

Jerome Jacobsen  
Mahtomedi High School  
Mahtomedi, MN  
Yemen, Factor 2

### **Global Cooperative to Build Water Infrastructure in Yemen**

“Under a staircase, clinging to a wall of Sana'a's Grand Mosque, groups of women and children lug plastic canisters to the leaky spigots of a public fountain. Small children struggle with canisters as they weave slowly between the fountain and the pushcarts used to wheel the water back home (Time).” Whether in cities or rural villages throughout Yemen, this is how millions of Yemenis obtain their water supply. In a country where water is almost never available, free public fountains are the only option for most, as very few can afford to pay the sky-high price for water. Water scarcity is becoming a chronic and debilitating problem for all of Yemen. On average, each Yemeni has access to a mere 140 cubic meters of water per year for all of their needs. This is less than fifteen percent of the Middle East water access average (Time).

The threat of Yemen running dry grows nearer and nearer with every passing day. Streams and aquifers are growing shallower. The water table has fallen far below sustainable levels. The capital city, Sana'a's water table was thirty meters below the surface in the late 1970s; it has now fallen to below 1,200 meters below the surface in some areas (Time). Experts estimate that Yemenis are using water that fell to the earth over 8,000 years ago. Making the situation worse is the exploding population of Yemen. Sana'a has the fastest growing population of any capital city, growing at seven percent a year. The population of Sana'a is projected to double in the next ten years, and the population of Yemen as a whole is expected to double from 23 million to 46 million in the next two decades (Capital).

Lack of access to water has many other ill effects than only thirst. It has been responsible for the spread of water-borne diseases on a scale not witnessed in decades. Dengue fever, diarrhea and cholera have spread at alarming rates in rural areas where access to clean water is limited. Last year, more than 30,000 Yemenis were suffering from acute watery diarrhea. When people are suffering from extreme thirst, they are not likely to consider whether the water in front of them is safe to drink (Time).

As much as 90 percent of all water in Yemen goes to small-scale farming, in cities and rural areas alike. However, agriculture only contributes 6 percent of GDP. Almost forty five percent of all water goes towards the production of Qat; a mildly narcotic plant chewed by most Yemenis is daily life. The water situation grows ever direr, and yet there is little effort to improve conditions in Yemen by the government. Due to recent political instability and change, water concerns are low on the government's to-do-list, as it is more concerned with securing its own power (Time). If no plan is made to rectify the water situation in Yemen, it will run out of water and its millions of inhabitants will be doomed. In order to secure the future of this culturally rich and significant country, there are steps that both the Yemenis and the global community must take.

First, it is important to understand the culture and life of the average Yemeni. Family is an extremely important part of Yemeni life. The average family is made up of extended family as well as a married couple and their children, around eight people. Children are extremely important to Yemenis and are viewed as gifts from God. Men traditionally assume the tasks that require contact with the public such as shopping. Women cook and clean. Women and children who are able to do more strenuous work like carrying water and fetching fuel. The authority in a Yemeni household is based on age. The elderly are regarded with the utmost respect, and their opinions are highly valued (Hestler, 64-65).

Yemeni food is very simple and always prepared with fresh ingredients. Although it differs from one region to another, basic dishes are similar and often include bread, rice, vegetables, beans, chicken, beef

and lamb. These dishes are rich in spices, though not fiery, and low in fats and sugars. Bread is the staple food in the Yemenis' diet. Many Yemenis consider Saltah to be the national dish. Saltah is made up of a meat broth base, chunks of beef, and a mixture of chilies, tomatoes, and onions known as sahawiq. Fenugreek seeds are added for texture. Saltah is often eaten during lunchtime with flatbread (Yemeni Cuisine). Saltah has a very high nutritional content, which is important because many Yemenis do not eat many fruits or vegetables outside of cooked dishes. Lahoh is bread with a texture similar to pancakes. The bread flour is made from sorghum, a type of wheat that is able to grow in arid places. Bint al Sahn is a type of bread eaten with honey. Fatta is bread soaked in milk and broth. Yemenis all over the country enjoy beef or chicken in broth served with bread. A typical Yemeni breakfast consists of fool, a stew with brown beans, tomato, onion and chili. Fool is eaten with a large, pancake like bread. Lunch is the main meal of the day and most Yemenis eat Saltah with lamb or chicken. In the north, more people have Fatta for lunch. Dinner is usually a light meal, usually consisting of an egg or cheese. Tea and coffee are the most common drinks in Yemen (Food). For many Yemenis, it is very hard to get adequate nutrition. It costs \$6.19 and \$2302.2 a year for a Yemeni to have a balanced, healthful diet (Food Prices). However, almost half of all Yemenis survive on less than two dollars a day (Mohsen). That is only \$730 a year. Almost fifty percent of all Yemenis only have access to less than a third of the money needed for a balanced diet available for all uses.

