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Guatemala, Water Scarcity

Guatemala: Precipitation Saving People

Guatemala is a beautiful country with a rich culture and an amazingly diverse, unique landscape. The people who reside there are friendly, and take family as a priority, along with creating an appetizing and flavorful cuisine many people around the world enjoy. Many tourists travel to Guatemala to see their natural attractions, like Lake Atitlán or Semuc Champey, and historical monuments, buildings, and architecture. Guatemala also produces many agricultural products like coffee and bananas. With a population of almost 18 million, in addition to the large agriculture industry, Guatemala needs a substantial amount of clean water to continue growing the crops it has become known for. Water scarcity is a prevalent issue for a large portion of the population. Weather complications such as droughts have become further intensified by climate change, thus causing a depletion of freshwater sources. Additionally, some businesses collect their water through rivers used by Guatemala's rural population, which further increases water scarcity. By instilling regulations and introducing a unique way of sourcing water, their dilemma will no longer be so pressing.

Guatemala's population is dense due to the smaller size of the country, housing similar rural and urban citizens. The country gained independence from Spain on September 15, 1821, and eventually became a Constitutional Democratic Republic ("Guatemala 08/04"). Of the almost 18 million population, 53.9% is urban and 46.1% rural ("Guatemala"). The size of Guatemala is 108,890 sq. kilometers or 42,042 sq. miles ("Guatemala 08/04"). This is comparable to the size of Tennessee with over double the population. Of this land, 33.6% is forest, 41.2% is agricultural, and 25.2% is used for other purposes ("Explore"). Guatemala has a large population, many of whom work in one of its biggest industries, agriculture.

Farming is a prevalent source of income and a common way of life for the citizens of Guatemala. Typically, farms are smaller; around ⅓ acre is the average size for smallholder farms ("Building"). In comparison, the average farm size in the United States is 445 acres ("Farms and Land"). The citizens of Guatemala grow many different types of crops on their farms. Guatemala's primary crops are sugar, coffee, and bananas ("Everything"). Other agricultural products include oil palm fruit, maize, melons, potatoes, milk, plantains, pineapples, and rubber ("Explore"). These crops strengthen the economy through selling and exporting them. Around 2% of the largest farms occupy almost two-thirds of the arable land, whereas 82% of agricultural holdings are smallholder farms ("Uatemala"). While larger farms occupy much of the arable land, many of the smaller farms cannot gather the water they need for their crops. Even though much of Guatemala's land is used for agriculture, it is still diversified. Guatemala has a mountainous terrain with a fertile coastal plain ("Guatemala 08/04"). The climate is temperate in the highlands and tropical on the coasts ("Guatemala 08/04"). The land in Guatemala is diverse and used for agriculture to feed its large population and strengthen the economy.

Much of Guatemala's population works in its prominent agricultural field, but many people who live in rural areas struggle to have a quality living standard. Many traditional Guatemalan houses are built with

adobe, a mixture of soil, silt, sand, and clay (“Adobe”). However, many people do not live in these houses and instead live in huts which usually have basic plastic or metal roofs and walls made with corn stalks, with over 1 million people living in houses with dirt floors (“Why Guatemala”). On average, 4.8 people live in each household (“Guatemala Average"). Quality issues like those are prevalent, another example being how more than six million people lack access to basic health services in Guatemala. Even though numerous people experience these scarcities of water, sanitation, and health services, there is still a large workforce. Nearly two-fifths of Guatemala’s labor force is engaged in agriculture, with around the same in the service sector, and about one-fifth working in manufacturing and construction (“Guatemala”). Agriculture makes up 13.5% of Guatemala's gross domestic product, or GDP, as well as two-fifths of exports; about 85% of that GDP comes from the private sector (“Everything”). The minimum salary in export factories is 2,831.77 quetzales a month, the conversion rate for the quetzales being 7.87 GTQ to 1 USD as of September 16, 2023 (“Stotz”). Guatemala City is the wealthiest in the country and has an average salary of around 4,200 quetzales whereas other areas have approximately 3,075 quetzales per month (“Stotz”). There is some strain between certain Guatemalan factories and citizens. Some factories in Guatemala will build private schools that only children from families that work at the factory can attend (“Brown”). In general, urban families have better access to clean water, telephones, toilets, and education than those in rural areas, meaning those in extreme poverty rarely have access to clean water and sanitation services.

