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Jordan, Factor 2: Water Scarcity

Water Scarcity in Jordan

In the Middle East, access to water is often severely limited due to climate, infrastructure problems, and conflict. Today, with the Syrian refugee crisis, dry climate, and a decaying infrastructure, Jordan's water security is in a precarious situation. In fact, the United Nations Development Program ranks Jordan as the fourth most water insecure country in the world. There have been estimates that Jordan's groundwater will be depleted before 2060, but due to the Syrian refugee crisis and other factors, some estimates are much sooner. For instance, the United States Agency for International Development (USAID) states that, "If current trends continue, Jordan faces an absolute water shortage by 2025." As water is a basic need for the survival of all living beings, water insecurity is a problem of great magnitude. Unfortunately, water scarcity is not an easy fix. Nevertheless, it is crucial for Jordan to have an effective long-term strategy to cope with their limited water supply. As Marwan Al-Muasher, former deputy prime minister of Jordan, has warned, "Water scarcity is an existential threat to Jordan."

As with any nation that suffers from water insecurity, climate is the main cause of water scarcity in Jordan. Jordan's climate is classified as mostly arid desert (CIA). This means long, hot, and dry summers, and short, cool winters. Jordan's annual precipitation measures about 3.8 inches, mostly occurring during winter and spring with levels varying throughout different parts of the country (World Bank). During the summer, there is virtually no rain which, combined with the high temperatures, makes it very difficult to meet the water needs of over 8 million people and irrigation for farmland. Compounding the lack of water, the vast majority of their rainfall (roughly 92%) simply evaporates, further exacerbating the problem (Altz-Stamm, 2012).

Jordan is an almost entirely landlocked country with the exception of one small point on its southern border that comes into contact with the Red Sea. The country is situated between Israel, the West Bank, Syria, Iraq, and Saudi Arabia. Located in the Middle East, it is surrounded by turmoil and conflict. However, it is important to note that Jordan enjoys a relationship with the United States that is far better than most of the other Arab nations in the Middle East. Thus, it often receives foreign aid and cooperation from the U.S. Its total land area is 88,802 square kilometers, which is slightly smaller than the state of Indiana (CIA). The topography of Jordan consists mostly of desert plateau located in the eastern section. The topography in the western portion, however, breaks from the desert pattern. It consists of highlands, mountains, and the Jordan Valley. The northwestern border with Israel is defined by the Jordan River, which flows into the Dead Sea. These physical features receive the most precipitation and are host to what little vegetation and suitable farmland exists in Jordan (University of Texas at Austin).

The population of Jordan as of July 2015 (including the estimated number of migrants and refugees) is 8,117,564, and is growing at a rate of .83% (CIA). Approximately 83.7% of the population lives in urban areas. The average life expectancy in Jordan is 74, with women usually living slightly longer than men. The average family consists of three to four children (CIA). The Jordanian diet typically relies largely on cereals such as rice and wheat, but also includes fruits, vegetables, dairy products, and meat. Due to the difficulty of farming in such an arid region, Jordan relies heavily on imports to meet the dietary needs of the population. Despite the inability to produce much of its food, imports are able to meet this need fairly adequately. As a result, undernourishment in Jordan is a relatively minor issue. (Food and Agricultural Organization). In fact, according to a study sponsored by the United Nations Development Program only, "1.9% of the total poor in the Kingdom were facing some level of hunger in 2008." Perhaps partly due to Jordan's relationship with the West, Jordan has substantially improved education and health care over the

years. Children are required to attend school at no cost from ages six to sixteen in order to attain a basic education and more than half of men and women go on to gain a secondary education (Jordan Department of Statistics). Health care in Jordan has greatly improved over the decades. Jordan's Ministry of Health has put great emphasis in providing nationwide access to health care. The Jordanian government provides public health care centers that are focused on providing more basic health care treatments especially in poorer non-urban areas, whereas the private sector plays a major role concerning more advanced treatment (Meyer-Reumann & Partners). In 2013, health expenditures accounted for 7.2% of Jordan's GDP (CIA). Jordan's health care is ranked among the best in the Middle East.

