

The Water Crisis in Third World Countries

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Abstract

People living in third world countries are suffering from a water crisis that has become a major global health issue. Water is essential for life—not only for the body’s physical needs but also for domestic use; yet millions of people do not have access to potable water. The lack of available clean water contributes to numerous waterborne and water-washed diseases, causing the death of millions of people annually and hindering the development of communities. This paper will explore the problems of obtaining drinkable water and present solutions at individual and community levels that can help solve the water crisis in third world countries.

The Water Crisis in Third World Countries

Introduction

Water is absolutely essential for the existence, development and preservation of all human life, making it an essential commodity in the world. However, nearly one billion people in the world lack access to potable water, mainly those living in third world countries (Shah, 2010). A water crisis has gripped these regions, threatening the quality of life of those in the developing world. According to the United Nations Human Development Report, the water and sanitation crisis claims more lives through disease than any war claims through weapons (Water Facts, 2012). Every year, approximately 1.4 million children die from unavailable, clean drinking water; and 3.6 million people die each year from water-related diseases. Of that large number, 84% are children and 98% are living in the developing world. Clearly this is a major health issue in the world today that must be addressed to save the lives of the millions of people that are dying from preventable ailments.

Importance of Water

Needs

Water is an essential nutrient to maintain good health and proper body function, yet many people are not aware of water's importance and necessity in their lives. Most people do not drink enough water or know the amount of water they should be drinking each day. At the Mayo Clinic (2010), doctors recommend drinking eight to nine cups a day of water, which is sixty four to seventy two ounces. These fluids contribute to the daily-required amount of water, which is about three liters (thirteen cups) for men and approximately two and a half liters (about nine cups) a day for women (Kleiner, 2003). The human body uses 1cc of water for every calorie metabolized. An average man

consuming 3000cal per day would therefore require 3000cc, which is 3 liters. These estimates do not account for necessary fluctuations in water intake for individuals based on factors such as age, body type and physical fitness level. Furthermore, not all of the daily-required water needs to be in the form of liquid considering approximately half of the net weight of food is in water and contributes to the quantity of water the body requires. Ultimately, the necessary amount of water varies from person to person and each person must receive an adequate amount.

Drinking approximately 70 ounces of water a day may seem like a large amount. However, this quantity is necessary because water makes up approximately 60% of a person's body weight and is the most abundant compound in the human body. In fact, all biochemical reactions occur in water. Furthermore, water is an active participant in those reactions (Kleiner, 2003). Water flushes out harmful toxins in the body, carries nutrients to vital organs, provides a moist environment, fills spaces in cells and around them, and serves as a solvent for minerals, vitamins, amino acids, glucose and other nutrients. Moreover, water aids in absorption, digestion and excretion. Every body system depends on water to sustain its performance. Clearly, water is essential for proper bodily functioning and for sustaining human life.

In addition to water being essential for body functioning, clean water is indispensable for living necessities and domestic purposes. Water is used for basic household maintenance such as cleaning the house or cooking food to eat. In many areas of the world water is also required for agricultural purposes. According to the United Nations Environment Programme, over 80% of the world's water consumption is used for agriculture (WaterAid, 2012). Furthermore, water aids in the prevention of disease.

Water is vital to personal hygiene and can be used to flush the toilet, to wash hands, or to shower or bathe. In all areas of life, human survival requires water.

Diseases

According to Bartram's (2010) journal article regarding water, sanitation and hygiene, approximately 2.4 million deaths globally could be prevented each year if every person practiced good hygiene and had clean drinking water. In developing countries water and sanitation deficits contribute to almost half of all people's suffering. This is largely due to the many diseases that result from drinking unsanitary water.

