

Six United Nations (SUN) presents...

Aqualux

Improving the health of women and their households



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About

Introduction

Water covers over 70% of the world's surface area and is one of the most basic human needs. However, 884 million people in the world still do not get their drinking-water from improved or safe sources. Of these, almost all of them are in developing regions.

Nearly two million people in the developing world die of easily preventable diseases associated with unsafe drinking water, lack of water, inadequate sanitation and poor hygiene, majority of whom are women and children.

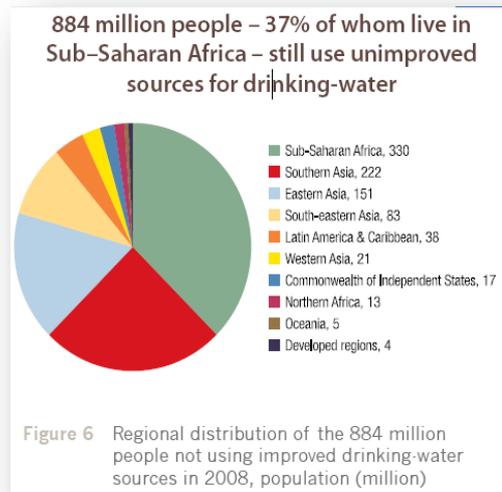
It is not just having access to clean water that needs to be considered, but also the way in which water is collected. Research has shown that women spending more than half a day per round trip progressively collect less water, and eventually fail to meet their families' minimum daily drinking-water needs. Providing access to clean water close to the home can dramatically reduce women's workloads, and free up time for other economic activities. For their daughters, this time can be used to attend school.

Business Concept

Our focus is to foster women's social and economic development but before we can achieve this; we need to fulfil women's physiological needs – starting with easy access to clean drinking water.

UN Millennium Development Goal 7 has 10 aims to half, by 2015, the proportion of people without sustainable access to safe drinking water and basic sanitation. Even so, 672 million people will still lack access to improved drinking water sources in 2015.

In aligning our ideas and objectives with the UN Millennium Development Goal 7, SUN is proposing to use a small, relatively cheap and sustainable UV light to disinfect water thereby



making it safe and drinkable for small rural communities. To start with, our focus will be primarily on Colombia, Chocó in particular.

Currently the population of Chocó is an estimated 476,173 people, so we also want to include the wider distribution of drinkable water in our proposal. Ultimately SUN would like to expand to other developing countries where access to safe drinking water is difficult, in order to aid the UN in achieving their goal of a world where everyone has access to safe drinking water.

Quality Control

The World Health Organisation Drinking-water quality guidelines provides specific values for indicators of microbial contamination and chemical hazards, but allows countries to adapt guideline values to their own socioeconomic contexts.

Rapid Assessment of Drinking-Water Quality (RADWQ) uses intensive field work to collect one-off (not routine, iterative or long-term) water quality and sanitary inspection data from statistically representative water supplies, which are then analysed to improve the knowledge and understanding of which technologies deliver safe drinking-water.

Short term Objectives

- To provide cheap and safe drinking water available to the populace of developing world.
- To develop a sustainable source of income for women of the locality by involving them in the process as the project's employees.
- To provide women with health care measures in the refilling booths as most of it is mostly the women who go to the source to fill water.
- To help in the process of achieving the MDG goal of halving the proportion of the population without sustainable access to safe drinking-water by 2015.

Long term Objectives

- To create a society free of water borne diseases.
- To reduce the mortality rate and malnutrition caused by lack of safe drinking water.
- To improve the overall quality of water being supplied around the world by globalizing this project.

The Technology

UV Radiation Purification System

The technology which we are going to use is called the Ultraviolet-Light Radiation Water Purification System. It was created by Ashok Gadgil, after a terrible outbreak of cholera began in southeastern India, 1992. Within months it had spread into neighboring countries killing up to 10,000 people. The tragedy inspired Gadgil, an Indian-born scientist working at the Lawrence Berkeley National Laboratory in California, to look for a new way to purify drinking water. Using science no more complex than the ultraviolet light emitted by an unshielded fluorescent lamp, he built a simple, effective, and inexpensive water disinfection system.

