

Global Case Writing Competition 2010

Social Entrepreneurship Track

3rd Place

WaterHealth International: Providing Safe Drinking Water to the Bottom of the Pyramid Consumers

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INTRODUCTION

In February 2009, Irvine, California-based WaterHealth International Inc. (WHI) received a funding of US\$ 15 million from the International Finance Corporation¹ (IFC) to expand its operations in India. With the funding, it was expected that more than 600 communities in India would be able to set up WaterHealth Centers² (WHCs) with a capacity to serve over 3 million people. On receiving the funding, Tralance Addy (Addy), founder of WHI, said, "In response to the need to address the urgent problem of water-borne diseases, WaterHealth plans to expand rapidly. As we continue to do so as a result of strong demand, our need for capital to help communities finance these systems also increases. We are pleased, particularly in these challenging economic times, that IFC has elected to strengthen its relationship with WHI."³

Ever since its launch in 1996, WHI had been involved in dealing with one of the most pressing problems in developing countries worldwide – scarcity of potable water. It was estimated that more than 2 billion people lacked access to clean drinking water in developing countries. These people, therefore, often relied on water resources that were contaminated. It was reported that nearly 60 million children suffered from diminutive growth due to water-borne diseases. In addition to deaths and economic loss, women and girls, on whom the burden of obtaining water for the family fell, had to trek long distances and spend around six hours of their time fetching water – time that could be better spent with family or on economic activities.⁴

WHI aimed to alleviate the suffering caused by water-borne diseases and the associated economic loss through its innovative and breakthrough UV Waterworks (UVW) technology. The UVW technology was invented by Ashok Gadgil (Gadgil), an Indian-born senior physicist at the Lawrence Berkeley National Laboratory⁵ (Berkeley Lab) in 1993, for disinfecting water from harmful pathogens and microbes with the help of ultraviolet light (UV). The result was safe and clean drinking water that exceeded the World Health Organization's⁶ (WHO) water standards and was sold to bottom of the pyramid⁷ (BoP) consumers.⁸ As of 2009, WHI operated through subsidiaries in India, the Philippines, and Ghana. WHI water systems were also installed in a number of countries including Mexico, Bangladesh, Sri Lanka, and some parts of Africa.

¹ The International Finance Corporation was established in 1956. It promotes economic growth in developing countries by mobilizing capital in the international financial markets, financing private sector investment, and providing advisory services to businesses and governments.

² WaterHealth Centers are the main offering of WHI which harnesses the company's proprietary UV Waterworks technology to provide a water facility for communities. An average WHC can provide a community of 3,000 residents with up to 20 liters of potable water per person per day.

³ "WaterHealth International Announces \$15 Million Financing by IFC," www.reuters.com, February 16, 2009.

⁴ "Statistics Illustrate the Challenge of Clean Water Access around the World," <http://www.waterhealth.com/water-crisis/statistics.php>.

⁵ Established on August 26, 1931, the Lawrence Berkeley National Laboratory is located at the University of California. The lab was founded to conduct scientific research.

⁶ Headquartered in Geneva, the World Health Organization (WHO) is a specialized agency of the United Nations. The main task of the WHO is to coordinate with other institutions on international public health programs.

⁷ In economics, the bottom of the pyramid is the largest, but poorest socio-economic group. There are an estimated four billion people in the world who live on less than US\$2 per day (mostly in developing countries) that come under this group. Many companies, cutting across industries, are developing new business models to target this group.

⁸ "WaterHealth International, Inc. (WHI) Today Announced ICICI Bank's Funding Commitment for WHI's Development of Community Water Facilities in Rural India," www.politicalfriendster.com, December 12, 2008.

Over the years, Addy⁹, as the CEO of WHI, played a crucial role in refining the business model of the company in an endeavor to make its services relevant to the target segment and also ensure returns for the investors. After meeting with limited success while trying to sell the UVW technology in the form of a product, WHI changed its business model to offer it as a service. WHI helped arrange loans for communities to finance the installations of its water systems and the beneficiaries had to pay a nominal user fee to avail of the service.

WHI's UVW technology and the business model it adopted to serve the underprivileged communities living in rural and peri-urban areas attracted the attention of experts who felt that it was innovative and sustainable. Experts felt that, in addition to solving the water problem, the company addressed issues related to health, gender, education, and economic losses associated with the water problem. It also generated employment for local people besides indirectly improving earnings in rural households. Experts said that tackling global challenges such as the water crisis required a collaborative approach like the one adopted by WHI.

