Natalia Lopez-Yanez
Culver Academies
Culver, Indiana
Mexico 10

Water Insecurities in Mexico

Mexico. Population: 114,975,406. Mexico's greatest economic income is because of its tourism. In fact, Mexico attracts more than 22 million visitors per year. However, there is one thing that has been plaguing the country and all its visitors for tens to hundreds of years; its water. According to the National Water Commission, the water supply in Mexico has dropped by fifty percent in the past half-century. In fact, according to an article from Global Sherpa from 2010, Mexico is ranked in the top 100 of the countries around the world that does *not* have access to safe drinking water as only eighty-eight percent of the population has access to clean drinking water. 106 million people do not have running water in their homes. Thirty-two percent of the rural populations in Mexico are without clean drinking water. Seventy-five percent of the Mexican Industry depends on ground water. Seventy percent of the Mexican population lives in areas where the water sources are scarce, and on top of that the sources are over-exploited and/or severely polluted. Seventy-six percent of the population is connected to sewage collection systems, but only twenty-three percent of this collection is actually treated while eight-five percent of the wastewater is industrial and remains untreated when it is dumped into oceans, rivers, lakes and groundwater. Although in the past there have been several governmental programs launched in attempts to purify and treat the water, such as an "Oral Rehydration Therapy" program and a "clean water" program, water still plagues the country.

Many of the northern states in Mexico receive their water supply from the Colorado River. A water treaty between the United States and Mexico states that Mexico is obligated to supply the United States with 350,000 acre feet of the Rio Grande area water while the United States is obligated to supply Mexico with 1.5 million acre feet to Mexico from the Colorado River. However, each year the United States struggles in providing enough water over the border to meet its minimum treaty requirement. Even so, all the water is currently being used up by farmers and growing cities along the Colorado River. The Mexican states that do not border the United States get their water from wells and desalination plants because they are unable receive a municipal water supply. In order to get the water to different cities and towns, Mexico uses a pressurized water system. However, the pressure causes leaks and about fifty percent of the water is wasted. In attempts to cut back the amount of water that is being wasted every day, water sources can be often shut off at certain times in the day. In many cases, this still is not enough water to supply various needs of the villages or towns. Also, these communal drinking sources that villages use are often untreated and are unprotected, since the water sits in the pipes when the system is turned off. Therefore, it becomes a breeding ground for waterborne diseases and parasites. However, most of the water is already contaminated. High, and potentially dangerous, levels of minerals such as iron, zinc, chrome, aluminum, and nickel in the water along with inorganic chemicals and metals, synthetic organic chemicals and even radioactive substances. Dangerous poisons lurk in the water such as arsenic along with feces and other waste materials.

According to the CIA fact book, a typical Mexican family size consists of four to five people, but in the pueblos the number of family members is usually higher. Many households contain up to three generations and average about 8-10 people. Puebla is a state in southern Mexico that in the heart of its city it looks like other urban city in Mexico, but out in the villages it is different scene. The towns are desert-like, extremely hot, and there are minimal amounts water, let alone clean water. Puebla has the third highest level of poverty in Mexico with about two-thirds its population, (about 3.5 million people) living under the poverty line. The reason that so many people live in poverty is because of the situation regarding the water.

In Puebla, an estimated two million hectares of water are used for agriculture and about thirty-seven percent of the Puebla population is employed in a job involving agriculture. The agricultural economy requires an incredible abundance of water to be able to water all the fields, however, due to the state's lack of the investment in agricultural lands, irrigation is limited. Only eleven percent of the state's arable land is able to be irrigated. Currently, the little water that is available to irrigate crops is dirty. If vast amounts of people don't have adequate water supplies for themselves, they will not use it water crops. The minimal water that they have and use is often times from rivers containing contaminants such as the ones previously mentioned; but much of the water that is used for irrigation contains high contents of soluble salts that can only be used under certain conditions.