Waterborne diseases constitute the majority of illnesses that cause suffering and death in developing countries. These are diseases that result from contact or consumption of infected water. Some of these diseases include malaria, typhoid, cholera, Guinea worm, *E. coli*, Giardia, amoebas, and other parasites; but the greatest disease caused by unsafe drinking water is diarrhea. In fact, diarrhea is currently one of the greatest killers of children in the world. Pathogenic microorganisms, such as protozoa or bacteria, in contaminated fresh water may be transferred to a person through drinking the water, washing with the water, or eating foods that have been prepared from the unclean water. The person then becomes infected from the pathogenic microorganisms contained in the water and develops a waterborne disease.

Not only are there waterborne diseases, there are also water-washed diseases affecting millions of people. Water-washed diseases encompass those diseases that are removed by merely washing with water. In regards to health, water is vital to having proper hygiene. Simply washing one's hands with soap and water can reduce the risk of endemic diarrhea by up to almost 50% in addition to other respiratory or skin infections

(WaterAid, 2012). Washing hands with soap has been shown to prevent the transmission of ascariasis, a disease caused by drinking water contaminated with feces carrying eggs and resulting in fever, diarrhea, nausea and vomiting as some of its major symptoms. Hand washing can even reduce neonatal mortality if performed at delivery and postpartum. Furthermore, face washing prevents eye infections such as trachoma, the greatest cause of infectious blindness throughout the world (Bartram, 2010). Trachoma is a bacterial infection of the eye caused by the bacteria *Chlamydia trachomatis*. Some of the symptoms associated with trachoma include the following: cloudy cornea, discharge from the eye, swelling of lymph nodes just in front of the ears, swollen eyelids, and turned-in eyelashes. Currently, there are approximately eight million cases of blindness due to trachoma in the world, transpiring mainly in Africa and Asia but endemic in an estimated 55 countries (Polack, Brooker, Kuper, Silvio, Mabey & Foster, 2005). Trachoma spreads through direct contact with a contaminated object (i.e. a towel) or from direct contact with the secretions of an infected body part such as the eyes, nose or throat. Prevention occurs by facial hygiene and hand washing. Water can also be used to flush toilets, further improving hygiene and preventing diseases resulting from fecal matter. In conclusion, life requires usable, safe water; consequently, many types of diseases result from not having the necessary amount of clean water.

Water Availability in the World

Today's water crisis is not always an issue of scarcity, but mainly of potability. The majority of the earth is covered in water, yet only a small percentage of that amount is available for use as clean water. In the United States and other modernized countries, water availability is not very problematic. Even though the majority of people in these

countries do not receive a sufficient intake of water, there is still a significant amount of uncontaminated drinking water available. However, this is not the case in developing countries across the world. Currently, 12% of the earth's population, mainly those living in third world countries, is using 85% of the world's available water (Shah 2010). So the primary issue at hand is not a water shortage crisis, but a water management crisis.

Sources

According to the United Nations Human Development Report, if all of the available water in the world were to fit in a bucket, only one teaspoonful would be drinkable (WaterAid, 2012). Water covers a large portion of the world, but approximately 97.5% of the earth's water is seawater, making it unusable for drinking water. However, the earth also contains fresh water—water with low concentrations of dissolved solids and salts. Even though seawater is not a viable solution for providing drinkable water without expensive measures of purification techniques, there is still a sustainable amount of fresh water throughout the earth that can be used, coming from a variety of sources. Of all the water on earth's surface, the 2.5% that is fresh water originates in ice caps, glaciers, ice sheets, ponds, streams and rivers. Approximately 2.05% of fresh water is frozen in glaciers, 0.68% as groundwater, and 0.011% as surface water in lakes and rivers (Pidwirny, 2006).

Water underground contains a larger pool for usable drinking water than water found in lakes and rivers. According to the U.S. Geological Survey (2011), groundwater is a valuable yet unrecognized water resource; the majority of the empty spaces in the rocks underground are filled with water. After rain or snow falls, the ground will absorb the moisture. The absorbency of the ground is dependent on the composition of the soil

and the rate of precipitation. The water moves into the deeper soil levels until the point of saturation is reached. The upper layer of water-saturated ground, the water table, is variable and dependent on environmental condition. The deeper layers of earth and rock, aquifers, are waterlogged and relatively stable.