As of mid-2009, more than 600 WHCs had been installed, providing safe water to more than one million people around the world. WHI's aim was to take the UVW technology to needy communities throughout the world by establishing a global presence (Refer to Exhibit I for WHI's vision and values). While experts appreciated WHI's efforts to provide potable supply of water to underprivileged communities in developing countries and also appreciated its sustainability-driven business model, they felt that going forward the company would have to address various challenges.

GADGIL'S INITIAL EFFORTS

An outbreak of cholera in West Bengal, India, in 1992 provided the impetus for the development of the UVW technology. Since the surface protein on this particular strain of cholera was a little different, several vaccines which had been used to cure cholera till then were ineffective. This led to the death of thousands of people in India. The strain soon spread to Bangladesh and Thailand. Gadgil was well aware of the water problem that communities in India faced and he desperately wanted to do something to help solve the issue, which he knew, plagued other developing countries as well. But he could not do anything constructive because of the other projects he was involved in at Berkeley Lab.

Distressed by the loss of human life caused by the epidemic in his home country, Gadgil began to constantly think about ways in which the issue of water-borne diseases could be addressed. In 1993, he started working evenings and weekends and began his research with a mechanical engineering student and researcher in the Life Sciences Division of Berkeley Lab, Derek Yegian, to devise a system that would disinfect water using UV light. In his initial years, he did not have any funding for his project. He only had access to a colleague's expertise and the equipment offered by Berkeley Lab. During his research, he found that the UV light could disinfect one ton of contaminated water for five cents.¹⁰ "It took two years to make it simple, simple, simple – and as low-maintenance as possible. It was extraordinarily inexpensive – about 4 cents to 5 cents per person per year. That got me excited. I thought,

⁹ As of 2009, Addy was a member of the board of directors.

¹⁰ "Success Stories: Start-Ups - WaterHealth International Inc.,"
http://www.lbl.gov/tt/success_stories/articles/WHI_more.html.

‘We can make a profit, but with a social mission,’”¹¹ said Gadgil. Several scientists were amazed by the technology invented by Gadgil as it was simple yet ingenious, and capable of addressing the water problem in developing countries. Daniel Kammen, Professor at UC Berkeley’s Energy and Resources Group, Goldman School of Public Policy and Department of Nuclear Engineering, said, “The general idea of using UV light in a tube to kill pathogens has been around since the 1970s, but Ashok really pioneered the use of the technology for low-cost applications in developing countries.”¹²

While Gadgil’s research was on, cholera continued to be a problem in India. It was reported that from May to August 1994, nearly 2,200 people had lost their lives to the disease.¹³ This led Gadgil to launch his prototype. The same year, he received some funding from federal and private sources. Using this money, he developed a prototype that was efficient and low in cost. The working model could disinfect eight gallons of water per minute for a price of two cents per ton, which included the annual capital cost of the unit, consumables, and electricity.¹⁴ The model was taken to a village in India for field testing. It was tested using a car battery since the area had no electricity. The feedback from the tests revealed that the technology could be improved further. The villagers said that the model was too efficient for small villages and rural communities of India since the system purified water much faster than they could store and supply it. They also pointed out that they lacked the kind of water resources required. Moreover, they felt that the system was too big, bulky, and expensive.

In 1995, Gadgil decided to revise the prototype after obtaining feedback from the villagers. It was at this time that Edas Kazakevicius (Kazakevicius), a Lithuania-based physics student, expressed an interest in working with Gadgil on his UVW project. In late 1995, Gadgil in conjunction with Kazakevicius built a revised prototype which was compact in size and weighed only 15 pounds.¹⁵ The system could disinfect four gallons of water at four cents per ton utilizing 40 watts of electricity.¹⁶ This smaller model matched the 3.5 gallon capacity hand pumps supplied by the UNICEF¹⁷ in many parts of the developing world, according to Gadgil.

The UVW system was retailed at US\$ 800 and could last for 15 years. The full vending station including filters, pumps, and tanks cost about US\$ 7,000. The water disinfected by the UVW system could be stored for up to 36 hours for consumption.¹⁸

Having developed the prototype, Gadgil decided to patent and license the technology. Berkeley Lab’s Technology Transfer Department played a significant role at this stage of the prototype. It received funds from the US Department of Energy’s¹⁹ Office of Science for developing this technology to a stage where it could be licensed. According to Viviana

¹¹ Colin Stewart, “Changing the World, One Gallon at a Time,” www.ocreger.com, May 24, 2007.