The gross national income (GNI) of Jordan in 2014 was \$5,160 (\$US). As of July 2015, the unemployment rate is 13.8% (Trading Economics). In 2010, 14.4% of Jordan's population was officially under the poverty line (Jordan Times). However, this does not include those who were temporarily in poverty. Jordan's GDP in 2014 was \$35.88 billion of which agriculture accounted for 3.8%, industry 29.8%, and services 66.4% (CIA). As far as jobs and labor is concerned, 2% of occupations were agriculture, 20% were industry, and 78% were services (CIA). Trade plays a major role in Jordan's economy with exports producing \$8.385 billion (roughly 41% of GDP) and imports costing \$20.18 billion (roughly 78.1% of GDP) (CIA, 2014). Major goods imported include cereals, oil, and machinery. Exported goods include textiles, potash, and phosphates (CIA).

The amount of agricultural land in Jordan is 11.4% of its total land. 8.4% is permanent pasture and the other three percent is farmland. The average farm size ranges from one to three hectares depending on what crop or crops are being grown. However, larger farms can range from ten to fifty hectares (Schiffler). Important components of Jordanian agriculture include cereals (ex. wheat, barley), vegetables (ex. tomatoes, cucumbers), fruit trees (ex. olives, citrus), and livestock (ex. goats, sheep) (Encyclopedia Britannica). It is important to note that many of Jordan's crops such as olives and cereals consume a relatively large amount of water (USAID).

Jordan's water supply is extremely scarce. Although almost 97% of the population has access to a clean drinking source, the amount of water is very low and must be rationed (CIA). In recent decades, Jordan's water supply has shrunk substantially. According to the Mercy Corps, "By 2008, Jordan's per person share had fallen to 145 cubic meters annually. And it continues to fall. According to a pre-crisis estimate, by 2025 it would hit 90. By comparison, the average American enjoys about 9,000 cubic meters a year." Jordan obtains its water through two main sources: surface water and groundwater. In 2004, surface water, consisting of bodies of water and treated wastewater, produced a total of 289.9 million CM. Groundwater from both renewable and nonrenewable sources produced 520.1 million CM (Jordan Department of Statics). However, in order to meet the water demand, groundwater sources have been overexploited.

The water scarcity issue in Jordan is a very complex problem with many different aspects affecting it. These include climate, population, overexploitation of water sources, infrastructure, and agriculture. Unfortunately, because the water scarcity problem is so complex, an effective long-term solution will not be easily developed or implemented. Jordan's climate - the inherent problem - is unavoidable. However, steps can and have been taken to mitigate dangerous levels of water scarcity by addressing other compounding factors such as population, infrastructure, and agriculture.

As Jordan's population continues to grow, conflict in neighboring countries such as Palestine, Iraq, and especially Syria, have caused refugees to flood into the country. The Syrian refugee crisis is creating a major strain on Jordan's already low water supply. Currently, there are over 900,000 Syrian refugees in Jordan, an increase of about 200,000 since the beginning of 2015 (UNHCR). While the sheer number of refugees puts a strain on water availability, the difficulty of adaptation as well as general chaos makes it much worse. In Syria, water availability is much better. Thus, the Syrian refugees have some trouble

adapting to Jordan's water scarce situation and are often more wasteful with water than the Jordanians who have rationed water for decades. This adds to tensions between the Jordanians and the Syrian refugees. While the only adequate way to solve this problem is to resolve the conflict in Syria, it is important that Jordan take the necessary steps to help inform the Syrians and other citizens of the shortage as well as proper means to conserve water in each person's daily life.

Decaying infrastructure is another source of water wastage in Jordan. Many of the water pipes have leaks and fractures in which a large quantity of water spills out into the soil. In addition, some people who are desperate for water resort to theft of water from water pipes (Mercy Corps). In a report from the Mercy Corps states that, "By one estimate, the amount of water lost nationwide every year could satisfy the basic needs of 2.6 million people, or more than a third of Jordan's current population." "Aging infrastructure is the culprit." It is imperative that Jordan devote attention to any infrastructure needs in order to conserve water.