Now, for some information about Yemeni education, employment, and health care. According to UNICEF, only 49 percent of all males and 27 percent of all females attended secondary school from 2007-2011 (At a Glance). 63 percent of Yemeni men and 51 percent of women report having no access to a formal health care provider (Institute). Many Yemeni women work in unpaid jobs and these jobs include farming, herding, collecting firewood, etc. They are denied any rights. They receive no medical care or education. Compared to women of rural areas who work in unpaid jobs, the unemployment rates hit high among urban area women. There are just a small number of women who work in public and private sectors. According to official statistics, women's unemployment rate reaches 39 percent in Yemen while it is just 16 percent among men. Despite the fact that women make up about 50 percent of Yemeni citizens at working age (between 18-50 years), women form only 23 percent of workforce, and about 72.1 percent of women are economically inactive. About 92.7 percent of working women work in an unofficial sector and they are unpaid. This applies to women working in the fields of agriculture and other associated activities. Businesswomen make up just 3 percent. According to the results of the Workforce Survey 2006, the number of working women reached 515,000. Only 5 percent of women work against monthly salaries while 95 percent of women are either unemployed or work in unpaid jobs (Al-Omari). The services, construction, industry, and commerce sectors employ about one-fourth of the population. Most people, however, are employed in agriculture and herding, although this accounts for less than 10 percent of Yemen's GDP (Yemen: Life). Agriculture and herding is not limited only to rural areas; about 10,000 citizens of Sana'a work on some 9,300 hectares of agricultural land in the city. More than 37,500 tons of vegetables, forage, fruits, qat, and other seasonal grain crops were produced. Around 4,500 cows and 110,000 sheep and goats in addition to camels, donkeys, poultry and bees populate the city as well (Al-Ariqi).

In Yemen people go to their local baqaaluun or souqs. Baqaaluun are similar to small neighborhood grocery stores. The baqaaluun typically range in size from that of a small bedroom to that of a small convenience store. A neighborhood baqaalah typically carries canned goods, beverages, cleaning supplies, small household/kitchen goods, sometimes a freezer of frozen foods, beauty and hygiene products, plastic goods, etc. This is the go to for many Yemenis as one can purchase parts of something instead of a whole pack if you don't have the money. For example, a Yemeni could buy two or three eggs instead of the thirty packs eggs come in. Also, someone could buy just one diaper if they cannot afford the entire pack (TJ). Souqs are open-air markets where merchants sell various goods. Food, clothing, spices, qat, and used electronics can all be readily bought (Places). Yemenis face difficulty in having enough food to eat because Yemen imports almost ninety percent of all of its food. In 2008, Yemen

