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Israel (Gaza Strip), Factor 9: Water and Sanitation

Water and Sanitation in Israel

The Gaza Strip is a Palestinian occupied territory in the country of Israel. It has an area of 360 square km. To the north and east of Gaza is Israel. To the west is the Mediterranean Sea and just south of Gaza is Egypt. The Gaza Strip is the 4th most densely populated area on Earth with approximately 4,505 people per square km (“BBC: Life in the Gaza Strip”). According to the CIA World Fact book, 44.7% of the population are between the ages of 0 and 14, 52.7% are between the ages of 15 and 64, and only 2.7% of the population are over the age of 65. The current population is approximately 1,819,982 with an expected 2.13 million in 2020. Thus the population is young and their needs will continue to grow (“CIA”). There are about 70,000 households with between 6 and 7 residents. However, most households do not contain beds. In fact there are only 1.3 beds per 1000 people. 80% of people in Gaza get food assistance from the Israeli government or the United Nations.

Water is the key to the future of every society. A healthy and functioning population needs safe and clean water that is easily accessible in order to survive. People need sanitation for avoidance of disease, healthful cooking and drinking. In the Gaza Strip, water and sanitation are a big issue. Gaza has no fresh water source, and its single aquifer (The Coastal Aquifer), which should create fresh water, has been overworked for decades even prior to the occupation by Israel in 1967. Cleansing sewage and wastewater is also a major problem in Gaza. Daily, 90 million liters of untreated sewage are pumped into the Mediterranean Sea. Additionally, many residents are not even connected to the sewage system. Therefore, their waste gets into the ground water. Production of agriculture is stunted due to the fact that only 25% of wastewater is recycled for agricultural use (“B'Tselem”). The primary source of groundwater pollution in Gaza is elevated chloride and nitrogen levels. The chloride is a result of salinity from the Mediterranean Sea, and the nitrogen is a result of the use of pesticides in agricultural and from sewage seeping into the aquifer.

The Palestinian culture revolves around food. For Palestinians *Ghada* is the biggest meal of the day. *Ghada*, meaning lunch, usually contains rice as a starch, chicken or lamb as protein, and cooked vegetables. *Fatur* and *Asha*, breakfast and supper, are usually lighter meals. However when food is scarce, like it is in Gaza, the father gets to eat first, then the oldest son, and so on (“(Palestinian Central Bureau of Statistics)Action”). This leads to the malnutrition of women and younger children. A typical family living in the Gaza Strip has 6.6 people, consisting of four or five children and two adults. Many families that are below the poverty line are ones that have lost fathers and sons.

Despite the poverty levels, 39% in all of Gaza and 73% near the buffer zone, the Gaza Strip has a fairly good educational system because the United Nations runs a lot of the schools. While male pupils are in school for 12 years, females remain in school for 2 additional years. Literacy levels are pretty high with 93% of women over the age of fifteen and 98% of men over the age of fifteen. Due to Gaza’s high population, class sizes are fairly large, ranging from 40-50 pupils. However, by 2020, Gaza will need 440 new schools to accommodate the growing population. Most schools currently run on a double schedule to accommodate the high number, which limits the instruction time and learning of students. For students to perform well they need to be in good

health. Diseases such as diarrhea and other stomach ailments can prevent students from learning and performing at their potential.

It is very hard to get medical help in Gaza if you are not “knocking on death’s door,” so to say. Health care and treatment are a problem. Most health care facilities are overcrowded and inadequate to treat patients due to the fact that there are only 1.8 doctors per 1000 people (“Palstinian Central Bureau of Statistics”). Public health services have lessened since Egypt closed the Rafah Crossing, the crossing between Gaza and Egypt. Egypt now only accepts an average of 305 emergency medical patients from Gaza a month compared to its previous average of 4,146. According to B’Tselem, The Israeli information center for human rights in the occupied territories, “The poor state of Gaza’s health care system is the result of neglect.... Israel allows most patients with life-threatening conditions who cannot receive treatment in the Gaza Strip to enter.” Therefore, people who suffer poor health due to the poor state of the water and sanitation do not have easy access to medical except in emergencies.

Other than water and sanitation, one of the major agricultural barriers is that over a ¼ of the arable land in Gaza is located in the buffer zone between Gaza and Israel. This means that Gaza does not have all the farmland that it could. However, with past events the buffer zone is definitely needed for the safety of citizens on both sides of the Gaza and Israel border. Another major barrier concerns the exportation of the crops that Gaza grows. Exportation has been seriously curtailed after the blockade, and farmers are only able to sell within Gaza’s borders. Some farmers have dealt with this by diversifying the crops that they grow in hopes that other crops may compensate for the loss in profit.