Irrigation is a necessity in many parts of Jordan due to the desert environment. Total irrigated land in 2004 was 788.6 sq. km (CIA). Though only accountable for a small portion of GDP, agriculture accounts for over 60% of water consumption in Jordan (Altz-Stamm, 2012). Because of this, agriculture is a prime target for short-term and long-term improvement. Recognizing this fact, the Jordanian government has done much to improve water efficiency in the agricultural sector. For one, it is gradually increasing irrigation tariffs. Begun in 2014, irrigation tariffs are supposed to increase by about 25% by 2017 (The Jordan Times). The goal of these tariffs is to reduce crop water consumption while allowing the agricultural sector to thrive. These tariffs are geared to incentivize farmers to grow higher value crops that require less water. The USAID states, "Agriculture accounts for about 60 percent of Jordan's water use but much of it goes to water-intensive highland crops, such as maize, barley, wheat, and olives which produce modest or even negative returns. By contrast, Jordan's most profitable crops are winter vegetables from the Jordan Valley. A high proportion of the water being used in agriculture produces no crop value for the farmers or their communities." The irrigation tariffs hope to incentivize farmers to move toward growing those crops which require less water by making it more profitable to do so. Of course, there is always a risk in switching crops. Yet, the Jordanian government is hopeful that these tariffs will ultimately bring about a net gain both in the economy and water conservation. Additionally, these tariffs will help finance the government in irrigation projects (World Bank Group).

Several things can be done in order to improve irrigation techniques to maximize water conservation. To start, improving education for farmers might actually help conserve water. New Mexico State University College of Agriculture conducted a survey, which found that education among farmers was limited mostly to an elementary level. Increased levels of education might aid in better water conservation techniques. However, perhaps the most efficient way to conserve water in the agricultural sector and keep a steady agricultural output is to improve irrigation techniques. The current irrigation techniques that are widespread throughout Jordan are often inefficient and can lead to water wastage. Various forms of irrigation used throughout Jordan range from less efficient systems such as canal irrigation to more efficient and modern techniques such as drip and spray irrigation (Ministry of Water and Irrigation). The government has actively encouraged and endorsed the use of these modern irrigation techniques. More recently, however, has been the development of hydroponic agriculture. Though this agricultural technique is thought to be an ancient innovation, it has great potential for efficient water conservation in Jordan. Hydroponic agriculture is a method of growing crops completely in water. The water is actually a nutrient solution, thus enabling the crops to grow without soil. In Jordan, the crops grown hydroponically are enclosed. At first, this seems like an inefficient use of water, but because plants can't absorb all the water in soil, hydroponics is actually more efficient. According to Powering Agriculture, "It is estimated that hydroponic techniques use 50 - 75 percent less water than crops grown in the traditional field." In addition to conserving water, hydroponic agriculture crops need less pesticide and aren't vulnerable to soil-borne diseases. The USAID Hydroponic Green Farming Initiative has aided Jordan in developing this

method of agriculture. Though hydroponics have great potential, there definitely are obstacles to commercial use such as initial cost. However, hydroponic agriculture is certainly promising. U.S. ambassador to Jordan and proponent of hydroponic agriculture, Alice Wells, stated, “The future of hydroponic farming techniques is bright in Jordan. Hydroponic farming techniques are well-suited toward maximizing Jordan’s scarce supply of water.” Because the agricultural sector consumes such a large portion of Jordan’s water, it is imperative to concentrate on irrigation technology and policies to better conserve water.

Jordan’s water supply is running out at an alarming rate. In order to meet their water needs, Jordan has had to draw water from its aquifers at several times their recharge rate (Future Directions). While this may be able to satisfy water demands in the short term, it will come at a cost in the very near future. Many of the major problems Jordan faces with water scarcity such as climate and conflict are unavoidable. However, with Jordan’s current water supply, every drop counts. Therefore, it is necessary that Jordan act on any opportunity that is likely to conserve water. These include educating citizens and refugees on ways to efficiently implement water conservation practices within their lives, working with farmers to improve irrigation and farming techniques, and sponsoring government projects to repair some of the most urgent infrastructure flaws concerning transportation of water. With water sources quickly running out, population booming, and conflict in the Middle East unceasing, it is of utmost importance and urgency that Jordan use all available resources to develop long-term strategies to cope with water scarcity.

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