imported ninety-five percent of consumed cereals and eighty-five percent of all food. As a country that is so reliant on imported food, changes in the global food market can have drastic impacts on a country that doesn't produce a sufficient amount of food on its own. Experts say Yemen has become over-reliant on food imports and foreign aid (Yemen: Food). The problem is that now, foreign aid is no longer coming. Halfway into 2013, less than 40 percent of Yemen's requested \$702 million Humanitarian Response Plan (YHRP) has reached aid groups, signaling a potential repeat of last year's shortfall in which donors funded only 56 percent of a \$585 million budget appeal. Two of Yemen's four "life-saving" clusters - Water, Sanitation and Hygiene (WASH) and Health - remain significantly underfunded at the mid-year point. According to UN financial records, Health cluster funding stands at 19.3 percent of a requested \$59 million, while only 18.3 percent of WASH's \$66 million budget is available. WASH cluster partners received 44 percent funding in 2012, permitting only basic programming and limiting the response to only half of the targeted population. If these startling numbers continue, Yemenis will have even more difficulty finding food. In the absence of humanitarian aid, vulnerable populations often adapt in ways that deepen the crisis. Negative coping mechanisms such as falling into debt, child labor, and child marriages mean the crisis could further corrode Yemen's long-term development unless short-term measures are put in place. At the same time, around 7,000 immigrants are entering Yemen each month with no signs of stopping. Yemen now has a growth rate of around three percent. These factors, in addition to a dearth of water resources and an increasing amount of available water going to the cultivation of qat, are adding up to an ever stronger barrier to adequate food access and nutrition (Funding).

Water scarcity is a severe problem in all of Yemen. Due to lack of water as well as a lack of arable land, Yemen must import vast amounts of its food. This makes the price of food very expensive. Yemen's food supply, then, is subject to the fluctuations in the world economy. This makes it hard for families to buy food, and even harder to buy food when prices go up (Al-Ariqi). With food prices higher than families can afford to pay, people cannot purchase foods and their nutrition suffers.

Water scarcity is very severe right now and is worsening. In parts of Yemen, people are currently using water from deep in the ground that is meant to be used only as a last resort. The water table is not being refilled and is growing shallower each year (Capital). While this situation is bad, it is particularly bad for women. Women in Yemen have had very little education, and many are economically inactive. They stay at home while the men work. They gather water and cook (Hestler). This means that while men are more able to find work, both in and outside of Yemen, women have no way to change their lives, except through their husbands (Al-Omari).

The water situation in Yemen is worsening at a very fast rate. One can measure the gravity of the situation in a variety of ways. One can look at the amount of water available per person. Each Yemeni has access to only 140 cubic meters of water per year for all of their needs. This is less than fifteen percent of the Middle East water access average. One can also look at the water table levels. In some places in Yemen, the water table is 1,200 meters below the surface. This is not sustainable (Time). Using these measurements to understand the water situation in Yemen, it is apparent that the water scarcity in Yemen is severe and it is getting worse. If water availability continues to dwindle, the people of Yemen will suffer. With most Yemenis having only sporadic water access now, greater water scarcity means Yemenis will have even less access to water, which could become very dangerous. This, combined with extreme population growth means Yemenis will have very little water available to use (Capital).

Improving or resolving water scarcity in Yemen would have many important benefits for the people of Yemen. If more water were available, many people could successfully farm in both rural and urban areas. This would provide a more stable supply of food for Yemenis. This food would be cheaper, as it would be locally grown and not flown in from other countries. An end to water scarcity could also employ many unemployed people. People able to take up farming could sell extra crops for money, creating a source of income. Ending water scarcity could also provide jobs for people in water sanitation plants, maintenance,

desalination plants, and other jobs that deal with maintaining the water infrastructure. If water scarcity is resolved, Yemen could put water back into the water table, which would stabilize the environment, as it is currently draining its water table at an unsustainable rate (Time). Investing water back into the environment would not only stabilize the environment, but also provide a reliable source of water in case of a water emergency. If water and food are secure and easily accessible for Yemenis, this could lead to economic improvement and poverty reduction. There would be a new market of jobs in the water maintenance field and farming could make someone a living. This could employ unemployed people. Also, without having to worry about food and not having to take off school to secure water, children can focus on education. With a stronger education, children could go on to college and learn skills that would secure them jobs in specialized fields. This would benefit girls especially, as only 27 percent of girls attend secondary school (At a Glance). Both men and women would be able to find economic freedom because educated individuals have a wide variety of job options. This would also benefit Yemen as a whole, because Yemen would have a more educated workforce with specialized workers. Educated engineers could develop new ways to improve agricultural efficiency and how to keep water access secure. Trained doctors and nurses would greatly improve health care access in Yemen as over half of all Yemenis have no access to health care now (Institute). All of this is possible with a resolution to water scarcity.