¹² “Researchers Help Bring Clean Water to Households in Developing Nations,” www.universityofcalifornia.edu, February 6, 2003.

¹³ Ashok Gadgil, “UV Waterworks: Reliable, Inexpensive Water Disinfection for the World,” <http://eetdnews.lbl.gov>, 1996.

¹⁴ Martha Davidson, “Innovative Lives,” <http://invention.smithsonian.org>, February 26, 1999.

¹⁵ Martha Davidson, “Innovative Lives,” <http://invention.smithsonian.org>, February 26, 1999.

¹⁶ Ashok Gadgil, “UV Waterworks: Reliable, Inexpensive Water Disinfection for the World,” <http://eetdnews.lbl.gov>, 1996.

¹⁷ Established by the United Nations in 1946, UNICEF is the acronym for United Nation’s Children’s Fund. It works for children’s rights, their survival, development, and protection.

¹⁸ Suzanne Snell, “Water and Sanitation Services for the Urban Poor,” <http://waterwiki.net>, December 1998.

¹⁹ The US Department of Energy is a government department set up with the mission of promoting and advancing energy technology in the US.

Wolinsky, the Licensing Manager at Berkeley Lab, “Gadgil worked with the Technology Transfer Department to devise a strategy for a technology that everyone realized had the potential to offer significant, widespread social benefit. To foster the broadest distribution of the technology, Berkeley Lab decided to patent and license it.”²⁰

Several companies bid for Gadgil’s UVW technology and WHI was one of them. The University of California which runs Berkeley Lab licensed the UVW technology to WHI.

ABOUT WATERHEALTH INTERNATIONAL

In 1996, Addy, a Ghana-based entrepreneur, set up WHI. The organization’s stated aim was to “invest in business that aid society”. By setting up this organization, Addy planned to address the water problem faced by communities in developing countries. He said that he often felt the need to do something for people in water-stressed communities where women and girls traveled long distances to haul water. He also cited the example of his childhood days in Ghana where he had to wait in long lines to fill water from the tap. According to him, providing safe and clean drinking water was one of the best ways to impact the lives of the BoP communities.

Addy’s focus on doing something for the BoP customers grew while he was working at Johnson & Johnson²¹ (J&J). While working there, Addy looked at a number of technologies that could address the water problem. He then licensed the UVW technology from Berkeley Lab. In 1998, WHI collaborated with UNICEF to integrate a solar-powered hand pump with the UVW system since several villages in developing nations had no access to electricity.²² Though that did not materialize, Addy planned to continue with the existing model. J&J executives, however, did not show any interest in the UVW technology and said, “Look, this is really interesting. This is really great, but it’s just a little too weird for us. We don’t see this being at Johnson & Johnson Company.”²³ Hence, Addy decided to start a company of its own and resigned from J&J in 2001. He also brought in Gadgil as the vice president, R&D, and Chief Technology Officer of WHI.

Despite the benefits offered by the UVW systems, WHI was unable to sell the number of units needed for the company to break even. By 2002, the company had made investments of around US\$ 6 million, but was able to sell only 300 units at a price of US\$ 1000 each.²⁴ This led to the company filing for bankruptcy. However, Addy’s venture management company Plebys International LLC²⁵ (Plebys) initiated a buy-out and restructured the company. Subsequently, it also restructured the ownership of shareholders from seventy shareholders to a core group of nine shareholders (Refer to Table I for WHI shareholding pattern after restructuring in 2002).

Table I

²⁰ “Success Stories: Start-Ups — WaterHealth International Inc.,” www.lbl.gov/tt/success_stories/articles/WHI_more.html.

²¹ Johnson & Johnson, one of the premier healthcare companies, was founded by the Johnson brothers in 1887. The company is engaged in the manufacture and sale of healthcare products in more than 57 countries across the world through more than 250 operating companies.

²² Suzanne Snell, “Water and Sanitation Services for the Urban Poor,” <http://waterwiki.net>, December 1998.

²³ “Peter Hamilton - Interview – Plebys,” <http://www.e-clips.cornell.edu>

²⁴ Colin Stewart, “Changing the World, One Gallon at a time,” www.oregister.com, May 24, 2007.