The agricultural economy of Puebla has a plethora of products that are being grown. These products include vegetables such as tomatillos, onions, carrots, tomatoes, and squash. Puebla grows fruits such as oranges, limes, cactus pears, apples, avocados, peaches. Also important are crops such as alfalfa, sugar cane, and animal feed. The most important crop that Puebla grows is corn; which makes up about ninety percent of the agricultural economy. Most of these crops are mostly grown on small farms, communal fields or family plots, but some crops are grown on large plantations.

Since water is only limited to about eleven percent of the land, Puebla turns to the rainy seasons between the months of June and October to grow crops in abundance. For a farming family in Puebla, this causes them to have to find alternative means of income during the non-rainy season. Unfortunately, people are not always able to find alternative jobs which cause a decrease in income or sometimes it causes many families to live in poverty. Often families need to cut back on the amount of food that they purchase and eat which, unfortunately, can lead to malnourishment and can be detrimental to the proper development of children.

In Puebla, similarly to other rural states, people are more exposed to a wide range of food or waterborne bacteria that in turn increase the possibility of sickness. Bacterial diarrhea, commonly referred to as, "Montezuma's Revenge" is one of the most common illnesses, in addition to typhoid fever and Hepatitis A. Another, but rare disease is called leptospirosis which comes from contamination of animal urine in water. What is shocking about this disease is that it can be spread from a mother to an unborn child or to a child that is nursing.

By solving this problem and supplying sufficient water to states such as Puebla there is extreme potential to change the economy and changing the lives of millions. Agricultural families would be able to grow crops all year round which would lead to an increase in supply. Incomes of families would become stable and have the possibility to rise certain times in the year. This would stimulate the economy of Puebla, leading to an enormous decrease in poverty since thousands of families would make sufficient money to rise above the poverty line. Another benefit from clean water would be that the amount of people that die each year from waterborne infections or poisons would drastically decrease.

In 2008, then president, Felipe Calderon, said that the government would invest about $21 billion to expand the supply networks and to improve the drainage and water treatment in order to work on the sustainable development of the country. In February 2010, the government released an advertising campaign entitled, "The City May Run Out of Water" in efforts to attempt to conserve water among several other attempts, such as the ones previously listed. Ideas have been suggested such as water recycling, desalination, and cloud seeding. Water recycling would allow for waste water to be treated and used for non-consumption purposes such as toilet flushing and in many parts of Mexico, this is used, as water is used for irrigation. Desalination would allow non-municipal receiving states to obtain their water from sources such as the ocean or other places with salt water. Cloud seeding would be used to alter the amount of water that falls. An idea presented by the government that appears to be exacerbating the people of regions without municipal water distribution is the idea that people would have to buy expensive bottled water in order to drink and cook; vast amounts of people in Mexico are unable to afford

this causing them to turn to drinking unsafe water. Repair projects to fix broken dams and pipes have been put into effect but, overall, these ideas just seem to contribute to a standstill result. So far, Mexico is not seeing any results, in fact, the water issue only seems to be becoming more and more of a problem.

Climate change and global warming would contribute negatively to the already unstable water dilemma. In many parts of Mexico, such as in Mexico City, immediate water sources are subject to change depending on weather patterns in the Pacific Ocean. In the case of a family in Puebla, if a sudden climate change or a drought were to occur during the rainy months, most people would not be able to do their harvest and consequently there could be fatal results involving the starvation of thousands of people because of the inability to grow crops. With annual water levels falling rapidly, a looming threat of a water shortage is in the horizon and would only make the situation worse. Lastly, if the populations in Mexico were to rise, the demand for water would further increase, the water would have to be more distributed and people would get less and less water. Regardless, any of these situations could prove to be fatal to thousands of people.