With or without an immediate end to water scarcity, Yemen will still have to face other issues that affect water scarcity and the quality of life for Yemenis. A major issue facing Yemen is population growth. The population of Yemen is expected to double from 23 million to 46 million in the next two decades. This means there will be twice as many people to support with the same land area and resources Yemen currently has. The population will need double the amount of water, when the current population does not have anywhere near adequate water access. Urbanization is another issue facing Yemen. More people are moving into cities. This puts a strain on waste management and hygiene in the city. Sana'a has the fastest growing population of any capital city, growing at seven percent a year. The population of Sana'a is projected to double in the next ten years. The people in the city will demand more energy and pollution will increase. The greater population means food will need to be produced efficiently in Yemen and water will need to be created for the large population to survive. Yemen will have to find ways to stop relying on imports for food. Jobs will have to be created for the new, large population and the government of Yemen will need to make sure sufficient energy is available for its entire population. Yemen will have to control the pollution from energy plants and from the population (Capital). Climate change is also deepening the water scarcity problem, making seasonal rains less reliable and driving up average temperatures in some areas. Another issue is dwindling energy resources. Yemen is a small oil producer. Unlike many regional oil producers, Yemen relies heavily on foreign oil companies that have production-sharing agreements with the government. Income from oil production constitutes 70 to 75 percent of government revenue and about 90 percent of exports. Yemen contains proven crude oil reserves of more than 4 billion barrels (640,000,000 m<sup>3</sup>), although these reserves are not expected to last more than 9 years, and output from the country's older fields is falling, a concern since oil provides around 90% of the country's exports. The World Bank predicts that Yemen's oil and gas revenues will plummet to zero by 2017 as supplies run out. This means Yemen will not be able to rely on oil and gas to import resources and food. Yemen will have to find alternate sources of income. Tourism may pick up if the nation is stabilized. Yemen should look at how countries with similar geography and resources make money and deal with obtaining resources and supplies. Clearly, even with water secured, Yemen will still have to deal with these serious issues (Plaut).

While the water situation in Yemen is critical, there is certainly hope of solving the problem of water scarcity. There are many ways to improve water availability. One way is by increasing the efficiency of water use. Irrigation efficiency is as low as 30%. Several projects have sought to install more efficient localized irrigation systems, but the costs are very high, and little progress has been made. To enhance water conveyance and distribution efficiency, the government has replaced traditional, earthen canals with

PVC and GI pipes. The Food and Agriculture Organization estimates that irrigation efficiency could reach 60% by constructing a conveyance pipe system and over 80% by utilizing localized irrigation systems, which would further increase average yields of crops (Wendt).

Another solution is improved sanitation services and sewage treatment. Sanitation services in Yemen are limited. Almost all villages in rural areas, where 75 percent of Yemen's 21 million people live, still use traditional means. Sewage is either dumped in watercourses or piped onto open ground. The quality of sewage treatment is extremely poor, but this does not stop farmers from using this inadequately treated water for irrigation. This can cause disease. If the quality of sanitation and sewage treatment is improved, Yemenis would be safer from disease and the country would have access to treated water for various uses. Countries such as Saudi Arabia are working to expand their wastewater treatment infrastructure and increase reuse capacity, a variety of technologies have been proven effective as treatment solutions for a variety of applications (Sanitation). If these same projects are applied in Yemen, water use will be significantly reduced and efficiency improved.

Another way to improve water scarcity in Yemen is water education. Education is important to get Yemenis to start thinking about water consumption. Over half of Yemen's water goes to the cultivation of qat, a plant with no nutritional value at all. If the people decided to reduce qat consumption, water could go to growing other crops. This would help ease hunger in Yemen. Qat farmers earn more than food crop growers, but if people stopped chewing qat or qat farmers grew other crops in addition to qat, this would begin to help ease the hunger problem in Yemen (Worth). Also, one proposal discussed in the agricultural ministry is to promote the production of Yemeni-style qat in Ethiopia where there is plenty of water. Importing qat from Ethiopia makes sense in terms of water accounts (Schmitz). There is also a new public awareness campaign. In a race to shape public opinion, the government has developed a national mascot to encourage water conservation. Rowyan and his wife are animated raindrops (Hill). Education of the population can have a huge impact on the solution of the water crisis. The Millennium Development Goals of Achieving universal primary education and Promoting gender equality and empowering women would be important to this solution.