²⁵ Plebys International LLC is a venture management and development company that sets technology-based enterprises with the stated aim of serving underserved markets worldwide.

WHI's Shareholding Pattern after Restructuring in 2002

Company	Percentage
Plebys International, LLC	78.46
Elwyn Ewald	7.31
Johnson & Johnson Corporation	5.18
Monsanto Corporation	3.23
Eric Lemelson	2.84
Richard Cortese	1.4

Source: "Project Sponsor and Major Shareholders of Project Company," www.ifc.org.

With the help of Plebys, WHI raised investments of US\$ 16 million from SAIL Venture Partners²⁶, Dow Venture Capital²⁷, the IFC, and Acumen Fund²⁸ in 2002.²⁹

In 2004, Plebys invested another US\$ 2 million in WHI.³⁰ According to Addy, the company had failed initially since it had focused on marketing a product rather than the service. Addy maintained that a market for clean water did exist and decided to adopt a new approach to market its UVW technology. WHI partnered with several Non Governmental Organizations (NGOs) to educate rural consumers about the significance of drinking clean water. He built up a network of professionals who were trained to maintain and service the equipment. He also set up a financing structure that enabled the communities to make a down payment of around 30 to 40 percent with the rest of the amount being paid through a loan arranged by WHI.³¹

Following the investment from Plebys, IFC and Acumen Fund also invested US\$ 1.8 million. "These investments highlight growing recognition of the importance of WHI's technology and business models and our ability to get things done to provide safe drinking water even in challenging environments around the world,"³² added Addy. The UVW units were field tested in USA, Mexico, the Philippines, South Africa, and India. They were produced in California, USA, and at Mumbai in India. Over the following years, the company refined its business model and set up its water systems in many countries. Analysts felt that since 2004, the focus of the company had been more on India.

²⁶ Founded in 2002, SAIL Venture Partners is a venture capital company with offices in Washington DC and Southern California.

²⁷ Dow Venture Capital invests in start-up companies in Asia, Europe, and North America.

²⁸ Acumen fund is a non-profit venture fund that aims to serve the underserved communities globally through market-oriented and innovative approaches.

²⁹ "Ventures WaterHealth International," <http://www.plebys.com/ventures/waterhealth.htm>.

³⁰ Nitasha Tiku, "Do-Good Capitalist of the Year," www.inc.com, December 2007.

³¹ Nitasha Tiku, "Do-Good Capitalist of the Year," www.inc.com, December 2007.

³² "WaterHealth International Receives New Funding Totaling \$1.8 Million.," www.allbusiness.com, November 22, 2004.

Being a privately held company, WHI did not disclose its revenue. However, its typical installation reportedly brought in as much as US\$ 50,000 and the company expected to break even in 2008.³³ For the year ended 2008, WHI revenues were estimated to be US\$ 17.3 million.³⁴ It had an employee strength of around 125 people. Its prominent shareholders were Acumen Fund, Dow Venture Capital, IFC, SAIL Venture Partners, and Plebys.

CREATING A SUSTAINABLE BUSINESS MODEL

WHI installed its UVW system in places such as schools, hospitals, and local communities. It also installed the systems at homes and in apartment buildings. Its flagship offering was WHCs (also called Community Water Systems). A standard WHC was approximately 55 square meters in size with an additional area for social use. The WHC was designed to act as a place for social gathering for the village people. The village residents collected water from these WHCs. In some of the communities, local entrepreneurs delivered water to some houses at a fee. A standard system offered 20 liters of water for one person per day and served up to 3,000 people. The system required maintenance only once in three months and thus, this did not significantly add up to the cost of owning or operating the system.³⁵

The land for setting up the WHC and water resources was given by the local governments (For instance, the village *panchayat*³⁶ in India).³⁷ The equipment, sourced from vendors, was provided by WHI. The company took the responsibility of installing the capacity equipment. After taking approval from the local community, the WHCs sourced water from perennial water sources. In the dry season, the company entered into contracts with water vendors or water tankers to supply water to their WHCs in order to ensure uninterrupted water supply.