Even with poor housing, rural families are still very close. Many rural families also live next to, or with each other (“Guatemala - UFS-USA”). In the family, the father is usually considered the head, while women are considered the core (“Guatemala - UFS-USA"). Families in Guatemala enjoy spending time with each other, such as at family gatherings or during meals (“Guatemala - UFS-USA”). Families consume a wide variety of food, with a mix of Spanish, Mayan, and different local influences in their dishes. Food has also received significant influence from Caribbean, African, Chinese, and American cultures, which have all made their way into the Guatemalan diet (“Guatemalan Food”). Foods such as pork, rice, beef, cheese, chilies, corn, tortillas, and beans are the primary ingredients of traditional Guatemalan cuisine, and certain foods are eaten on specific days of the week (“Guatemalan Food”). Guatemala’s national dish is pepian, one of the oldest dishes in the country that combines Mayan and Spanish cultures (“Guatemalan Food”). This dish usually contains chicken and a variety of vegetables and fruits (“Guatemalan Food”). The various ingredients are bought from local markets. Some also purchase what they need from other citizens who are looking to sell what they already have (“Brown”). Family is very important to the people of Guatemala, and many spread their love for each other by spending time together and eating the meals they have cooked.

The food citizens eat and enjoy is also affected by water scarcity. Even though Guatemala has numerous natural water sources, the ones available for use are primarily occupied by large farms and industries. They use the water for their farms that primarily grow cash crops. While the water from local rivers and lakes is used for agriculture, the people of Guatemala who live in rural areas suffer due to the lack of available water for other uses. In addition to the water used by larger farmers, some areas have no accessible water due to droughts, contamination, hydric stress, and overall changes in the climate (“Safe Water”). Most citizens who live in extreme poverty cannot adapt to these circumstances. Of Guatemalan children under five, 49% of them suffer from chronic malnutrition (“Brown”). As a result, women have cut back on food to provide for their children, which causes the number of low-weight babies born to

increase exponentially (“So Many”). More than 30% of Guatemala's population does not have access to sanitation services (“So Many”). In more urban areas, like Guatemala City, sanitation services and water are more available due to internal migration (“So Many”). Water scarcity not only causes harm to humans but to plants and animals as well, which are unable to survive without their usual water or precipitation.

A solution to deter the issue of water scarcity in Guatemala is by collecting water available from the result of the country's naturally more humid climate. Collecting water from the air allows people to access water no matter where they reside. It also is a way to ensure the water collected is cleaner than any potentially polluted or contaminated water. Systems that collect water from the air, like those built by companies such as Tsunami Products, are referred to as atmospheric water generators of the cooling condensation type (“Day”). They work on a similar principle as a modern air conditioner, relying on a refrigeration circuit that cools a surface where water then condenses and is collected (“Day”). From there, the water is filtered and purified to remove any contaminants that may have been captured from the air (“Day”). The only potential downside to this solution is the expenditure that is put into supplying the energy for these machines.

A potential solution to overcoming this obstacle is to get a grant from the Inter-American Foundation. The Inter-American Foundation directly invests and engages with local leaders, innovators, and entrepreneurs in underserved areas to create more prosperous, peaceful, and democratic communities (“Home”). They respond to project proposals sent by community-led organizations and decide whether or not to give a grant purely based on merit alone (“Home”). If this project were to get a grant from the Inter-American Foundation, it would likely be able to fund the installation of solar panels. This would decrease the high cost of energy originally presented by the water-collecting machines.

There is a cheaper version of collecting water from the air, which is collecting it through large nets that would lead the water into a reservoir for people to use (“Arenschield”). “‘We thought: ‘How can we gather water from the ambient air around us?’’ said Bharat Bhushan, Ohio Eminent Scholar, and Howard D. Winbigler, Professor of mechanical engineering at Ohio State. ‘And so, we looked to the things in nature that already do that: the cactus, the beetle, desert grasses’” (“Arenschield”). All the organisms listed collect the water they need to survive by gathering droplets through the fog at night, then filtering them to areas to keep them hydrated. Both the machine and the net systems work to collect water from the air. The benefits of the mechanical system are that it works all day, rather than primarily at night like the net, collects more water, and filters it. Members of local communities could also potentially get paid for helping construct the nets or set up the machines, move the machines around, or help install solar panels. The government would presumably agree or have some additional requirements, but likely not object as long as the project does not interfere with large-scale farms or other government work.

One of the primary conflicts is any acrimony that could potentially occur with other farms in the area, who might see the project as competition beginning on smaller farms. A policy that would need to be put in place for this project to work, would implement rules that assert no destruction or displacement of the water-collecting system. Another thing to acknowledge would be the number of water-collecting systems needed due to the amount of agriculture there is in Guatemala, even in more rural or dry areas. By using these systems that collect water from the air, there would be no need for things that disrupt the surrounding environment, like dams. Wells, too, could disrupt animals and their surroundings if not

correctly placed within a community. Air water collection is a non-intrusive way of getting clean water to Guatemala's rural citizens.

A deadly combination of climate change and thoughtlessness from people in power has caused many rural communities in Guatemala to suffer from water scarcity. Making sure companies are not taking water from areas that need it would start improving water availability. Nevertheless, many Guatemalan citizens need a system that will consistently provide them with clean, fresh water. Implementing an air-water collection system, either by a machine or net, would give Guatemalan citizens an improved way of life. Water, for many rural towns, would mean more food to feed themselves and their families, an improved community economy, and jobs. An air-water collection system would truly change many lives, and create a better country for future generations.

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