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 South Sudan, Factor 9: Water & Sanitation

A Better World- One Drop at a Time

An old Slovakian proverb says “Pure water is the world's first and foremost medicine” (14). The original author of this timeless quote recognized the importance of water for all humans. This truth is not lost in South Sudan, a country where only 27% of the population has access to safe water according to World Vision (20). The Center for Disease Control considers clean water and good sanitation a resource vital to the progress of a country. The following statistics support that claim:

- * Unsafe drinking water, inadequate availability of water for hygiene, and lack of access to sanitation together contribute to about 88% of deaths from diarrheal diseases(7)
- * 2,200 children are dying every day as a result of diarrheal diseases (7)
- *An estimated 2.5 billion people — half of the developing world — lack access to adequate sanitation (more than 35% of the world’s population) (7)
- *Water, sanitation and hygiene has the potential to prevent at least 9.1% of the global disease burden and 6.3% of all deaths (7).

One place where this problem is particularly prevalent is South Sudan. South Sudan was originally part of the British Colony Sudan. The republic of Sudan was granted independence from Britain in 1956, but the area that is now South Sudan suffered through two civil wars while part of the Republic of Sudan (32). The first conflict lasted from 1955 through 1972 and the second conflict lasted from 1983 until 2005 (27). The decades of civil wars to gain independence from the Republic of Sudan were costly in terms of human life, existing infrastructure and the development of new infrastructure (25).

On July 9th 2011, South Sudan became independent from the Republic of Sudan and became the newest country in the world (5). Civil war erupted again in South Sudan on December 20, 2013 when President Salva Kiir dismissed his cabinet and vice-president Riek Machar (25). According to USAID, 1.9 million South Sudanese have been displaced from their homes since the new outbreak of hostilities in December of 2013 (22). Many of the displaced (1.4 million) are internally displaced within the borders of South Sudan (22).

The cost of this conflict is estimated to be between 22 and 28 million dollars over the next five years if a solution is not reached (23). This is a staggering figure considering that the gross national product of South Sudan is estimated to be 14.5 million U.S. dollars for 2015 23.5 million when adjusted for purchasing-power-parity) (23). The seriousness of this conflict to the international community is reflected in the United Nations resolution of 28 May, 2015 to station military personnel and civilian police in South Sudan (26). Currently there are 12,523 uniformed United Nations (UN) personnel stationed in South Sudan along with a contingent of over two thousand civilian personnel and United Nations volunteers (26).

One of cumulative results of many years of conflict in the South Sudan region is a lack of infrastructure to provide clean water to most of the people in South Sudan. This problem has been severely exacerbated by the displacement of many South Sudanese people (5). The current climate of conflict and displacement make it unlikely that the government will be able to make sufficient long-term investments in permanent solutions to providing clean water to their people.

The Nile River runs through South Sudan making the land ideal for agriculture and livestock/wildlife (20). South Sudan gets sufficient rainfall throughout the year for many crops (1). According to Farm Africa, 90% of land is suitable for agriculture in South Sudan (11). However, currently only 2.760 million hectares or 4.3% of the land is under cultivation (21). South Sudan is also home to one of the largest annual animal migrations (1). Currently 95 percent of the population depends on farming, fishing or herding to earn a living (17). According to the Food and Agricultural Organization of the United Nations, about a third of the people living in South Sudan are food insecure (17). The Integrated Food Security Phase Classification (IPC) conducted in May of 2014 indicates that 3.5 million people in South Sudan are facing crisis level food insecurity and are in danger of famine (17).

There also is an abundance of resources in South Sudan including oil, gas, gold, silver, iron ore and copper (1). Oil is an important part of South Sudan's economy. The country claims that they have 4.5 billion barrels of oil in reserves (6). South Sudan has the potential to thrive given its geography. This is contingent upon a decrease in child mortality and the ability for the South Sudanese people to remain in one place which can be solved with clean water.

The average South Sudanese family is made up of approximately 7.4 people with 20% of the household members under the age of 5 years old (16). Most South Sudanese families live nomadically or in small local villages (25). Diets of South Sudanese people are typically based on porridge made from millet (10). The peanut is another prime part of the Sudanese diet and is found in many Sudanese meals (10). Other sources of protein in the Sudanese diet are goat, beef, and chicken (10). Staple crops in South Sudan include Sorghum, maize, peanuts, millet, and rice (1). Farms in South Sudan range from 0.4 hectares to 1.7 hectares (21). Most of the South Sudan population makes a living off subsistence agriculture (20). These small farms require clean water for the irrigation necessary to have a successful farm.