WHI offered a financing program to the communities after criteria such as community size, user interest, and compliance to repay the loan had been met. The company collaborated with financial institutions to help with the finances for the communities. The village leadership, local government, NGOs, or private sponsors made the down payment and the remaining costs were then financed by the company. The fee collected from sale of water was then used to repay loans. After the loans were repaid, the WHCs became income-generating assets for the local communities. The proceeds were sufficient to cover the expenses of the UVW system in addition to the cost of tanks, controllers, valves, pumps, civil structures, and maintenance of the equipment.³⁸ Moreover, the proceeds were used for improvements in villages. The communities shared the net revenues gained from the user fees with WHI if the system had been financed by the company.³⁹

In addition to helping with the finances to set up WHCs, WHI also educated the communities about the threat from water-borne diseases. Addy added, “Now we build the key technical

³³ “Go Green, Get Rich,” <http://money.cnn.com>, April 4, 2007.

³⁴ <https://www.zoominfo.com>, 2009.

³⁵ Ashok Gadgil, “The Rosenfeld Effect,” <http://www.energy.ca.gov>, April 29, 2006.

³⁶ *Panchayat* is a political system followed in the villages of India, Pakistan, and Nepal. In a *panchayat*, five elders assemble and settle disputes taking place between individuals and villages. They receive funds from local body grants and state governments, etc.

³⁷ “WaterHealth International, Inc. (WaterHealth Ghana),” www.aquaya.org/files/nairobi.../Mawunyo_Puplampu.pdf, June 26, 2009.

³⁸ Nachiket Mor, D Chattanathan, and Rajiv Panthary, “Enhancing the Flow of Credit and Managing Risks in Agriculture,” www.nachiketmor.net/EnhancingFlowofCreditandManagingRisk.pdf.

³⁹ “WaterHealth International, Inc.,” www.aquaya.org, June 26, 2009.

components, provide financing, educate customers about the devastating impact of water-borne diseases, and provide a financial method for collecting money and putting it into the bank.”⁴⁰ (Refer to Box I for services offered by WHI).

Box I

Services Offered by WHI

- Site assessment and preparation
- Conveyance of raw water from source to treatment facility
- Turnkey assembly, installation, and validation of water treatment equipment and civil works
- Building a modern, aesthetically designed and landscaped civil structure that also serves as a gathering place for the community
- Provision of specially designed water containers that minimize the potential for recontamination during customer use and storage
- Extended maintenance contracts to keep quality and operating standards high
- Recruitment, hiring, and training of local residents to operate facilities
- Overall management of WHCs
- Ongoing education programs on health and hygiene

Source: www.waterhealth.com/products/community-water-systems.php

The water for the WHCs was sourced from the pond through buried high density polyethylene pipes. People were offered training on safety, health, and the environment in order to ensure that the WHCs were run in accordance with the policies and procedures of WHI. The company persuaded people to buy clean water by advertising the financial benefits to the poor communities. Experts appreciated WHI's efforts at advertising the benefits of potable water to the poor. According to Robert Katz, a staff member at the World Resources Institute⁴¹, “Poor people care about feeding, clothing, and housing the family. If people are missing work because they are getting sick from water-borne diseases, you can show them how much money they are losing.”⁴²

In March 2006, WHI developed a franchise model, making marketing and distribution easy for local entrepreneurs. The entrepreneurs who bought the franchise model were assured of a marketing and service model with ongoing checks being done for quality and maintenance. On an average, the franchisees received a return on investment within 12 to 18 months, according to WHI.⁴³ Experts felt that the franchise model was an attractive business value proposition for local entrepreneurs and non-profit organizations interested in revenue generation.

⁴⁰ Colin Stewart, “Changing the World, One Gallon at a Time,” www.ocregister.com, May 24, 2007.

⁴¹ The World Resources Institute is a non-profit organization that works with the mission of protecting the environment and improving the lives of the people.

⁴² “The Why Files,” <http://whyfiles.org>, November 15, 2007.

⁴³ “Water Health International: Water Supply Franchising,” <http://timbuktuchronicles.blogspot.com>, March 12, 2006.

Experts felt that WHI had developed a cost-effective technology for serving the poor. They also commended the company for its approach to social marketing and distribution. Several industry observers were of the opinion that the WHI's business model was unique since it was a combination of social marketing expertise, knowledge about local markets, financing skills, and one of the world's best technologies that purified water from bacterial contamination (Refer to Box II for salient points of WHI's business model).

