides 70% of the cost of materials needed, given that local communities provide labor for construction and upkeep (New Program).

Another promising method of water preservation for rural agriculture is the drip irrigation system. Small-scale farmers across Yemen traditionally use flood irrigation that requires large amounts of diesel to fuel

water pumps that must be used for 15 hours per day (Yemen Mercy). Organizations such as USAID and Operation Yemen Mercy have introduced drip irrigation systems to rural farmers, which uses inexpensive sprinkler lines that drip water over crops. Not only does this preserve local aquifers, but it drastically reduces the amount of diesel fuel needed. One farmer, with the help of Operation Yemen Mercy, witnessed notable results: "For every field, I am saving 3 hours of constant watering and 20 liters of diesel fuel every week. With drip irrigation, the amount of water needed is very minimal, but the crop is abundant!" (Yemen Mercy). Even the individual farmer has an integral part in resolving the country's water crisis. The UN World Food Program, for example, give families a weekly ration of wheat and cooking oil in exchange for sending their children to school where they learn about modernized agriculture, such as the efficacious drip irrigation system.

Although wadi-dams and drip irrigation systems are very promising for Yemen's nutritive crops, water levels are still greatly depleted by Yemen's parasitic Khat production. While it is unlikely that farmers of Khat will grow staple grains, researchers confide in a rather surprising crop: the Indian Fig Cactus. These plants are widely known to grow successfully in the most severe droughts, while also producing fruit known for their delicacy. The fruits sold in markets are in high demand, and other by-products were produced as well, such as jams, juice, and even fodder from the cactus pads converted into compost. Furthermore, in Gahyman, the region where it was first introduced, Khat is hardly produced in favor of the profuse Fig Cactus, which comprises 80% of the regions arable land. Some organizations, such as the Qat Uprooting Agricultural Project, offer saplings of Cactus and other cash crops to willing farmers. To date, they have uprooted 270,000 Khat trees with the help of rural farmers "eager to achieve the project" (Nasser). In addition local businesses like Al-Ezy extend a philanthropic hand by buying the produce for a competitive price to sell on the international market. (Al-Nusairi et. al.).

If any aspect of Yemen's water crisis has drawn the media's attention the most, it is the capital of Sana'a, the infamous "Venice of Dust". The city's aquifers, which provide for 1.7 million inhabitants, are regained at a rate of 52 million cubic meters per year, but depleted at a rate of 260 million cubic meters per year. The resulting 900 million cubic meter deficit is enough to completely dry up the city by 2025, or as early as 2017 (Sufian). While some officials have already considered relocating the capital, others have looked to modern, renewable water strategies. The desalination of the Red Sea, a massive body of water located approximately 80 miles west of Sana'a, is one of the only proposed solutions that provide almost unlimited fresh water. One studies states that, while the cost of relocating the capital would near 36 billion, the cost of Red Sea desalination would only be 6 billion. Furthermore, the desalination plant can be powered through solar energy, and create 1 billion cubic meters of fresh water for Sana'a's population (Sufian).

Yemen's water crisis, which has partially instigated a unceasing civil war by some studies, has placed the country at the 24th most water insecure and 11th most food-insecure country in the world (Absali). As their staple crop production turns to khat, Yemenis are finding it harder to buy basic nourishment; as stated by Abdullah Al-Osami: "I have become unable to provide food to my family-even the basic needs, such as plain bread and water" (Al-Muslimi). However, there remains hope for the starving populations of Yemen; water preservation strategies as simple as drip irrigation or as complex as seawater desalination are rapidly being undertaken by domestic as well as foreign aid groups. Billions of dollars of aid are pouring into Yemen from countries shaken by headlines of Yemen's suffering. Infrastructure is rapidly being developed and the afflicted Yemenis are receiving aid no matter their level of destitute. These life-

saving measures strive to eliminate every trace of water insecurity; but even the most simple acts of aid are met with vehement gratitude. In one account to the USAID relief organizations, Yaseen Yahia, a Yemeni whose house was destroyed in Houthi shellings, proves that even the most minute amount of aid can be pivotal in the life of a Yemeni. "People of all ages and genders eagerly flock to the relief organizers, bearing water containers of different sizes and shapes to bring water back to their families," he states with encouragement in his voice, "*It is an unforgettable moment."* (O'Toole)

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