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Barbados, Water Scarcity

A Community Approach to Battling Water Scarcity

As a popular vacation destination, the white sandy beaches of Barbados provide beautiful ocean views and warm sunshine year round. But hiding underneath all of this beauty is a serious issue threatening the Barbadian, also known as Bajan, lifestyle. Barbados is a gorgeous island in the West Indies surrounded by the North Atlantic Ocean and the Caribbean Sea (“Climate - Barbados”). The total land area is 430 square kilometers (166 square miles), and 287,061 residents call Barbados home according to Worldometers. Over 665,000 tourists visit the country each year, and this number is only going up (“Number of International Tourist Arrivals”). According to Forbes, “Barbados is the wealthiest and one of the most developed countries in the Eastern Caribbean and enjoys one of the highest per capita incomes in the region”. However, Barbados and several countries in the Middle East are among the top 15 worldwide to consume close to 100% of their total renewable water resources (“Tender Notice”). So how could such a small and rich island country end up having no fresh water to drink?

Barbados has a relatively flat landscape that contains coastal lowlands, rolling hills, and a few small rivers. Coral reefs surround almost the entire island (“Barbados Geography”). It is considered to be a tropical climate, with the average temperature ranging from 70° - 88° F. There is a consistent average of 8 hours of sunlight per day, however the months of May through October are more humid and muggy than the rest of the year. Hurricanes pose a threat year round, but usually develop between August and October. Usually these tropical storms are classified as low-category in this geography. September through November serves as the rainy season, but precipitation takes place all year round. The average rainfall totals range from 47 - 55 inches per year. The ocean is always warm enough to swim in and enjoy — a major benefit for the tourism industry (“Climate - Barbados”).

On the island, only 32% of Barbadians reside within an urban area, such as the capital: Bridgetown (“Barbados Population”). This results in a large majority of the population living in rural areas, many working on farms. On average, a small farm in Barbados occupies .58 hectares of arable land (“Barbados” [Food and Agriculture Organization of the United Nations]). Index Mundi states that of the total land of Barbados, 32.6% is used for agriculture, with primary agricultural products including sugarcane, vegetables, and cotton. Barbados is a major exporter of crops and goods, with the main export commodities being “sugar and molasses, rum, other foods and beverages, chemicals and electrical components. The main import commodities are consumer goods, machinery, foodstuffs, construction materials, chemicals, fuel and electrical components” (“Find Import and Export Expertise in Barbados”). The manufacturing of these products does, however, produce high levels of pollution. The country uses both imports and exports to keep the economy going and provide products for both its citizens and tourists.

Although the legal system is founded in the British common law, Bajans still exercise political control (“Barbados” [Countries and their Cultures]). The island has a two-part government system — a parliamentary democracy and constitutional monarchy (“Government”). “Barbados is an independent parliamentary democracy within the British Commonwealth. For administrative purposes, the island is divided into the city of Bridgetown and eleven parishes. The queen of England is recognized as the head of state, and the highest court of appeals is the Supreme Court of the United Kingdom. The queen appoints a governor-general to represent her on the island” (“Barbados” [Countries and their Cultures]). The two political parties, the Barbados Labour Party and the Democratic Labour Party, compete for seats within the House of Assembly. The leader of the majority party is appointed as Prime Minister. Other

members of this party are appointed to join the Cabinet, a branch that helps the prime minister carry out executive functions. The national government takes care of issues that apply at the local level which means that the government is capable of easily creating policies dealing with water regulation or technology.

Bajans are privileged with easy-to-find healthcare, including old age pension, sick, disability, maternity, employment injury benefits, unemployment insurance, and medical costs scaled to household income. They also have free education for children under age 16, resulting in a 90% literacy rate. There are only two economic classes in Barbados: middle and elite. The middle class makes up almost the entire population. Middle class citizens are blue-collar or white-collar workers of almost every field, doing everything from manufacturing goods to farming to working in the service or tourism industry. The elite hold positions as accountants, lawyers, medical personnel, journalists, and more (“Barbados” [*Countries and their Cultures*]). The average gross salary is 66,825 Barbadian dollars (BBD), or 33,413 US dollars (“Average Salary Survey”). All of these factors allow for a more equal standard of living.

