Final Project: Water Sanitation Analysis and Proposal

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**Introduction:**

One of the many problems facing Nicaragua as the second poorest country in the Western Hemisphere is that of water access, which involve both aspects of sanitation and hygiene. Water, undeniably, is basic necessity for life, composing over 70% of the human body, and it naturally follows that access to safe water – for consumption or other uses – should be a fundamental human right.

Ironically, despite being called “Land of Lakes and Volcanoes” and being 10% surface water, this water is severely contaminated from extensive mining, cattle ranching, and agriculture. Consequently, over 800,00 people in Nicaragua do not have access to safe, potable water (Wateraid).

Currently, based on estimates made by the Joint Monitoring Programme (JMP) for Water Supply and Sanitation by the World Health Organization (WHO) and the United Nations International Children’s Emergency Fund (UNICEF), 31% of the rural population in Nicaragua receive their drinking water from surface water or other unimproved sources. The JMP defined improved drinking-water source as “one that, by the nature of its construction and when properly used, adequately protects the source from outside contamination, particularly faecal matter.”

Improved drinking-water sources include:
- *Piped water into dwelling*
- *Piped water to yard/plot*
- *Public tap or standpipe*
- *Tubewell or borehole*
- *Protected dug well*
- *Protected spring*
- *Rainwater*

Conversely, unimproved drinking-water sources include:
- *Unprotected springs*
- *Unprotected dug well*
- *Cart with small tank/drum*
- *Tanker-truck*
- *Surface water*
- *Bottled water (not from an improved source)*
Many rural communities still receive their water from these sources. Even the seemingly safe delivered water can be deceiving: Eva Peréz and Emma Miller, two staff members with Bridges to Community working in Siuna, Nicaragua report that the water delivered twice a week is yellow and remains contaminated with bacteria. This water requires filtration and/or straining, often with chlorine tablets.

The already-low rates of access are made even more problematic by their low functionality. In the Caribbean Coast Autonomous regions, 80% of the water supply services are thought to be “non-functional” (WaterAid). In a region where only 18% has “sustained access to safe water” and 20% “access to adequate sanitation,” these statistics highlight the vulnerability of rural populations.

Hygiene, which is closely linked with water, is also a huge problem in Nicaragua. Based on 2006-2007 statistics, only 1% of rural populations have sewer connection. The poor sanitation systems not only negatively affect the already few sources of potable water in Nicaragua but also hurt the economy, which can only further drive the government to seek out mining industries and foreign investors that may not take into considerations Nicaragua’s environmental vulnerability.

Even in urban areas, water sanitation can be quite problematic. Lake Managua, which has been described as “the world’s biggest toilet,” is severely contaminated. Since 1927, the lake has been a government-sanctioned collecting ground for wastes from 60 chemical companies and the inhabitants of Managua via 17 drains, including but not limited to sewage and garbage from the city. Although recent clean up operations have been started, there remains much work to be done before the lake regains even a natural color. In the meanwhile, it continues to negatively impact the health of those around it by acting as a breeding ground for flies and mosquitoes, vectors for malaria, dengue fever, and diarrhoea.

In the Rapid Assessment of Drinking-Water Quality (RADWQ) survey conducted by UNICEF in six different countries (China, Ethiopia, Jordan, Nicaragua, Nigeria and Tajikistan), Nicaragua performed dismally. Water from various sources in 46 municipalities in Nicaragua were tested in 2004, which revealed several problems with the water sanitation in the country. These included but were not limited to extreme pH values in delivered water (including piped), insufficient residual chloride levels in over ⅓ of piped water and over 97% of otherwise delivered water, suggesting improper disinfection, 90% of water supplies containing faecal contamination, and contamination of protected wells in Río San Juan, Matagalpa, Boaco, and Jinotega as well as piped-water in Rivas that “merits immediate action” or “need to be carefully monitored.”