A major solution to the water crisis is water desalination. Water desalination is feasible for Yemen as it has a very long coast and the salinity of the Gulf of Aden and Al Qamar Gulf are less than other nearby bodies of water, which means the cost would be less. Many other countries rely on desalination plants for a large part of their water. Yemen is a prime candidate for building water desalination plant (Correspondent). Desalination plants can be run on solar panels. New technology will be able to greatly reduce the cost of desalination. Instead of membranes, the new method, electrochemically mediated seawater desalination, uses no membranes, is considerably simpler than conventional methods, and is so low-energy that it can be performed with the energy provided by store-bought batteries (Nathan). If desalination plants are built on the coasts of Yemen, desalinated water can be piped around Yemen. Using new technology, the price of the process could be greatly reduced. Yemen would then be creating water for its population and farmers to use. This would definitely improve the water scarcity problem in Yemen. The creation of a common water network could also greatly help Yemen.

Using these various techniques, the water scarcity problem in Yemen can be resolved. In Yemen now, however, there are few projects operating to improve water scarcity due to instability in the government and country and lack of funding. However, if one looks to other countries in the Middle East, they are successfully using these techniques ward off water scarcity. Many of the countries in the Middle East do not have some of the advantages that Yemen does, such as Yemen's lower salinity, yet the water conservation practices thrive. These practices would flourish in Yemen if applied. The Millennium Development Goals of Eradicating extreme poverty and hunger and Ensuring environmental sustainability are very important to Yemen as well. The most important MDG for saving Yemen, though, is developing a global partnership for development. Yemen is a very poor country and does not have the money to implement these various solutions. It will be up to other countries, global organizations, and the

global community as a whole to work with Yemen to fund these solutions. Organizations and countries around the world can work together to build desalination plants, sanitation centers, and send people to educate and train the population of Yemen. Global organization and the government of Yemen can work with other Middle East countries to figure out how to best implement the water solutions. It is imperative that the Yemeni population is involved because the Yemeni population will be employed in running the new water infrastructure once other organizations and countries have left. The population will have to take part in building the water infrastructure and have training in how to operate and successfully run it. If the population has an active part in creating it, they will have a greater desire to see it run effectively. The population will gain millions of jobs and the newly available water will start to end the food security in Yemen. Gulf Cooperation Council countries have recently started looking into working with Yemen to build desalination plants (Correspondent).

In conclusion, Yemen is a culturally rich and significant country. It has a long and interesting history. The people of Yemen are tenacious and stalwart. The family unit is important to all Yemenis. Elders are respected and children are viewed as gifts. Food in Yemen is simple, filling, and always made with fresh ingredients. However, almost half of Yemenis have only a third of the money needed for a balanced diet available for all uses. The children in Yemen do not receive great education, with girls especially disadvantaged. A large portion of the Yemeni population is unemployed, with many more employed in the failing field of agriculture. Health care access is also very poor in Yemen. The Yemenis are a respectable people and do not deserve the hardships in their lives. Yemen is the poorest country in the Middle East and it currently faces an atrocious water scarcity problem. This lack of water also affects the food security of the country. Resolving Yemen's water problem would also benefit the food security. While the situation is dire, there are many solutions to the water crisis. Practices such as increasing the efficiency of water use, improved sanitation and sewage treatment, water education and education in general, and building water desalination plants would all serve to end the water scarcity crisis in Yemen. The solutions, however, cannot be implemented by Yemen alone. It is clear that in order to save Yemen from impending disaster, it will take a concerted effort between the people and government, countries both neighboring Yemen and around the world, global organizations, and the global community as a whole. While not easy, this must be done, and the outcome of a global cooperative is more than enough incentive to see it through. The outcome is a country of millions of healthy people with access to both water and food. The outcome is a prosperous Yemen, a Yemen that will never again have to face the crippling, debilitating effects of extreme water scarcity and food insecurity.