UV light is popular because it's able to be used in many applications such as disinfection and sterilization, among others. It destroys over 99.99% of the bacteria and viruses in the water because it directly damages bacteria and virus' DNA in just 12 seconds; thus stopping them from reproducing and they eventually die as they are not able to produce the enzymes that keep them alive rendering them harmless.

Because of this ability, UV light is often used in water treatment systems to increase the security and quality of water supply.

Ashok Gadgil's ultraviolet-light radiation water purification system uses UV light, to disinfect water. The UV lamp used only needs 40 watts to work and this can be obtained from a car battery. The water supply will first undergo pre-filtration in order to remove big particles such as lead and dust. The water then flows to the UV waterworks system which consists of UV lamps suspended above a shallow pan where the water will flow because of gravity.

In this process, the UV lamp will emit ultraviolet light peaking at 254 nano-minutes which is strong enough to kill viruses and bacteria in the water.

The disinfected clean water will be kept in a stainless steel storage tank ready to be distributed to the consumer.

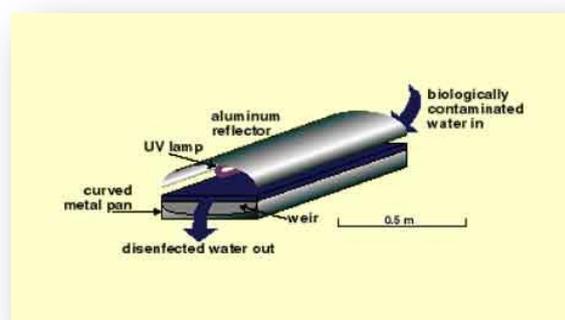


Diagram of UV Waterworks

Location

Chocó, Colombia

The department of Chocó is located in northwest Colombia and borders the Pacific Ocean, Panama, the Caribbean Sea, the departments of Antioquia, Risaralda and Valle del Cauca. It has an area of 46,530 km² and according to the DANE's last census in 2005, the estimated population for 2010 is 476,173. The most populated municipality in 2010 will be Quibdó with 114,548 people. The population of Chocó is mostly African descendant (82.7%) and about 51.7% live in rural areas.

This department has a high degree of humidity, hot temperatures, exuberant vegetation and intense rain, so economic activity is precarious. Chocó's main source of income comes from the gold mining industry but another important economic activity is platinum, silver and copper mining. There is also abundant exploitation of petroleum and wood and there is considerable banana, coconut, cacao, rice and corn production in the region of the Gulf of Urabá.

Many facts were considered to select Chocó as the location to implement the project; First, two members of the team are Colombians so it was possible to identify the poor economic development of this region and also obtain information about it to contextualize the project in the reality of this department.

70% of the world's blind are women who have been infected, directly or through their children, with trachoma, a blinding bacterial eye infection occurring in communities with limited access to water.



Then, reviewing demographical data, we discovered that 22.5% of the population of Chocó had aqueduct water supply in 2008. The coverage in the capital city, Quibdó, was of 33.4% in the same year. For 2010 the largest age group of the total population will be 0-4 years with 33,573 male and 32,698 female. Despite this, the child mortality rate (of every 1,000 born) is the highest in the country being 76 - national rate is 19.90 - and the child-woman ratio (by woman) is the second highest being 0.62 after the Amazonian group (group of departments) which is 0.64.

All these facts justify the decision of considering Chocó as the region to develop the UV water purifier project since it has low coverage of clean water services, it is quite rich in water sources, and women will be involved in it, improving their quality of life and consequently the basic needs of the households in Chocó. The first production and distribution centre will be located in Quibdó with the idea of integrating more regions to this project as sustainability in the first location is reached.

Operations Strategy

Our Strategy of Operation will start with the set up of a water hut facility that sells decontaminated safe drinking water to people of Chocó, Colombia, through the use of the UV light system. We will call our facility Aqualux and we will charge \$2 or \$3 (US) for a re-sealable bucket of water - depending on whether distribution is included or not. Our major objective is to make this clean water easily accessible, as well as teach about sanitation. Our competitive advantage will be our location. We will locate our facility in the middle of Quibdó so that the women do not need to walk miles back and forth to get enough safe water for their entire families to consume in a day. The UN suggests that each person needs 20-50 litres of safe freshwater a day to ensure their basic needs for drinking, cooking and cleaning. We will also provide small carts to rent to help carry more buckets if necessary that can be returned at the end of the day. At Aqualux we will also sell soap bars.