**Why is addressing water access and sanitation important?**

**Health Effects: Water-borne diseases**

Not surprisingly, the lack of clean water negatively impacts health. In addition to the risks associated with dehydration, exposure or ingestion of contaminated water can be extremely dangerous. Bacterial diarrhoea is a major problem in Nicaragua: 215 million children die every year of diarrhoea linked to water and sanitation. Parasites can also cause debilitating diarrhoea and intestinal infections. Compounding already unstable food security of Nicaragua, intestinal parasites can worsen the effects of malnutrition by stealing the nutrients within the host.
Hepatitis A and typhoid fever are two other water-borne diseases that are also considered high-risk in Nicaragua, according to the CIA World Factbook. Malaria and dengue fever can also be considerable problems due to mosquito populations in the swamps that form around polluted bodies of water like Lake Managua.

Chronic pain issues can also be associated with heavy loads of carrying water for long distances (according to some primary sources, around 40 liters a day). Victoria Hernandez told *El Porvenir*, a non-profit organization that works with water sanitation in rural communities of Nicaragua, that she suffered two miscarriages due to the strain on her body in carrying the water back to her village. Even then, this water is usually not safe to drink, as the surface water, as aforementioned, are usually contaminated – either due to mining industries or to poor hygienic practices, including the lack of latrines.

Another surprising health effect is that on HIV and AIDS. Although Nicaragua historically has not had relatively high rates of HIV infections, it has experienced a recent spike in recent years, according to a 2011 WHO report. Poor water sanitation compounds upon the impact of HIV infection, which attacks the immune system, by weakening the body’s defenses. By providing basic access to clean water for rural communities, the consequences of HIV/AIDS can be reduced by limiting opportunistic infections and allowing caregivers, who are usually women and girls, to spend more time taking care of sick family members or working to bring home more income (UNICEF).

**Widening of gender and socioeconomic disparities**

The burden of acquiring potable water often falls on the women and girls of the household: In rural communities that do not have piping or water delivery, women and girls walk
several kilometers every day to reach an acceptable water-source. The transit time walking to and back from the water-source as well as waiting in the lines steals valuable time for women and girls, who sacrifice working or receiving an education in order to access water.

In addition, as aforementioned, water access disproportionately affects the rural these communities of Nicaragua, although Managua itself suffers from contaminated surface water. In face of the already existing extreme poverty and vulnerability of the indigenous populations and the tension between the central government and autonomous regions, water issues only serve to exacerbate these disparities.

Economic Effects

According to UNICEF, developing nations could save $263 billion annually by providing “basic, low-cost water and sanitation facilities,” and $11.6 billion and 5.6 billion productive days worldwide just due to the reduction in diarrhoeal diseases alone. Governmental resources being funneled towards treating those sick from water-related diseases can be used for other projects, such as developing more infrastructure or going towards emergency planning. Not only does water-borne illnesses reduce the productivity of the existing workforce, but also by putting the burden of getting water to women and girls, the lack of basic access to clean water sources reduces the potential workforce by around 50%.

In greater Managua, many fishermen continue fishing in Lake Managua, despite the poisons and contaminants in the lake, driven by hunger, poverty, and the lack of other options. The fish are found to have high concentrations of mercury unsafe for consumption, but are still eaten by the villagers.

What are the current challenges facing water access and sanitation in Nicaragua?

Many of the current issues come down to two large themes: economic development versus environmental sustainability, and climate change.

Mining and Environmental Pollution

Although in some ways, mining can be a profitable industry that promotes economic growth, current methods make it an unsustainable industry that hurts Nicaraguans more than it benefits them. The mining techniques result in severe pollution of the environment, including but not limited to the water supplies.

To make matters worse, mining not only affects the surface water – already polluted with sewage, bacteria, and other contaminants – but also poisons the ground water, assumed to be a safe source of drinking water for many rural families. The indigenous populations are discriminately affected. In Wiwinak, a small Miskito village, the community elders claim that the water from their drinking wells contain mercury and cyanide, both extremely toxic compounds which are released into the environment during the in the gold-extraction process from mines along the Rio Coco. Similarly, the Nicaragua-based environmental activist group Humboldt cited cyanide contamination of the Mico River due to gold mining.

