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## **Reviving the “Green Island”**

There are over 150 developing countries across the globe today. Each of these countries, ranging from small island countries to large landlocked countries, are trying to develop their infrastructure and economy, as well as addressing other political issues, such as government structure, and social issues ranging from water sanitation to education. Cyprus is one of these developing countries located near the Mediterranean Sea, south of Turkey and north of Egypt, with a population of about 1.2 million people as of 2018. Cyprus was originally known as the 'Green Island' in the ancient world because it was an exception to its middle-eastern neighbors (Murray 2017). Rather than a desert, it was largely forested and had abundant supply of surface and spring water. Today, however, Cyprus struggles with water scarcity. In Greek mythology, which holds a large role in the heritage of Cyprus, Cyprus was the birthplace of Aphrodite. As the patroness of rare and beautiful things, she was considered the reason for Cyprus' rich copper deposits. However, this abundant natural resource has helped to contribute to the islands water scarcity issues because the amount of water that is used to extract the minerals from the Earth during the mining process. Not only is water used for mining, but it is also used for agriculture, which makes up 13.4 % of the land use on the island as stated by the World Fact Book of the Central Intelligence Agency in 2011 (2010). Water demand for irrigated agriculture in Cyprus totals approximately 290 Mm<sup>3</sup> (million cubic meters) while the water supply only reaches around 262 Mm<sup>3</sup> as stated by Fassel in 2013 (Bishop & Sofroniou 2014). While Cyprus was, at one point, the pinnacle of water availability, this is not the case anymore and they must implement new ways to combat their growing water scarcity problems. They can do this through the use of several techniques such as the implementation of “Grey Water” systems, desalination plants, the replacement of water wasting crops, and the enactment of new government policies focusing on water conservation through education and economic incentives.

Cyprus became a presidential republic on February 15, 1959, but, in its 10,000 years of history, Cyprus has been ruled and conquered by several different people including the Greeks, the Phoenicians, and the Egyptians. Cyprus holds the rank as the third largest and third most populous island in the Mediterranean. Cyprus has long, warm, dry summers and mild winters. As a center for global trading, Cypriots find it to be advantageous to be highly educated with a rich multilingual heritage including an average of 6 languages. These languages include Greek, Turkish, English, German, French and Russian (Murray 2017). While it may seem as if Cyprus is the perfect country, their lack of planning by the government to prevent water scarcity issues has lead them into situations that are dangerous for its citizens. In 2012, Cyprus entered its fourth consecutive year of drought. This caused record low levels in both the aquifer and several dams on the island. Even more recently in 2014, “The Intergovernmental Panel on Climate Change Fourth Assessment Report (IPCC-AR4) indicates significant summer warming in South-Eastern Europe and the Mediterranean, while downward trends are associated with the mean annual precipitation” which concludes that the conservation of water sources to be most important (Bishop & Sofroniou 2014). Lack of water lead to the forced importation of water from outside sources (Bishop & Sofroniou 2014). Desalination is the extraction of salt from salt water to create a fresh drinkable water source. Although desalination would have been cheaper than this importing of water, the government's failure to plan for this type of infrastructure caused this expensive, but necessary, evil. To put this lack of planning into comparison, the city of San Antonio, Texas alone plans 35 years ahead to ensure water availability, such as the construction of a desalination plant and the use of recycled water within the city. The government of Cyprus should be making their water scarcity problem their top

priority because, if they don't, this may lead to a public health crisis and economic failure because people cannot sustain themselves without reliable and safe water resources.

Today, economic growth within the tourist trade is diminishing the water resources to record low levels. With 67% of the population now living in urban areas, the over pumping of water from Cyprus's aquifer throughout the decades for mining and other activities has led to the point at which the aquifer is not able to replenish itself fast enough for the human rate of consumption with the little average rainfall of 480 millimeters a year according to the Republic of Cyprus's Department of Meteorology (2019). Since 1960, the amount of laborers going into the agricultural industry has been decreasing from 40.3% to 3.8% today (2010). These decreasing rates are dramatic. The people are transitioning into the services industry due to the rising tourist population. This supplies as of 2017, 85.5% of Cyprus's Gross Domestic product and controls 81% of Cyprus's labour force according to the World Fact Book of the Central Intelligence Agency in 2014 (2014). Today, the water scarcity problem is worsening. Shipments of water are having to be imported to the island and water is now being sold by the parcel per hour. This leads people to use possibly unsafe water sources for cooking, cleaning, and hygiene practices. In America, the USDA, FDA, FSIS, and EPA have worked together to have secured one of the safest food supplies in the world and in Texas, more specifically, the citizens are blessed to have a limestone aquifer, the Edwards Aquifer, which supplies San Antonio area alone with over 136.5 million gallons a day. There are times during the year when Texan citizens have restrictions placed on this natural resources use to ensure the conservation of water, but on the average day the San Antonio population does not have to fear the lack of water availability in the way Cyprus's citizens do everyday.