According to the United Nations Children's Fund (UNICEF), South Sudan has the second lowest literacy rate in the world at 27% (3). 70% of South Sudan's children between the ages 6-17 do not attend school (3). One reason for this is the few children attending school; females make up a small percent at 33% (3). Less than 50% of children in South Sudan go to primary school for 5 years (16). The World Health Organization, WHO, describes healthcare in South Sudan as very limited due to lack of doctors (1 physician for every 65,574 people) and costly expenses that cause poor people to delay getting treatment until an emergency (18).

Water quality is a determining factor for educational and economic opportunities because contaminated water is the leading cause of illness. Without clean water, the possibility of breaking out of the poverty cycle is unlikely. People in these communities must spend their time transporting water typically miles from their village rather than working or going to school. South Sudanese people are also weighed down on their way back by their jerry cans, containers used for water collection commonly in Africa, that can weigh over 40 pounds (12). According to the World Bank, around 38% of the population in South Sudan has to walk for more than 30 minutes one way to collect drinking water (19). The UN estimated that approximately 40 billion hours per year are lost collecting water in Sub-Saharan Africa (12). If clean water was more readily available, South Sudanese people would have more time to earn a living and go to school to support themselves.

A sustainable water source can help expand farming and business and eliminate people from being sick from waterborne illnesses. Adults are able to work and maintain small farms and businesses when they have access to water. Sustainable agriculture is possible with a reliable water source. Successful agriculture reduces hunger. With clean water, children will be healthy enough to attend school. With accessible water, children will have enough time to go to school instead of spending their days collecting water. Schools are able to feed students with gardens, which helps decrease expenses. The World Health

Organization explains the economic effects saying for every \$1 invested in water and sanitation, there is a profit of between \$3 and \$34 (12).

According to World Vision, the leading causes of death among children under the age of five in South Sudan are malaria, acute respiratory infections, and diarrheal diseases, combined with malnutrition (20). The South Sudan Medical Journal recorded that about 40 percent of children under the age of five had diarrhea in the two weeks before their caregivers were surveyed (16). Diarrhea is a common effect of many water borne illnesses like Cholera that release more nutrients than solid stool (30). Even if South Sudanese people have access to enough food and sufficient nutrients they still may face malnutrition if they are not able to absorb nutrients properly. Many waterborne diseases can cause diarrhea that prevent people from digesting important nutrients (30). In addition to not absorbing nutrients, diarrhea also releases many salts and minerals (30). Lower concentrations of salt in the body causes a decrease of water that stays in the body which can lead to dehydration (30). The 4.6 million South Sudanese people on the edge of starvation would gain more benefit from food aid and investments in agriculture if they first gain access to safe drinking water.

Solving these challenges requires many types of interventions. South Sudan is on the brink of a massive humanitarian crisis with nearly 8 million people in need of aid (13). Due to the urgency of the situation, immediate intervention is crucial. However, it is equally important to set up long term solutions that will give the South Sudanese access to clean water for many years to come. It is imperative that South Sudanese people are a part of the solution so they can help themselves and eventually not be dependent on humanitarian aid. Methods to improve drinking water quality range from disinfecting water at the household level to implementing water management at the community level. In some circumstances, more than one type of intervention may be necessary.

A successful sustainable water quality program should include the use of local people in the community. Effective programs typically have a community champion that helps develop leaders in the region and educate them on proper clean water and sanitation methods to promote successful sustainability. A program will empower the local community to help meet their ongoing needs and insure that the correct type of water systems is used for that specific population. Water management improvements may include shallow and deep wells, well repairs and ceramic water filters; bio-sand filters, and bamboo charcoal water filters. Using latrines and implementing researched handwashing techniques can significantly decrease illnesses. Providing a water supply to a village is not enough; the village must be empowered to maintain the source so the water is sustainable and safe. Once this is in place, the community will be able to move forward and be healthy and self-sufficient.