Based on my research, it is evident that something must be implemented and executed in order to solve this crisis; it is also evident that fixing this mess will be no small task. To begin, I agree with the idea of Jorge Navarro, from Arizona State University, that insists the pressurized system must be fixed in order to reduce the amount of leaks in the piping system which leads to the unnecessary wasting of water. However, I believe that water cannot just stand still in the pipes and wells as the water will become warm and it can turn into a hotbed for bacteria. There needs to be a way that the water can remain in circulation at all times without necessarily being pressurized. Additionally, the amount of water that remains untreated is unacceptable but to reduce the amount of bacteria it is crucial that pipes that are used to carry clean water are not the same pipes that are used to expel wastewater. This is important because the bacteria in these pipes still remain and unless they are sanitized properly, they are not suitable for carrying clean and fresh water to people. In regards to purifying water at homes or in towns, there are several different routes that one could take. Two of the most common purification devices are point-of-use systems and point- of –entry systems. In this case, the most logical system that I recommend be used would be the point-of-use systems. These systems consist of several parts: filters, reverse osmosis devices, distillation equipment and ultraviolet purifiers. These systems are best used when contaminants present a problem for safe drinking and cooking water. It would be wiser to invest in these systems because they are less expensive in comparison to point-of-entry systems. Point-of-entry systems are more expensive systems to not only install, but also maintain and are composed of filters, water softeners, ultraviolet disinfection systems and aeration systems. These systems are larger than the point-of-use systems and purify all the water that enters a building, such as laundry water, shower water, etc. The main purpose of point-of-entry systems is to rid the water of contaminants which can harm appliances, plumbing, etc thus, they would not be effective in many of the impoverished towns of Mexico where the majority of the people do not have the luxury of plumbing and home appliances. There could be several places, in towns that currently have unsafe drinking water, where a few of the point-of-use systems could be installed in order for people to go and obtain water to drink from. The more households or buildings that are used per unit, the lower the cost is. If there are 5 to 15 units, then the cost of each point of use entry system lowers to an average of about $289 from $525. As little as branching off five buildings from each unit in each town or every few towns would be extremely significant in the amount of healthy drinking water that is received. As mentioned in the ninth paragraph, there are billions of dollar being invested to attempt to fix this problem, simply using a few million of these dollars would make a radical change in the amount of people having access to safe drinking water. This would be a step in solving the water crisis.

In 2000, members of the United Nations set eight goals, now known as the Millennium Development Goal to execute goals to improve the livelihoods of the world's poor by 2015. Due to the fact that seventy

percent of the world's poor live in rural areas, by solving the water crisis in Mexico multiple goals of the MDG would be achieved. These goals include improving food and water security, and the health and overall income of the poor. As mentioned previously, these improvements would directly affect the quality of life by assisting in agricultural productivity, hunger in Mexico and in states such as Puebla, it would reduce the both amount of people impoverished and the amount of people that parish from water contaminated causes.

In order to solve this crisis, the entire community, research agencies, the government, and many other organizations must be committed. The most crucial component to this change lies within the communities of the rural families that are currently most affected by the lack of clean water or lack of water in general. These families need to decide upon a proper administration of water systems, first in the community; then in years' time in their own homes with clean running water. If these homes already have a plumbing system and a system set up for water distribution all they need is the clean water running. Government officials first need to fix the leaks in the pipes by finding a way not to use a pressurized system all the time reducing the amount of unnecessary water loss. With this factor accounted for, government officials can begin to invest more money in more land for agriculture in states such as Puebla. This way, more agriculture is able to be done, and the water that was previously being lost would be able to irrigate all the land. Another factor that researchers should look at is a way to be able to decrease the amount of untreated waste water that is being dumped into the many bodies of water currently being used as water sources. Along with factories, these research facilities must find a way to install a proper filtration system that can be implemented with both industrial and domestic use.

All in all, the power that water possesses is incredible. Water has the power to sustain us, but without it, or with contaminants and waste, water has the power to kill us. In Mexico the lack of water use has led to high levels of poverty, infections and diseases among rural pueblos. The lack of water has also called for a decrease of agricultural production which in many cases contributes to a state's poverty. Contrary to belief, the water crisis does not only have a single problematic component that can be easily fixed, but rather various culprits are to blame which makes this a more complex issue to solve. However, with the help of the community, government, and other agencies, it *is* possible to solve this problem and will have the power to change millions and even billions of lives in the future.

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