Consequences of the Proposed Nicaraguan Canal

Although the proposed Nicaraguan canal, which would span 173 miles across the country, could improve the economy of the country, the potential environmental impacts could prove disastrous – doing more harm than good in the long-run.
The canal would run across Lake Nicaragua, one of the biggest and few surface-water sources of potable water in the country. Besides affecting the animal and plant species in the area, the volume of ships crossing across the lake if the canal is built could pollute the water, and increases the risk for fuel spills. In addition, the plans to “dredge” the area could potentially expose the lake surface to poisonous contaminants like “mercury, arsenic, and heavy metals” that currently rest at the bottom of Lake Nicaragua.

What raises further doubts is the fact that no real environmental impact study has been conducted, raising suspicion that neither the Hong Kong Nicaragua Development Group (HKND) nor the Nicaraguan government can guarantee the safety of or demonstrate interest for the nation’s environment.

With the other environmental concerns, the recent economic struggles of the Chinese businessman who put forth the plan, Wang Jing, and the timing of the project with the Panama canal undergoing a huge expansion, the potential consequences greatly outweigh benefits of the canal (which would only boost the economy if completed).

**Climate Change**

Droughts, like the current one that started in 2014, decrease the already poor drinking water availability as surface and groundwater start to dry up. Women and children must walk even farther to access any source of water, even though this water may be contaminated and unfit for drinking. Victoria Hernandez, the women who spoke with *El Porvenir* from the community of *La Pita, Nicaragua*, said: “Drought affected us as well. The creek where we all went for water dried up. That meant we had to drink water from the stream where the horses that had skin disease got sick during that time, and some of them died. The children couldn’t go to class because they had to help carry the water. It took so long that they missed school.”
How can water access and sanitation issues be addressed? At what scale and to what extent?

**In the Short-Term, At a Small-Scale**

These solutions are ones that are found within the household and are used daily, but also ones that do not provide the amount or quality of clean water that could be achieved. There are multiple solutions that many Nicaraguans utilize to meet their water needs.

Accessing Water:
- Travelling
- Utilizing rain-water collection containers

Purifying Water:
- Chlorine tablets
- Boiling
- Using ultraviolet rays from sun to kill bacteria
- BioSand Filters (*Please see Aqua Clara International for more information).

**In the Medium-Term, At a Medium-Scale**

Solutions at in this category provide large quantities of high-quality water to entire communities. This water that is not contaminated with bacteria, parasites, heavy metals, or large particles and enough of it to expand typical daily use.

Accessing water:
- Water basin
- Hand-dug well
- Gravity-fed piping system
- Hand-pump well

Purifying water:
- Water system chlorinators (Please see Compatible Technology International.)
- Reverse osmosis
- Expanded small-scale strategies

**In the Long-Term, At a Large-Scale**

Arguably, these solutions are the most important. Just installing a water basin or drilling a well then putting chlorine in the water is not sufficient to heal the wounds inflicted upon Nicaraguans by contaminated water. These solutions will, with time, improve all of Nicaragua and allow it to take full potential of their natural water resources for the good of its people.

Advocacy
- Policy-makers in Nicaragua might not even be aware of how the water issue is affecting their country; if they do, they need to be encouraged to do something about it.

Advocating for water issues at the local and national levels is crucial to ensuring
continued improvement. By keeping the issue of water at the top of development priorities in Nicaragua, the statistics discussed in the Introduction are assured to decrease.

Education

- Learning the extent to which water that is hard to access and already contaminated affects one’s community is important when spurring on community action. In order to ensure that technologies and projects are accepted and best utilized by the community, educating proper practices for things like hygiene must continue. Education should not be a matter of forced practices, but instead a general raising awareness of methods of staying healthy that are applicable to the lives of those being served. If these lessons are passed down from generation to generation, long-term improvement of water protection, use, and accessibility will be within reach sooner rather than later.
Who is already addressing water access and sanitation issues in Nicaragua? How are they doing it?