An aquifer is a water-bearing geological formation. Aquifers have an additional advantage over surface water of natural filtration; they are a wonderful source of water as they provide a good storehouse of clean water, often uncontaminated by surface filth and human intervention. Unlike many other water sources, aquifers provide a large amount of potable water. A water-bearing rock is classified as an aquifer when it readily transmits water to wells and springs. Wells can be drilled into the aquifers and then water can be pumped out for use (U.S. Geological Survey). Precipitation leaking into the porous rock of the aquifer will renew this source of water, making it a significant and reusable water source.

Rainwater could also be utilized as a workable source of water. Although it needs to be cleaned before being used as a drinkable source, rainwater provides many benefits in hygiene purposes, such as toilet water, and in agricultural use. Perhaps the greatest benefit of rainwater is that it is free and available to any person willing to collect it. Rainwater fills up ponds, streams, lakes and rivers, where it can be gathered for use; or rainwater can be separately collected from the sky using buckets and barrels before it is contaminated in dirty bodies of water. Rainwater delivers a free source of water, but it is not an available source for everyone since it does not come consistently or in large amounts in certain parts of the world.

Cost

Even though there are sufficient sources of water available, there is still a cost associated with extracting this water and making it usable. Consequently, an interesting correlation exists between a lack of water and poverty. According to Shah's report, approximately two in three people that do not have access to clean water survive on less than \$2 a day, and one in three living on less than \$1 a day (2010). The daily struggle to gain access to potable water in developing nations illustrates a major health disparity. In America a person can find free, clean water that is readily available. In stark contrast, a person living in a third world country would typically have to pay a lot of money for usable water. According to a study conducted by the United Nations Human Development, the cost of water in Barranquilla, Colombia is far greater than in the United States. A person in the United States will pay approximately less than \$1 U.S. dollar per cubic meter of water compared to the person in Colombia who will pay approximately \$5.5 U.S. dollars per cubic meter of water (2010). This disproportion forces the people in poorer countries to use the only water available, even if it is contaminated and unsafe. Furthermore, there is a difference between the wants of people living in modernized countries and the needs of people living in the developing world. Wealthy countries use water freely and wastefully; whereas a person living in a slum in India may carefully ration the small amount of water he has to provide for all his water needs. For example, an American taking a five-minute shower uses more water than a typical person in a developing country slum uses in a whole day (Water Facts, 2012).

Not only is there a health disparity between the wealthy countries of the world such as the United States and the poor countries of the world such as Africa, but there is also a gap between the wealthy people and the poor people within each country. A person

living in the slums may have to pay up to ten times more for clean water than a wealthy person living in the same city (Shah, 2010). Because no human makes water and controls its production, water can be considered to be free; however, there is a cost involved in purifying the water thereby making it usable. Furthermore, when there is only a limited amount of a natural resource, a competition arises regarding who controls that resource. This struggle for water leads to a financial cost in the distribution of the resource. Consequently, there is unequal pricing, even within the same city, resulting from the politics that are involved with the valuable commodity of water.

Politics

Due to the financial cost involved in water usage, the water crisis has also become a political issue. Ultimately, the politics involved in the water concerns are disputes regarding who decides who receives the water. There are various answers to this debate depending on the different countries and their individual policies, although some countries do not even have a policy in place. Water has become a strategic commodity that contains political value; therefore, many governments desire to control the available water. A problem arises when corrupt governments do not care about the needs of the people, but rather seek after the potential profit that water can provide.

In his report on global issues, Shah implies that a primary contributor to the water crisis is the commodization of water. Multinational corporations have increased their control of water as it has been endorsed as a commodity. There is a large market of water need and a responsibility to shareholders for profit increase; but this results in the poor who cannot afford the water being cut off from the supply of water (2010). Some researchers credit this further disparity in part to the controversial privatization of water

resources. Privatization of water is the term for private companies' involvement in providing water services. Opponents of this practice argue that privatization of water has ultimately furthered the gap of water availability by giving the rich access to cheap, clean water, yet making usable water financially inaccessible for the poor. On the other hand, proponents of private sector participation claim it has led to improvements in efficient distribution of water (Galiani, 2004).