## Works Cited

- Al-Ariqi, Amwl. "Urban Agriculture A Solution To Food Insecurity." Yemen Times. Yemen Times, 28 Dec. 2009. Web. 23 July 2013.
- Al-Omari, Moneer. "MOST YEMENI WOMEN WORK IN UNPAID JOBS; WOMEN'S UNEMPLOYMENT ON RISE." MOST YEMENI WOMEN WORK IN UNPAID JOBS; WOMEN'S UNEMPLOYMENT ON RISE- Yemen Post English Newspaper Online. Yemen Post, 10 Apr. 2010. Web. 23 July 2013.
- "At A Glance: Yemen." UNICEF. UNICEF, n.d. Web. 23 July 2013.
- "Capital City Faces 2017 Water Crunch." IRINnews. IRIN News, 23 Mar. 2010. Web. 23 July 2013.
- Correspondent. "GCC Countries Consider Building Desalination Plants in Yemen." Ooska News. Ooska News, 16 Apr. 2013. Web.
- "Food from Yemen." Food from Yemen: Dining Etiquette, Culinary Influences, Staple Foods, Specialties, & Drinks. Safari The Globe, n.d. Web. 23 July 2013.
- "Food Prices in Yemen." Food Prices in Yemen. Numbeo, n.d. Web. 23 July 2013.
- "Funding Shortfalls Hit Yemen Humanitarian Work." IRINnews. IRIN News, 23 Mar. 2010. Web. 23 July 2013.
- Hestler, Anna. "Lifestyle." Yemen. New York: Marshall Cavendish, 1999. 64-65. Print.
- Hill, Ginny. "Comic Answer to Yemen Water Crisis." BBC News. BBC, 09 Apr. 2008. Web. 23 July 2013.
- Institute for Women's Policy Research. "The Status of Women in the Middle East and North Africa (SWMENA) Project." Wwww.ifes.com. International Foundation for Electoral Systems, 2011. Web.
- Mohsen, Adam. "Yemen: Choosing Food." Yemen Times. Yemen Times, 28 May 2012. Web. 23 July 2013.
- Nathan. "Desalination With Small Electrical Fields." CleanTechnica. CleanTechnica, 30 June 2013. Web. 23 July 2013.
- "Places in Yemen." Arabian Voyages. Arabian Voyages, n.d. Web. 23 July 2013.
- Plaut, Martin. "Yemen 'faces Crisis as Oil Ends'" BBC News. BBC, 20 Nov. 2008. Web. 23 July 2013.
- "Sanitation Limited, Sewage Treatment Poor." IRINnews. IRIN News, 5 Mar. 2008. Web. 23 July 2013.
- Schmitz, Charles. "Building a Better Yemen." Carnegie Endowment for International Peace. Carnegie Endowment for International Peace, 3 Apr. 2012. Web. 23 July 2013.
- "Time Running out for Solution to Water Crisis." IRIN Middle East. IRIN News, 13 Aug. 2012. Web. 23 July 2013.
- TJ. "The Baqaalah: Around the Town in Sana'a." Living In Yemen Sana'a. Wordpress, 28 Sept. 2008. Web. 23 July 2013.

Wendt, Nathan, and Laith Aqel. "Yemen's Water Crisis: The Urgent Need for Action | EastWest Institute." Yemen's Water Crisis: The Urgent Need for Action | EastWest Institute. EastWest Institute, 26 June 2012. Web. 23 July 2013.

Worth, Robert F. "Thirsty Plant Dries Out Yemen." NY Times. NY Times, 31 Oct. 2009. Web. 15 June 2013.

"Yemen : Daily Life and Social Customs." Encyclopedia Britannica Online. Encyclopedia Britannica, n.d. Web. 23 July 2013.

"Yemen: Food Insecure Face Double Whammy." IRINnews. IRIN News, 2 Feb. 2009. Web. 23 July 2013.

"Yemeni Cuisine." TravelingEast. Traveling East, n.d. Web. 23 July 2013.