Marketing and sales:

We will market this mainly to women because they are the majority that collect drinking water for their families, however we will not limit our facility in only providing for women. We will be partnering with United Nations and their sub-department UN-Water for funding the start-up of our facility, *Aqualux*. We will hand out pamphlets about our UV system and how to be sanitary.

In the pamphlet will be facts about washing hands, such as washing for the same time allotted as singing *Feliz Cumpleanos* twice will eliminate a substantial amount of germs. Washing the backs of hands, between fingers, wrists, and under fingernails can prevent the

transfer of many diseases such as influenza, e-coli, Salmonella, Hepatitis A, Giardiasis or Rotavirus as well as many others. According to the World Health Organisation, Washing hands with soap can reduce the risk of diarrhoeal diseases by up to 47 per cent. The pamphlet will include the significance in washing hands before preparing food, after touching raw meat, using the bathroom, handling animals and before and after treating the sick or wounded. It will also have facts about the correlation between washing hands and newborn mortality rates. According to James Tielsch, PhD of Johns Hopkins Bloomberg School of Public health, "research highlights the importance of hand-washing in the developing world for keeping newborns healthy. This practice is not well understood in the developing world and needs to be taught." In his study, birth attendants washed their hands with soap and water or an antiseptic about 60% of the time before the delivery, while the mothers only washed their hands about 15% of the time. Overall, hand washing by mother and attendant reduced the death rate by 41%." This shows that teaching a simple act can have the power to transform lives. Hand washing is especially important for women because they usually take on the household tasks of preparing food and caring for children.

We also want Aqualux to have a hand sanitizer dispenser. We will have to gain the trust of the locals of the quality of our product and our pamphlet will help this. We will have recruiting days to find women interested in being a part of our venture and we will hand out our pamphlet as well as have a demonstration of the disinfecting light. On these days we will also hand out hand sanitizer with our information pamphlets.

Human Resources:

We will employ women in the community and give them business training to run Aqualux. This will help in the sustainability of our venture. By providing women with jobs we will be able to increase their standard of living by giving them a fair wage. With the income, they will be able to provide their family with food and education. Also as mentioned above we will partner with UN-Water who unites with our same goal, to extensively reduce the number of inhabitants without access to safe-drinking water and basic sanitation. As a result of sharing in the same passion they will be able to help fund our venture with buckets and other materials needed in order to help reach the drinking-water and sanitation MDG (Millennium

Development Goals) target. We will also team up with the Purell Company of Johnson & Johnson Consumer Companies, Inc to provide hand sanitizers to hand out with our information pamphlets.

Sustainability:

Our hope at SUN is to train women of the Chocó community to run the water facility on their own. We will teach these women basic change making skills, how to operate and maintain the UV machinery, marketing, basic banking knowledge, and the importance of locking up supplies. We also hope to be able to use this particular business model in other less fortunate areas that also still do not have the luxury of safe drinking water because drinkable water should not be a luxury but a human right.

Challenges

One of our biggest concerns is regarding the region, Chocó. First of all, the supply of electricity is not always reliable in this part of the country. Only the capital city of the region, Quibdó, has electricity. Therefore the need of an alternative to electricity to operate the machinery could be needed. However, the system only needs about 40 watts to power the light and therefore it could be run on a car battery.

The second problem that we see regarding the region is the corruption. In November 2009, the new Corruption Perception Index showed that the corruption in Colombia is becoming a bigger problem. This could affect the implementation of our project in a negative way; it makes it harder to run the project and may also lead to “the wrong people” taking control over the system once we leave the region after the implementation is done.

A third problem that we can picture that our project might face is regarding the financing. There are different types of systems, however, the prices starts at \$1500 which should be considered a big investment for people on or under the line of poverty. Please see financial analysis for further details.

Furthermore, we see a challenge regarding the fact that there is a lack of infrastructure in this part of Colombia. Chocó has insufficient levels of both water pipelines and roads. It is especially the challenging as water pipelines is something that we need to consider as we may have to find an alternative way to supply the villages with water to filter through our UV machinery.