Problems

Access

As previously shown, the problem at the heart of the water crisis is not how to manufacture more water on the earth but rather accessing clean water that can be used for living purposes. Unlike America, people living in third world countries cannot just turn on a faucet and be immediately rewarded with clean water. In order to have any water at all, the inhabitants may have to go acquire it. In many third world countries, this task falls to the responsibility of the women of the household while the men work to provide financially. Every day women throughout the world will spend a collective 200 million hours collecting water (Water Facts, 2012). Some women walk up to three hours a day to get water to bring back to their families. They will have to travel, often on a dangerous path, to a water source and obtain all the water that their whole families will use that day for drinking, cleaning, cooking and other activities. The weight of this water that women will carry on their heads for up to three miles is generally 200kg. Sometimes the parents of a home may be forced to make the difficult decision of using the dirty, contaminated water nearby or using several hours of the day collecting water from a distant yet cleaner source. If the mother of the household in the above-mentioned example decides that the

cost of collecting clean water is not worth the time or risks, then the family may have to suffer from the diseases resulting from the dirty water. In other situations, a cleaner source of water is not even a possibility and the people have no choice but to drink the little water or contaminated water that is available.

Not drinking enough water is very harmful to the body; insufficient water intake leads to death. Throughout the course of a day, a person loses a lot of water. A large amount of fluid is lost due to urine output. In fact, the average person's urine output is approximately six cups per day. In addition to urine, the body loses about another four cups of fluid through the everyday processes of perspiration, respiration and even bowel movements. Moreover, when a person is sick and is vomiting, having diarrhea, or fighting a fever, he or she is losing water (Vorvick, 2010). Sometimes, environmental factors, such as a change in the temperature or a change in the elevation, can contribute to an increase in sweating and breathing, resulting in a decrease in body fluids. With this much water leaving the body daily, it is easy to lose too much water without replenishing. Dehydration results from an inadequate intake of water and is defined as a one percent or greater loss of body weight as a result of fluid loss. Just one percent body weight loss affects physical and psychological performance (Kleiner, 2003). Because the human body loses so much water throughout the course of just one day, it is very important to replenish the body's supply of water to avoid dehydration before even feeling thirsty.

When a person experiences the feeling of thirst that person is already dehydrated and is not functioning at an optimal performance. As a result of insufficient water intake, a person may experience the following: headaches, fatigue, loss of appetite, muscle cramps, dry mouth, light-headedness, heat intolerance, dry eyes, burning sensation in the stomach, flushed skin, and dark urine (Kleiner, 2003). If the dehydration becomes severe,

other signs appear as well, such as difficulty swallowing, dim vision, muscle spasms, clumsiness, numb skin, and even delirium. Dehydration can cause urinary stasis, leading to a bladder infection, resulting in painful urination. Not receiving adequate amounts of water is very unhealthy for the body and can even cause death.

Quality

As previously noted, the greatest problem contributing to the water crisis in developing countries is that the accessible water is not clean, thus making it not potable. Even after obtaining some water, there is still a problem with the quality of that water, often times leading to disease. Bartram's (2010) article on the foundations of health expresses how some people who have access to water within their homes still have a problem with water quality. Many of the piped water systems found in both middle income and developing countries work only for a few hours a day or are not properly filtered and contain unsafe water. In fact, more than one in five water supplies in larger Asian cities do not measure up to national water quality standards (2010).

Pathogens. The reason water quality may be poor is due to pathogens contained in the water. These pathogens are also from fecal matter deposited in the same rivers or streams where the water is collected. These microorganisms give rise to diseases that affect millions of people worldwide, such as: malaria, typhoid, cholera, Guinea worm, *E. coli*, Giardia, and countless others. The most widespread of all the diseases resulting from poor hygiene, sanitation and water is diarrhea. The tragedy lies in the realization that the majority of people suffering from these preventable diseases are not even aware that the causes of their diseases are due to their unsanitary water.