A variety of housing options exist today including the popular Chattel Houses — a somewhat temporary wooden house that was once located on a plantation. Each structure was proudly built with style, character, and interest. These houses remain today as a uniquely Bajan icon (“The Traditional Bajan Chattel House”). When it comes to food, there are many location options with a surprisingly high amount of imported choices, along with locally grown crops. Items are sold at supermarkets, minimarts, and convenience stores (“Barbados Supermarkets and Grocery Stores”). A typical family diet includes flying fish, which is the national symbol. Other typical foods include coconut bread, coocoo (a mix of cornmeal and okra), fish, chicken, pork, rice, papaya, mangoes, guava, bananas, oranges, and pineapples (“Barbados” [*Countries and their Cultures*]). These items are cooked with methods similar to those used in the United States, such as grilling, baking, or frying. Index Mundi shows that almost 100% of families have access to clean water, toilets, electricity, paved roads, and local markets.

From the outside, Barbados appears as a well-put-together tropical country. However, even though Bajan families have all of the benefits listed above, there are major barriers faced throughout their lives. Humanium states that 14% of children are living in poverty. Although this is the lowest rate of the Caribbean islands, it is still much too high. Also, “Three children out of twenty do not receive the nutrition necessary for their development” (“Children of Barbados”). Pregnancy rates run high, as 25% of women age 18 have given birth to a child. The HIV disease is a lurking problem, along with obesity caused by poor nutrition. The issue that causes more worry, however, is the possibility of physical violence both at home and at school. Corporal punishment is still legal, and drugs and crime are prevalent in the streets (“Children of Barbados”).

The most concerning factor, though, is the lack of available water resources to meet Bajan demands. The Food and Agricultural Organization, or FAO, considers a country to be water scarce when its per capita water resource availability is less than 1,000 cubic meters (m³) per capita per year. The available water resources in Barbados reaches only 390 m³ per person (“About the Barbados Water Authority”). The severity of this situation is little known but continually worsening. Naturally occurring freshwater that once bubbled up from springs and ran through the hills is almost gone, for it was over-consumed without preservation. The country now relies heavily on potable water to be brought in from an outside source. In 1981, the Barbados Water Authority (BWA) was put in place, and this Statutory Body is “charged with supplying the island with potable water as well as the provision of wastewater treatment and disposal services to the seweried areas of Bridgetown and the South Coast. The Authority is also responsible for the monitoring, assessment, control and protection of the water resources in the public’s interest” (“Some History of the Public Water Supply”). The BWA has worked to implement new technologies to bring water into Barbados. Freshwater now transfers through pipes into pump stations, providing residents with potable water. Desalination, a technique that creates drinkable water by removing salts and particles from

seawater using reverse osmosis, is also utilized (“Some History of the Public Water Supply”). Unfortunately this progress comes with an extremely lofty price and there is still much more work to be done.

Throughout Barbados, people are affected differently by the water scarcity. Farmers require fresh water for their crops, for that is their survival. “Urbanized populations tend to consume more water per capita than rural populations. Poverty in rural areas is much higher than in urban areas, and ... The effect of an increasingly urbanized population along with improvements in standards of living are likely to drive further increases in both total and per capita levels of water consumption” (Cashman). Even though 99.7% of the population has *access to* freshwater, it does not mean that they are receiving *enough* water for a healthy lifestyle (“Barbados - Improved Water Source”). While not having water to wash, clean, cook, or garden is bad enough — not having drinkable water is a life or death situation. As the Mayo Clinic points out, dehydration in men and women can lead to extreme thirst, fatigue, no urination, dizziness, and eventual kidney problems. These effects are even more dangerous in children and the elderly, for they can lose fluid faster (“Dehydration”). On top of this, water scarcity also negatively affects the environment. As Sonia Madaan, the top writer for Earth Eclipse, points out, “When water is scarce, then it means the natural landscapes suffer the most as it contributes to desertification, loss of plants and death of wildlife and other animals. As a result, these ecological catastrophes create habitat loss that, in turn, leads to food shortages and poor quality of life.” The wetlands could dry up to the point of losing the ability to hold water. The vegetation levels and amount of wildlife will continually decrease until preservation of the natural freshwater begins (Madaan).