One way to make clean water abundantly available in South Sudan is to drill wells. Although the drilling and installation of wells is costly, they make a lasting difference in the community. Another tactic is to simply repair existing wells in South Sudan and train local people how to maintain wells. There are many nonprofit organizations already in South Sudan building wells including Water Harvest International and Wells for Hope (29, 31). These organizations team up with the local community to build wells in villages (29, 30). Water Harvest International creates a water well committee after building wells composed with community leaders in the village (31). The committee members are given maintenance training and work together to establish bylaws for the well's usage in the village (31). During South Sudan's rainy season, the mud makes it difficult to drill wells (29). The rainy season generally last from April through November (1). With over half of the year plagued with rain that creates a less preferable environment for drilling wells, there is limited time to successfully drill wells. The rainy season can be used as a time to fundraise and select locations for future wells.

A cost effective solution to obtaining safe drinking water is the use of bio-sand filters. These are household water purification devices that adapted from traditional slow sand filters (4). Bio-sand filters

are made small (1m tall and 0.3 wide on each side) and can be used sporadically making it ideal for household use (4). Filters are made of concrete or plastic and are filled with sand and gravel specially made and selected (4). Pathogens and suspended solids are removed from the fresh water added to the filter by the sand (4). A thin biolayer, composed of bacteria and microorganisms that eat harmful pathogens, is added to the top 2 cm of the sand (4). Bio-sand filters have successfully implemented in over 55 countries including South Sudan (4). Wells built can be complimented with bio-sand filters to purify the water for safe drinking.

South Sudan does have regions of fertile land and grow bamboo. Bamboo grows faster than most trees so it can be harvested more frequently. There are many uses for bamboo including bamboo charcoal. Some communities have had success making clean water filters made from local resources including charred bamboo, gravel and natural adsorbents like sand. This type of filter has predominately been implemented in India (15). Most existing purification methods not only remove the impurities but drain out the essential minerals as well. Bamboo charcoal dissolves its rich mineral contents into the water so the filtered water becomes mineral-rich. Bamboo charcoal is rich in a number of minerals including potassium, magnesium, sodium, and calcium. This type of filter has great potential impact in South Sudan. African countries also typically rely on fire wood for the energy source for domestic cooking and other productive activities and deforestation is a major problem (28). If a village can get access to water and bamboo, this type of filter to clean the water is a healthy, low cost and environmentally friendly option.

The introduction of water purification devices will help aid the staggering water crisis in South Sudan. A paragon of water purification is ceramic water filters. Ceramic water filters remove organisms larger than one micron removing bacteria, and protozoa from the water (9). The removal of microorganisms helps reduce waterborne diseases in the filtered water (9). The addition of wheels and a handle to ceramic water filter will also help assist in carrying their water for long trips up to 8 miles.

Ceramic water filters are inexpensive and can be made with products locally available. This makes them easy for South Sudanese people to obtain their own ceramic water filter. Moreover, ceramic water filters are easy to use and maintain. Production of ceramic water filters and quality control are long processes especially at local level (24).

UNICEF and the Water and Sanitation Program (WSP) teamed up to provide ceramic water filters in rural communities in Cambodia and Myanmar (8). The filters successfully reduced diarrheal illnesses in Cambodia by 50% (8). UNICEF and WSP can use the same strategies used in South East Asia in South Sudan. The ceramic water filters can be made from clay in South Sudan and then distributed in surrounding communities and schools by local people. In addition to employing South Sudanese people, producing ceramic water filters in South Sudan is a more viable option than transporting them from elsewhere because ceramic water filters are fragile. Once distributed to local communities, the ceramic water filters can be used at a household level. UNICEF and WSP can help make this happen by teaching South Sudanese people how to make them and providing written instructions. However, there is a risk factor in bringing ceramic water filters to South Sudan because it has a different climate than the South East Asian countries they have successfully been used in.

The current conditions in South Sudan are dire and there are many challenges to overcome but fortunately there are basic interventions that can positively impact the health and quality of life for millions of people. Targeted sustainable water quality programs can have a lasting impact in a village. There are reputable humanitarian organizations already developing collaborative relationships in South Sudan in local communities and some of these groups have successfully built clean water solutions that now can be replicated and implemented in other areas. By expanding evidence-based community appropriate water quality programs, more time and effort can be spent farming and tapping into South Sudan's natural

resources. Children will be available to attend school, receive healthy diets and eventually positively contribute in their communities and help breakout of the poverty cycle.

There is realistic hope for a better world in South Sudan. Improvements may be gradual and change may be slow but sustainable clean water programs are a vital building block to support South Sudan's efforts to construct this new country's infrastructure.

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