The quality of the water needs to be evaluated not only for pathogens, but also for harmful chemicals that can contaminate the water as well. For example, mercury is commonly found in water but is not harmful in small amounts. However, in large quantities, mercury can be very harmful to the human body and cause various forms of illness. Chemicals and pathogens immersed in water supplies also cause the water to taste badly. The taste of the water influences how much of the water a person drinks; humans need a lot of water and the poor taste of the water available to a person should not be a factor determining how much he receives (Kleiner, 2003). These issues of water quality are all part of the water crisis that need to be solved.

Community

The lack of available, clean water negatively impacts a community's development in several ways. First of all, the women and children in developing communities spend much of their time collecting the most basic of necessities—water. The time women spend collecting water takes away from cooking, cleaning, working, or caring for their children. In addition, the water crisis affects community development in its contribution to disease. Illness becomes a major cause of lost work and school days. A community cannot flourish and a country cannot develop if the people cannot spend their time working to financially provide and going to school to obtain an education.

Children. Ultimately, the water crisis has a profound impact on children. Children in poor environments often carry 1 000 parasitic worms in their bodies at any time (Water Facts, 2011). In the developing world, 24 000 children under the age of five die every day from preventable causes from unsafe water such as diarrhea. Currently, diarrhea remains in the second leading cause of death globally among children under the

age of five. In fact, statistics show that approximately one in five child deaths, which is about 1.5 million each year, is due to diarrhea. This number means that diarrhea due to unclean water alone kills more young children than AIDS, malaria and measles combined (Bartram, 2010). If that many children in developing countries are sick and dying from unclean water, the community cannot be expected to grow and flourish; the 4 000 child deaths every day due to the water crisis stifles the third world's growth (WaterAid, 2012). Clearly the effect that unsanitary water has on children is reason enough to demand worldwide attention and a solution to this preventable public health crisis.

Solutions

Currently, no person or organization has offered and implemented a sustainable solution to the water crisis. However, there are several feasible solutions that will aid in the reduction of the billions of people negatively affected by the water crisis. Public health specialists, governments and organizations are employing short-term and long-term solutions aimed at various populations. Some solutions are directed toward things that individual people can do to provide clean water for themselves. Other solutions attempt to help provide safe water to communities as a whole.

Surface water remedies

Most often, people in third world countries acquire water from surface level sources such as ponds, rivers, streams, or lakes. Because these bodies of water are also where humans and animals alike deposit their waste, these sources are contaminated and are disease-causing. Consequently, before surface level water should be used it needs to be properly purified.

Filters. One way to purify water obtained from rivers or other bodies of water occurs through filters. The use of filters can be performed at an individual or community level. In a qualitative assessment study conducted by Dye, Apondi, Lugada, Kahn, Sandiford-Day, and DasBanerjee (2011) related to diarrhea and water filtration in rural western Kenya, positive results were observed from using filters. This public health campaign gave each household in the community a personal water filter, a household water filter or both filters. The reports from the study show that the participants were successful in obtaining clean water, thereby reducing diseases in that community. By using the filters, the community was also able to conserve the resources that were previously used to produce clean water. Using the filters and experiencing the positive results also aided in changing the beliefs, attitudes, and practices of the people in rural western Kenya toward clean water and filtration devices. This approach is an example of how filters can be a water solution for either individuals or the community.

Constructing a household filter such as a slow sand filter can be a simple and inexpensive process (Fewkes, 2000). A slow sand filter is a type of sustainable technology that works using biological action in sand without adding any chemicals to the water; it can be made from recycled materials and can operate without the use of electricity (David, 2012). A person living in an area without clean water could construct a slow sand filter using a container with a system of pipes with holes drilled in them. The container should be covered by approximately 6 inches of gravel, which is then covered by 3 feet of sand. Due to the pull of gravity, water that flows over the top of the sand will flow slowly down through the sand and gravel and into the pipes on the bottom. Hydraulic pressure will then cause the water to flow back up through one output pipe to

the level of the input water. After using this system for about a month, a biological layer that can catch and extinguish destructive bacteria will form on the sand (2012). Using this simple technique, water can be easily filtered for use.