Although this may seem like a daunting problem to solve, actions are being taken in Barbados to reverse this water crisis. In the year 2000, the Spring Garden Desalination Plant was installed and commissioned. This plant produces around 30,000 m³ per day, supplying 20% of Bajans with fresh drinking water (“Ionics Freshwater Limited”). In February of 2016, the BWA placed a Request for an Expression of Interest for the Seawater Desalination Plant. Within this tender, the group explained that “Barbados is extracting close to its sustainable limit from its fresh water resources”, and that “The preferred solution is the installation of two (2), 30,000 m³/day seawater desalination plants to augment available conventional freshwater resources” (“Tender Notice”). In July of 2017, millions of dollars in funding were secured for this project, and building will begin within the next couple of years (“BWA Secures Funding”).

As a first step, desalination technology is already making a huge difference in Barbados, but as they look to build more plants there are weaknesses and strengths to consider. These plants rely on a lot of energy to be able to cycle water through the purification process. This is expensive and negatively contributes to the world’s greenhouse gas emissions. These facilities are also very costly to build, so a smaller country like Barbados may not be able to handle this economic weight. This process is, however, proven to be effective in producing high quality drinking water. Desalination is well studied and understood, and does not rely on uncontrollable factors such as rain totals for success. The source of water is the ocean, which is an almost inexhaustible source, no matter the season or weather conditions. Using a source other than the remaining freshwater would allow Barbados to preserve this resource for the future. Desalination is a sustainable solution that can continue to provide the residents of Barbados with fresh drinking water for years to come. 68 new desalination plants have been built in the Caribbean within the last decade (Ewing-Chow). Many other water-scarce countries are implementing techniques such as this, but with slightly different approaches. For example, Saudi Arabia, another water-scarce country, has “announced a new initiative to build solar-powered desalination plants to reduce water and energy costs by 40 percent” (Walton). Brett Walton is an award winning journalist for Circle of Blue. He notes that 50 - 70% of the population of Saudi Arabia relies on desalination for a daily supply of freshwater. Purifying water in these amounts requires a lot of energy, as “Saudi Arabia uses 1.5 million barrels of oil per day at its plants” (“Saudi Arabia to Use Solar Energy for Desalination Plants”). This was not a sustainable solution, for the country was using up its valuable oil resources. An alternative energy source, solar panels, could turn this

trend around because alternate energy sources not only use less energy, but also cost less overall while eliminating greenhouse gas emissions, which is safer for the environment.