Financial Analysis

Many assumptions are considered for the 6 year projection. As our target population will be the population of Quibdó, we will be using DANE's population projection in estimating customers each year. The estimated coverage is established assuming that the service users will prefer receiving the purified water in their households. These estimates are not idealistic, assuming that penetration in 2016 will reach 10% of Quibdó's total population, but even being pessimist in that sense, and considering that the machines' total capacity won't be used, a 136% rate of return will be obtained implementing this project.

For a break-even analysis, 878 customers (0.76% of Quibdó's population) are needed to obtain in the first year a \$0 USD income in the estimates, being 581 users of the distribution service and 297 users obtaining the water in the production centre.

ESTIMATES						
	2011	2012	2013	2014	2015	2016
Machines	7	8	9	10	11	12
Quibdó estimated population	114,798	115,054	115,300	115,537	115,694	115,937
Coverage (%) per year	5.0%	6.0%	7.0%	8.0%	9.0%	10.0%
Coverage per machine (no distribution)	0.24%	0.25%	0.26%	0.27%	0.27%	0.28%
Coverage per machine (distribution)	0.48%	0.50%	0.52%	0.53%	0.55%	0.56%
Customers per machine (no distribution)	273	288	299	308	316	322
Customers per machine (distribution)	547	575	598	616	631	644
Total customers per machine	820	863	897	924	947	966
Consuming per year (no distribution)	22,960	27,613	32,284	36,972	41,650	46,375
Consuming per year (distribution)	45,919	55,226	64,568	73,944	83,300	92,750
Taxes	33%	33%	33%	33%	33%	33%

INCOME STATEMENT (USD)							
Revenues	Notes ¹	2011	2012	2013	2014	2015	2016
Water selling (no distribution)	A1	45,919	55,226	64,568	73,944	83,300	92,750
Water selling (distribution)	A2	137,758	165,678	193,704	221,831	249,899	278,249
		183,677	220,904	258,272	295,775	333,199	370,998
Cost of sales							
Machines	B1	10,500	1,500	1,500	1,500	1,500	1,500
Delivery cart	B2	5,600	800	800	800	800	800
Water container	B3	2,800	3,200	3,600	4,000	4,400	4,800
Small containers	B4	4,200	6,400	9,000	12,000	13,200	14,400
		23,100	11,900	14,900	18,300	19,900	21,500
Gross profit		160,577	209,004	243,372	277,475	313,299	349,498
Expenses							
Maintenance	C1	1,050	1,200	1,350	1,500	1,650	1,800
Rent	C2	25,200	28,800	32,400	36,000	39,600	43,200
Public utilities	C3	12,600	14,400	16,200	18,000	19,800	21,600
Human resources	C4	134,400	153,600	172,800	192,000	211,200	230,400
		173,250	198,000	222,750	247,500	272,250	297,000
Operating profit		-12,673	11,004	20,622	29,975	41,049	52,498
Net income before taxes		-12,673	11,004	20,622	29,975	41,049	52,498
Taxes (33%)		-4,182	3,631	6,805	9,892	13,546	17,324
Net income		-8,491	7,372	13,817	20,083	27,503	35,174
Internal Rate of Return	136%						

¹ **Notes; A1:** \$2 USD per consuming, **A2:** \$3 USD per consuming, **B1:** \$1,500 USD per machine, **B2:** 2 per machine, USD400 per cart, **B3:** 2 per machine, \$USD200 per container, **B4:** 200 per machine, \$USD4 per container, **C1:** 10% Provision of machine cost, **C2:** \$300 USD per machine, **C3:** \$150 USD per machine, **C4:** \$4,800 USD per employee, 4 employees per machine.

Final Word

Water is the foundation of life and even the ancient Romans built aqueducts in order to supply their societies with water.

We at SUN believe that even in this modern era water is the key to a bright life and therefore, with the help of the Aqualux project, we believe that the women of Chocó can empower themselves and their society to a sustainable economic and social growth.

High quality water is more than the dream of the conservationists, more than a political slogan; high quality water, in the right quantity at the right place at the right time, is essential to health, recreation, and economic growth.

Edmund Muskie, US. Senator