Issues with water and sanitation also affect farms. Ninety percent of the farms in Gaza are smaller than ½ acre. The crops most frequently grown are citrus fruits, vegetables and strawberries. All crops that are grown in Gaza are harvested by hand (“ANERA”). The crops are sent to local stores and markets where customers purchase the food. The average farm worker makes approximately \$6.90 (USD) a day. However, with regard to employment, most residents are employed by either Hamas, the political party currently controlling Gaza, or the United Nations. Water is definitely needed for agriculture, and since water is scarce in Gaza, farmers need to pay a substantial amount for water; limiting the amount of money (Action)they can pay their workers.

Water and sanitation are a barrier for health, farming, and a quality lifestyle in the Gaza Strip. In addition to the aforementioned facts, 70% of water that Gaza has is already being used for agriculture. Gaza’s water crisis lowers the agricultural productivity, which makes food cost more and lowers its accessibility to citizens. The average family pays ⅓ of their monthly expenditure for semi-drinkable drinking water from private vendors. Therefore, these people do not currently have enough money for the amount of food they need. We can tell that the water quality is worsening by the amount of pollution and salt that continues to grow. Because of the culture in Gaza women and young children are already at a disadvantage. The longer people wait to improve the water quality in Gaza, more and more problems will occur. Malnutrition and starvation are examples that will become even bigger problems than they currently are.

My proposed solution to the issues dealing with water and sanitation is to use a new molecular filtration solution developed by Lockheed Martin engineers for desalination. Using this new technology, the Mediterranean Sea and groundwater may become better utilized as sources for drinking water. The Perforene filter is made out of graphene that is only one atom thick (Lockheed Martin). Graphene is made of pure carbon and is similar to graphite. The filter is covered with holes of one nanometer or less. These holes are small enough to trap sodium, chlorine and other ions that are in seawater. Also, because it is so thin, the Perforene lets water flow through the filter 100 times faster than the current reverse osmosis systems. Reverse osmosis

is where water, or another solvent, passes through a porous material in the opposite direction in which it would for natural osmosis. (“Lockheed Martin”). One of the problems with current filters is the amount of energy they take to use, 800 to 1,000 pounds per square inch to be exact. Perforene doesn’t need nearly as much energy to purify water, reducing the cost of operation. One of the other major advantages of Perforene is that you would simply “plug it in” in the place of the existing filter (“Spector”). This is a great advantage since existing systems can be used instead of spending money on costly new systems. Many of Gaza’s water desalination plants were meant to be temporary, but are used as permanent desalination plants. Gaza could replace the filters in their current desalination plants with Perforene, which will make them permanent. Becoming permanent will increase the amount of water that they will be able to purify because breakdowns will be avoided, and it will make clean water accessible to a lot more than the current 20% of the population of Gaza. The only problem with the Perforene filter is that it has not yet been mass-produced.

Used (Spector) in conjunction with other current projects in Gaza like the Maia Project, whose aim is to provide clean water to children in Gaza, and efforts like those of the United Nations and the governments of other countries (The United States, Canada, Japan), my proposed solution will help Gaza in many ways. The clean water will increase the quality and amount of food that farms are able to produce. That will drive the price of crops down, allowing for more food to be bought for families to consume. The economy of Gaza could improve because more money is being made by agriculture, which will allow their government to provide relief services to the poor, lowering poverty levels. Women and young children will then have more nutritious food to eat and will get fewer illnesses, such as goiter and other malnutrition based diseases. This creates less crowded hospitals, allowing doctors to deal with the patients that are currently having to be sent out of Gaza. The environment will also benefit by having clean water to use for various purposes. For example, previous World Food Prize winner Daniel Hillel, who happens to be Israeli, developed drip irrigation, which is an irrigation method that saves water by allowing water to drip slowly from the roots of plants.

Along with water and sanitation, water scarcity and population growth are two other major key factors that will impact Gaza in the near future. Even with the Mediterranean Sea and groundwater as new sources for clean water, Gaza still has no major fresh water source. If the agricultural industry grows in Gaza, there will be a higher need for water, hence the usefulness of drop irrigation, which uses only a fraction of water that regular irrigation uses. Water scarcity will also get worse with population growth. The amount of new schools and housing Gaza will need in the near future may be more than they can handle considering their current economical status.

To help implement my suggested solution, Gaza will need the help of NGOs (Non-Governmental Organizations). They will also need Lockheed Martin to mass produce Perforene or be willing to use Gaza as a test subject. Gaza may also need assistance installing the filter. It would truly help Gaza financially if they got grants from the United Nations and any other countries that would be willing to help. Israel can also donate if they decide they want to. The rural and urban families can help implement the solution by using the water it purifies and monitoring the amount of water that goes through the filter.

Gaza is a small place with a lot of people. The culture of most of the citizens put women and young children at definite disadvantages compared to the male population. The salinity of the water is currently the biggest concern that can be solved using the Perforene filters. In conclusion, Gaza is a very complicated place with many concerns dealing with food and water safety and security.

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