In Cyprus, the majority of the agriculture section, which accounts for 69% of Cyprus's water consumption, is in the business of growing crops such as citrus trees, table grapes, wine products and potatoes as stated by the Agricultural Situation Report of Cyprus and the Market and Trade Policies for Fruit/Vegetable and Olive Oil by the Agricultural Research Institute, Nicosia, Cyprus (Markou & Kavazis 2006). Approximately 79% of the agriculture in Cyprus is irrigated (Bishop & Sofroniou 2014). While Cyprus's water resources are under great shortage the staple crops that Cyprus is continuing to grow are all very water ineffectient. For example to grow 4.6 ounces of citrus it takes nearly 14 gallons of water according to the Water Education Foundation (Chong 2019). Total water demand for irrigated agriculture in Cyprus accumulates around 290 Mm<sup>3</sup> while the water supply only reaches around 262 Mm<sup>3</sup> as stated in by Fassel in 2013 (Bishop & Sofroniou 2014). This deficient puts the country in a bad scenario because the deficient then leads to crops being irrigated with unsafe water that has been polluted from water contamination and industrial wastes. Food that is grown using industrial waste polluted water can be very dangerous to the people that are eating it and in consideration that nearly 100% of those crops grown in Cyprus are exported to other countries, supplying the country with more than 2.8 billion dollars in income in 2017, they are putting those foreign consumers at risk as well (2010). This means that not only is the population of Cyprus putting themselves at risk of illness due to consuming these products grown off harmful water sources due to the scarcity of clean and sanitary water, but they are putting others at risk as well. Health risks associated with polluted water includes diseases such as respiratory diseases, cancer, diarrheal diseases, neurological disorders and cardiovascular diseases. Nitrogenous chemicals are responsible for cancer and blue baby syndrome as stated by Mehtab Haseena in July of 2017. All of these concerns are due to Cyprus's problems with water scarcity and if that problem was to be solved these concerns for the health of the nations citizens could be dissolved.

However, Cyprus is doing something to recover from the years of neglecting their aquifer and water resources. Their recently elected president Mr. Nicos Anastasiades has been pushing for improvements in water conservation. Crops such as pomegranates are being recommended as replacement crops for they require less water resources, as they on average only need to be watered every two to four weeks, and are projected to raise income for the country, for in 2017 more than 29,880,726 pounds were

sold. Not only have pomegranates been recommended as a replacement crop, but so have prickly pears for their medicinal oil created by their seeds is highly sought after and can sell for up to 40,000 euros or the equivalent of 44,271.00 U.S. dollars a liter ("Agriculture & Food" 2019). To help with this major transition from citrus bearing trees that require much irrigation to crops such as the prickly pear and pomegranates which are better suited for the region the European Union Common Agricultural policy (CAP) has granted Cypriot farmers over 102 million euros over the past year as well as implemented various programs and subsidies ("Agriculture & Food" 2019). This financial help is to try to ease this transition between markets. This transition between markets will help to boost the economy and provide better nutrition for the population eating Cypriot foods. It will also help to improve safety measures by decreasing the use of water therefore decreasing the chance of using polluted water due to the water scarcity issues.

The government also is working to implement new government policy related directly to the water scarcity problem. This includes price increases on water from 25% to 165 % to increase motivation to practice water conservation by the average family as presented by the Cyprus Water Development Department as well as educating the public. In 2012, approximately 50 lectures were given to nearly 10,000 elementary and secondary school age children to promote water consciousness from a young age within the country (Bishop & Sofroniou 2014). The government is trying to develop water consciousness from a young age in their children to create a generation of water conservationists. Finally 85.5% of the people work in the services industry from the recent rapid growth in Cyprus's economy (2010). Therefore the islands hotels are being targeted to reduce on the amount of their water usage due to their constant washing of linens and towels. This has pushed the islands hotels to adopt a policy, like many hotels in the United States, which asks travelers to reuse their towels and linens for the duration of their stay. For the larger concentration of tourists, this practice is sufficient.

Another way that Cyprus is fighting this issue is with something called "Grey water." Grey water is water used for washing such as baths, showers, washing machines and dishwashers. This wastewater is then sent into another tank to be used for toilet flushing and domestic irrigation. With the average household in Cyprus being 2.7 people, according to ArcGIS an online global mapping and analytics platform, this system has already helped to reduce consumption up to 50%. Grey water is seen as the future of the water conservation world as stated by the Water and Waste Digest (WWD) (Bishop & Sofroniou 2014). This process of using advanced technology to reuse and recycle water to help conserve the precious resource is helping to decrease the water scarcity issue in Cyprus which has been evaluated as the most affected country in the European Union with a water stress of approximately 66 % as stated by the Organisation for Economic Co-operation and Development (OECD) (Bishop & Sofroniou 2014). The use of grey water systems have not only helped to lower water consumption and to help correct water scarcity issues for the country of Cyprus as a whole, but they have also helped to reduce individual homeowners water bills. With the increase of water prices to help promote water conservatism, recycling water is a primary way to help reduce water usage and therefore reduce the average monthly water bill.

In conclusion, Cyprus is a country with a prosperous and bright outlook, but without taking the necessary actions to correct their hazardous water scarcity problems their economy, food security, and the health of its people are all at risk. When people think of countries at risk of problems such as this, they generally think of places such as Haiti, Afghanistan, and Ethiopia. However, the global population never gives thought to small islands such as Cyprus which seem idyllic on the outside, but when taking a deeper, closer look they are actually in much danger. Cyprus can fight their issues with water scarcity in many ways such as the implementation of Grey water, change in traditional agricultural crops, and government policies to insure the safety of its people and economy. Over the next years Cyprus's people need to push for more government help in securing their water resources. This can be done through the voluntary transition to growing plants suitable to the region and compliance to new government policies

to help combat the water scarcity problem. With hard work and strategic planning these water scarcity issues can be corrected we can revive the green island.

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