A second and highly recommended solution that Barbados could implement is the use of rainwater harvesting — a technique involving collecting and storing rainwater. As rain falls onto roofs, it will flow through gutters, down pipes, and into a large storage container right next to the house. This container could be a tank, barrel, or other closed vessel. Again, there are both negatives and positives to be considered. Rain is unpredictable, the structure does require routine maintenance, and there are storage limits on the containers. Since the system includes a storage container, unpredictable rain totals shouldn't have much effect on the success of this project because rain can be stored for times of drought. On the positive side, the system is easy to maintain, there may be a large reduction in water bill prices, and many options for water use exist. Catching a percentage of the downpour will help to reduce the chances of flooding or soil erosion (“What is Rainwater Harvesting?”). Finally, the entire community is involved with this project, as each house would contain a rainwater harvesting system. Every family would be in control of their water and how they wish to use it. Not only can the water be used during a drought or emergency, but the daily lives of Barbadians would be aided by this stored water. Even without purification, activities such as washing, cleaning, cooking, irrigation, gardening, and doing laundry are all possibilities. “Catching rainwater and using it to assist in our daily lives can also serve as a means of removing much of our dependency for water from the Barbados Water Authority and as such, more Barbadians need to engage in the practice, especially during the rainy season” (“Rainwater Harvesting is the Way To Go”). The Barbados Advocate mentions that having access to these storage supplies will assist in situations where the BWA cannot provide water. Buildings and schools would not have to be closed for water shortages because they have reserves waiting right outside. To ensure that a change is being made, the BWA could propose a policy stating that all buildings — residential, manufacturing, or public — are required to set up and use a rainwater harvesting system. Enforcing this policy would be a major barrier to overcome in Barbados. Without an explanation, reasoning, or enforcement, Bajans might ignore the concept of rainwater harvesting. A position or team within the BWA could be created to ensure that people are complying with the new regulations. Some families in this developing country, however, may not be able to afford a rainwater harvesting system or pay for maintenance. The national government could provide underprivileged or possibly all families with help when it comes to these purchases. Since tourism is such a large and thriving part of the economy in Barbados, profits could assist in this task. If a \$2 fee was added onto each guest's hotel bill per night, this money could be transferred into a fund that helps local families buy and care for their rainwater harvesting systems. With over 600,000 tourists per year, the national government would bring on over 1 million dollars to support this water scarcity solution. The process of rainwater harvesting would help preserve the remaining natural resources and encourage commitment from everyone to help their country's freshwater supply recover. This solution is simple, easy, sustainable, and gives every citizen a chance to take action.

To aid the above projects, Barbados needs to lower overall water consumption and stay up to date with emerging technologies. Each citizen and tourist needs to lower the amount of water they use. As the number of visitors steadily increases, so does the demand for freshwater. Hotels and resorts use more water daily than Barbadian families because of the wants and needs of the tourists. These include washing linens, providing running water as well as drinking water, and more. As the water usage of tourists increases, the supply for local Barbadians is put at risk. Simple actions such as turning off the faucet or taking shorter, colder showers can make a world of difference in the cost and amount of water used per day. As technology advances, newer and possibly more efficient systems may be developed. Atmospheric Water Generation, or AWG, is a cutting edge development for water-scarce areas. Daphne Ewing-Chow, an environmental writer working in the Caribbean, states that AWG is “a process that extracts, filters, sterilizes and stores water directly from vapor that exists in the air”. Humidity in the tropical climate of Barbados works well with the process. Hydropanels are currently being tested in Australia. Solar-power helps to extract moisture from the air, producing between 4 and 10 liters of freshwater each day. Each

panel costs around \$2,000, and has a 15 year life span (“Water From Thin Air?”). Although costs up front are higher, countries could gain significant savings in water supply costs (Ewing-Chow). Once fully developed, AWG will be a more environmentally sustainable alternative to desalination. Due to the humidity, amount of sun, and water needs of Barbados, Atmospheric Water Generation could be a great solution in the future.

Barbados is a country that is currently low on freshwater but full of hope and potential. Drought, pollution, overconsumption, and tourism are factors that have led to this water scarcity crisis. Change is happening, and just in time. Alternate energy sourced desalination plants could create fresh drinking water to provide citizens with the amount of water they need. Individual rainwater harvesting systems would provide every household, business, and building with clean water to assist with daily activities. Promoting and enforcing these two projects, along with lowering overall water consumption, may kickstart an effective water solution. Tourists and Barbadians alike should be educated and advised on the topic of lowering water use. The Barbados Water Authority will lead the way, but the people need to follow. Full participation and support from every Bajan is crucial to the success of these projects, and sustainable solutions are within reach.

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