Boiling. Another effective method of purifying water is through boiling.

According to the Centers for Disease Control (2011), boiling water is the best approach for making drinkable, safe water. Boiling water kills the disease-causing microorganisms that cannot survive the hot temperature, such as bacterial, parasitic, and viral causes of diarrhea. This is a simple, easy way to make water safe. Water only needs to be boiled for one minute to sanitize it; but in parts of the world located at altitudes greater than 6,562 feet, water should be boiled for about three minutes to make sure it is disinfected. At higher altitudes water boils at a lower temperature so a longer boiling time is necessary to kill the germs. Boiling the water may remove pathogens, improving the quality of the water, but it does not improve the taste and in fact worsens it. However, adding a pinch of salt to the boiled water will help improve the taste (Centers for Disease Control, 2011). A potential problem for some people using this method is that the charcoal used for boiling may be too expensive. Furthermore, boiling large quantities of water could become very time consuming. Still, boiling is a better solution than consuming or using unclean water.

Chlorination. Currently, one of the greatest innovations in providing safe drinking water is through the process of chlorination to destroy disease-causing microorganisms. The World Chlorine Council (2008, p. 2) states, “The use of chlorine to protect drinking water is one of the greatest public health advances in history. Chlorine destroys disease-causing organisms in water and is the most commonly-used disinfectant in all regions of the world.” Chlorine is effective, affordable, and widely available for

disinfection, making it a viable option for water purification. Furthermore, chlorine provides a safe alternative to killing disease causing particles in water. The World Health Organization has concluded that the small amount of chlorine used to disinfect water presents no significant threat to human life; the guideline value of 5 mg/L for chlorine in drinking water is an approved amount for lifelong human consumption (2008).

The American National Red Cross (2012) provides a simple yet effective method of water treatment with chlorine. First, the water needs to be filtered to remove solid particles. This can be done using a piece of cloth or even a coffee filter. Then, water must be brought to a boil for about one minute and allowed to cool for at least 30 minutes so that the chlorine treatment is not made ineffective. Next, add 16 drops of liquid chlorine bleach per gallon of water, or 8 drops per 2 liter bottle of water, and stir to blend the mixture. The bleach should contain sodium hypochlorite of the concentration of 5.25% to 6% as its only active ingredient, although an added amount of Sodium Hydroxide is acceptable and does not pose a health risk. Furthermore, there should be no added soap or fragrances. After letting the solution stand for 30 minutes and making sure it smells of chlorine, the mixture is ready for use as a water treatment.

Education. Another powerful solution is to educate the people on the negative effects of unclean water and on what they can do to better sanitize their water acquired from surface level sources. Many people living in the third world do not even know that the deadly diseases they acquire are direct results of unsanitary water. They do not realize that using the restroom in the same body of water they use for cooking and drinking is harming their health. If a health education specialist were to give instruction on the necessity of having uncontaminated water and on practices to obtain safe water, then the

individuals would not acquire preventable diseases and the community would be able to flourish. For example, being provided with and educated on using chlorination to disinfect the water would greatly benefit a family living in rural Africa. Education aimed at teaching an entire community how the simple techniques of filtering or boiling their water can prevent life-ending diseases will change the quality of life for the people living there and will aid in the community's progression. Education on what the people most affected by the water crisis can perform themselves is critical in fixing the problem.