**Agua para la Vida**
Agua Para La Vida
Managua Office
Phone: +505 2250-3027
Rio Blanco Office
Phone: +505 2778-0009
Must email from their website.
http://aplv.org/

Agua Para La Vida (APLV) works on varied water projects, but also provides technical training and resources to locals who wish to be involved in constructing and maintaining water systems. The flow of projects are entirely dependent on community input—they are initiated by a request from the community and the work required to build the proposed project is supplied by the community with direction from APLV.

**Aqua Clara International**
Must contact using email feature on website.
http://aquaclara.org/

Aqua Clara uses BioSand filters to remove parasites, bacteria, large particles, and some metallic contaminants. One in-house filter can provide 36 liters of water each day. These filters are easily constructed using materials that can be obtained locally (several materials must be donated by ACI). They also install much larger BioSand filters for community pipes. They also worked on WHO trial project to measure and reduce arsenic levels in Nicaragua, finding that arsenic levels were high across the country.
blueEnergy
972 Mission St., Suite 500
San Francisco, CA 94103
Phone: 1-(415) 871-0785
Email: info@blueenergygroup.org
blueEnergy works with communities in the RAAS along the Caribbean coast. In addition to improving water sources through the use of BioSand filters, solar-powered water pumps, and borehole-dug wells, they work to lessen the environmental impact communities by installing efficient cookstoves, solar panels, and suggesting new ways of managing waste and planning for disasters.

 Bridges to Community
95 Croton Avenue
Ossining, NY 10562
Phone: 1-(914) 923 – 2200
info@bridgestocommunity.org
Works on several fronts related to water. Most recently, Bridges has helped build a water basin that supplies water to a school in Masaya, which had been relying on a water truck. Previously Bridges completed building a well, a water storage tank, and gravity-fed pipe system that brings water to Fonseca’s church, school, and most of its houses--Fonseca is just 10 kilometers from Siuna!

Compatible Technology International
cti@compatibletechnology.org
Phone: 651-632-3912
800 Transfer Road, Suite 6
Saint Paul, MN, USA 55114
CTI approaches water sanitation through its Water Chlorinator, which is tailored to rural communities by being easily assembled, not requiring electricity, and attaching easily to community water tanks. To make chlorine tablet distribution easier, they have installed 20 chlorine tablet storage sites around their focus area. They work with CAPs to ensure community buy-in.
El Porvenir mainly works in Leon, Matagalpa, and Boaca. Their most recent project was an electric water pump system in Chaguite Santa Maria. This NGO tackles water issues from all angles. They build safer latrines, provide hand-washing stations at schools, and construct community wash stations. Additionally, they promote the restoration of watersheds and agroforestry by planting trees and healing pasturelands.

Water for People focuses on hygiene education and provision in schools in San Rafael del Norte and Concordia. Specifically, it seeks to increase the effectiveness of CAPS through training on “topics such as tariff calculation and collection, meter reading, administration, water quality and treatment, watershed protection, gender equity, and system operation, maintenance, and monitoring” (From website).
Living Water International
4001 Greenbriar Dr.
Stafford, TX 77477
1.281.207.7800
http://www.water.cc/forlife

Living Water International is a proselytizing Christian organization that focuses on hygiene, sanitation, and water access. They partner with local churches, which often connect Living Water personnel with local schools that are in need of help. Their work is concentrated on the Caribbean coast of Nicaragua.

WaterAid
http://www.wateraid.org/where-we-work/page/nicaragua

WaterAid’s work reaches across the globe to 37 countries. While they do offer extensive water and sanitation development services, they also focus on advocating for water issues in order to affect change in policy and governance in general. Their website is incredibly useful for considering at methods to achieving clean water. At the very least, these would allow for communities to see some options for how they could address their problem. WaterAid works in the RAAN region. Their statement for what they are doing in the area: “We are helping to improve and expand safe water, sanitation and hygiene services in the region by training local people to install and maintain rope pumps (a simple type of water pump), install eco-toilets (a type of pour-flush latrine), drill manual borehole wells, clean and disinfect existing hand-dug wells, and install rainwater catchment systems.”