Rainwater Harvesting

According to the Water Supply & Sanitation Collaborative Council (2011), rainwater straight from the sky provides the simplest solution for drinking water. The affordability and sustainability of rainwater certainly makes it a good source of water, particularly in areas of the world that receive much precipitation. Some of the many benefits associated with rainwater harvesting are as follows: it does not leave a negative impact on the environment; it socially enables the people because it can be collected by them where it will be used, saving time and energy; and economically, there is a relatively low cost to rainwater harvesting, considering a person is not paying for the rain but for the method used to purify it (WSSCC, 2011). Rainwater is not being fully utilized just when it falls from the sky but when it is collected, either by an individual or by an organized system, and then made available for use. There are a variety of ways that rainwater collection can occur.

Roof catchment. The easiest way for an individual to retain rainwater is by using the roof of the house as the catchment—the area where the rain hits and drains toward a storage system (WSSCC, 2011). From the storage area, the water can be saved in a clean

environment for later use or filtered to remove the impurities. This can be as simple as collecting the water from the roof, draining it into barrels filled with sand, and letting the sand filter the water. From this point, the water can then be placed back on the roof in smaller, closed containers to allow the sun's ultraviolet rays to kill any remaining bacteria. From this simple method, individuals would be able to have access to cheap, clean water for drinking, irrigation, cleaning, cooking, bathing, or other personal hygiene uses.

Collecting grids. The same idea of a water collection system using a house's roof as the catchment could be applied to a community level as well. For instance, collecting grids could be placed on a mountainside and a system set up that would provide an entire community with water rather than providing water for a small amount of people. Initial costs of setting up the system could be a problem for some poorer areas, but if outside parties assisted in this initial process, the collecting grids would prove to be an effective means of water collection.

Although many people forget the simple solution of rain when thinking about the water crisis, there are certain organizations active in implementing some of these rainwater-harvesting techniques. One such organization is the WASH Coalition. Currently, this organization is involved with several projects in the Philippines and Sri Lanka. Still, more needs to be done to utilize rainwater in combating the water crisis (WSSCC, 2011).

Wells

Currently, a solution being implemented in several parts of the world is digging wells to provide drinking water for a whole community. Wells are a great resolution to

the water crisis due to the long-term benefits they provide to communities as a whole and not just to individual people. If a private organization goes to a third world country and gives the people there thousands of bottles of water, the supply will run out and the people will have to return to their previous ways of drinking unsafe water. On the contrary, if a private organization travels to a developing country and builds a community a well, long after the organization leaves the community will have a sustainable source of clean water. Wells are also a great option for providing usable water, because their water source is underground and remains largely unaffected by human contamination. Wells should be dug further away from a water source so sand can aid in filtering the water before it reaches the well.

Wells can either be dug or drilled; but the most efficient wells are deep bore wells. These types of wells are larger in diameter and are typically dug where an aquifer is present (Illinois Department of Public Health, 2010). Most wells are built at the water table level; however, the best wells will be dug all the way down to an aquifer. Not only will aquifers provide an even cleaner source of water, but they will also contain more water. Unfortunately, there are still some problems with this solution. According to the U.S. Geological Survey (2011):

The rate of recharge is not the same for all aquifers, though, and that must be considered when pumping water from a well. Pumping too much water too fast draws down the water in the aquifer and eventually causes a well to yield less and less water and even run dry. In fact, pumping your well too fast can even cause your neighbor's well to run dry if you both are pumping from the same aquifer.

(p. 1)

The rate of recharge discussed in the above mentioned quote must be taken into consideration when implementing wells into a community. In addition, wells can be a costly investment, particularly wells dug down into an aquifer (Rogan, 2004). However, the benefits of wells are worth the initial cost.

Development

Improving the water situations positively affects the development of a country. According to the United Nations Development Report, every one dollar invested in water and sanitation returns an average eight dollars in increased productivity; and to further illustrate this correlation, reports showed that the absence of safe water and sanitation costs sub-Saharan Africa approximately 5% of its Gross Domestic Product (WaterAid, 2011). Most countries throughout the world, particularly in developing countries, have a desire and a commitment to improving the water crisis and availability of clean water in their country, in order to reduce child mortality and increase the development of their country. However, most governments do not know how to actually go about improving their water situations. A current controversial option is water privatization. In a study conducted by Galliano, Gertler, & Schargrotsky (2004), the country of Argentina began one of the world's largest privatization campaigns that involved the privatization of local water companies. This included approximately 30% of the country's municipalities. Study results indicate that child mortality fell 8% in the areas that privatized their water service; the effect was largest in the poorest areas with a result of 26% (Galiani, et.al, 2004). This particular study elicits the potential positive outcomes of privatization.

Unfortunately, there are also issues with privatization. This process begs the question of who should get the profit and of how much profit is an appropriate amount.

Furthermore, some studies and research professionals would say that solely marketing water and making people pay for that service is unfair to those who cannot pay for various reasons and will not be a sufficient solution, but a cause of more problems. This argument correlates with the United Nations Human Development Report saying:

Some privatization programs have produced positive results. But the overall record is not encouraging. From Argentina to Bolivia, and from the Philippines to the United States, the conviction that the private sector offers a 'magic bullet' for unleashing the equity and efficiency needed to accelerate progress towards water for all has proven to be misplaced. While these past failures of water concessions do not provide evidence that the private sector has no role to play, they do not point to the need for greater caution, regulation and a commitment to equity in public-private partnerships. (Shah, 2010, p.7)

This report argues that in countries containing many people in poverty, public finances will need to be used to provide access whether that financial backing comes from public or private organizations. Furthermore, the report warns of privatization becoming an abusive monopoly. Ultimately, privatization itself is not the problem but rather the improper practice of privatization (2012). Guards must be put in place to ensure that people are not taken advantage of and denied the right to a natural element necessary for life.

Because providing clean water is so vital to the life of a community, outside involvement and aid is important, such as other governments and private organizations. According to research done by the World Health Organization partnering with Water Aid, "Investment in drinking-water and sanitation would result in 272 million more

school attendance days a year. The value of deaths averted, based on discounted future earnings, would amount to \$3.6 billion a year” (WaterAid, 2011, p. 1). Clearly investing in a solution to solve the water crisis will be beneficial to many.

Biblical Worldview

People living in a developed country who have unlimited access to clean water might justifiably wonder why the water crisis affecting mainly those in third world countries should matter to them in a developed country. This is a valid question. For those who believe in God, their answer is found in the example of Jesus Christ portrayed in the Bible.

Jesus' Example

Looking at the life and ministry of Jesus Christ while He was on earth, one will find countless examples of Jesus having compassion on the poor and the needy. While on earth, Jesus met the physical needs of people. Often times, He would first meet the physical needs of people, and then would meet their spiritual needs. One of several such examples is found in Matthew 20:34, “Jesus had compassion on them and touched their eyes. Immediately they received their sight and followed him” (New International Version, 1984). Another example is found in Matthew 14:14, “When Jesus landed and saw a large crowd, he had compassion on them and healed their sick” (NIV). Several of the Gospels share the story of Jesus feeding over 5 000 people. He did not want them to go away hungry, but provided for them physically. If Jesus were on the earth today, I believe he would be caring for and providing for those in need. Furthermore, Jesus admonished His followers to do the same. He told his followers that whatever they do for

“the least of these” they are doing for him (Matthew 25:40). Clearly, Jesus set the example for helping those in need and commanded his followers to do the same.

My Personal Response

As a Christ-imitator, I should follow the same example that Jesus set. Looking at the statistics of the millions of people dying from not having clean water and knowing that this can be prevented does not allow me to be indifferent. I firmly believe that Christians have a responsibility to care for those in need—this includes aiding in the water crisis.

Furthermore, providing people with the physical necessity of water opens up a door to present the Gospel. From my personal experience, I have seen that people are often more willing to hear what I have to say to them if I first demonstrate by my actions that I care for them. By showing people the filth they are drinking and introducing them to clean water, an opportunity is created to introduce them to the Living Water that can cleanse them from all filth.

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