Box II

WHI's Business Model: Salient Points

Direct WHC sales (assessment/ equipment/ facility/ support)

- Community provides land and access to water
- Community makes cash down payment of 10% and above
- Bank finances remainder — arranged through WHI

Maintenance service contracts

- Mandatory service contract for 8-10 years (loan term)
- Service charges paid to WHI from user fees
- Sale of service contracts after loan term

Management fees

- Share of net user fee revenues if system financed
- Contracted services if system purchased outright

Source: *WaterHealth International, Inc. (WaterHealth Ghana), Presentation at the AQUAYA Workshop in Nairobi Kenya 26th June 2009.*

Some experts felt that the model was sustainable since the system could treat surface water from lakes, ponds, and rivers. In case of any water shortage, WHI entered into deals with water tankers to source water for their WHCs. WHI through its UVW technology provided access to clean drinking water, contributing to public health by improving sanitation and hygiene and decreasing the risk of water-borne diseases. Moreover, the UVW technology offered a renewable, self-sustaining way of providing an improved supply of water with minimum wastage. It did not require fuel and also contributed to keeping the environment safe as it did not have to use biomass fuel for boiling water. Proper storage prevented water contamination and reduced wastage due to spillage and evaporation. What's more, the water supplied met WHO standards at lower costs than other methods of water purification (Refer to Exhibit II for a note on how the UVW technology works; to Exhibit III for a typical system configuration of a WHI system; to Exhibit IV for photographs of WHCs; and to Exhibit V for WHI's investment cost advantage vs. other options).

WHI removed education barriers since the children did not have the chore of fetching water. They also had access to safe drinking water and several communities provided free water to schools. Moreover, children did not miss school due to water-borne diseases. Women could

spend time on economic activities rather than wasting their productive hours on fetching water. According to experts, with all these benefits, the UVW systems also led to economic development and a foundation for sustainable growth. For instance, it generated employment for people in rural areas where WHI installed its water disinfection systems. The people employed were responsible for installing, cleaning, and maintaining the equipment. The local residents were also hired for selling and distributing water to remote areas.⁴⁴

WHI was successful in its venture in several countries. By January 2007, around 500 systems had been installed in Asia, Central America, and Africa and served around 500,000 people.⁴⁵ WHI and Gadgil received several awards and recognition for the UVW technology (Refer to Exhibit VI for a list of awards and recognition received by the UVW technology). In 2007, Addy was also profiled by the Inc. Magazine as 'Do-good Capitalist of the Year'.⁴⁶

Some experts opined that while the company had received immense recognition, it still had to reap profits. A few venture capital firms opined that the company should expand its business worldwide in order to have a return on investment. Commenting on WHI's approach to business, Henry Habicht, Managing partner, SAIL Venture Partners, said, "It's very important to make money like any other business."⁴⁷ Reiterating his commitment to running WHI as a for-profit enterprise, Addy said, "We're motivated to do what we're doing because of a huge need and huge suffering. Unless we can bring private capital to bear on these problems, the solutions will not be sustainable. ...We are very much a for-profit company."⁴⁸

Experts often cited WHI as an example of a social enterprise. Some of them opined that the WHI could do more for poor people if it operated as a business that made profits rather than as a donor-backed organization.

WHI'S WORLDWIDE OPERATIONS

As of 2009, WHI operated through subsidiaries in three countries – India, the Philippines, and Ghana. The company's prime focus had been on India where more than 200 of its water facilities had been installed. The company also had UVW systems installations in some other countries.

WHI in India

WHI contended that India was a major market for targeting the BoP consumers since the adverse impact of unsafe water on health was a continuing story, causing diseases like diarrhea, cholera, etc. In India, the monsoon was the time when there was a spurt in water-borne diseases, as drinking water became mixed with sewage and animal waste. Unhygienic practices during collection and storage and limited access to sanitation facilities also brought about the transmission of water-borne diseases in humans. According to the WHO, diarrhea was the single largest cause of death of over 700,000 Indians in 1999 – over 1,600 deaths per

⁴⁴ Achintya Madduri, "Water Water Everywhere?" <http://floatingsun.net>, November 3, 2007.

⁴⁵ Go Green, Get Rich," <http://money.cnn.com>, April 4, 2007.

⁴⁶ Inc. Magazine is a New York-based monthly magazine. The magazine is targeted at people who run growing companies.

⁴⁷ Colin Stewart, "WaterHealth: Changing the World, One Gallon at a Time," www.ocregister.com, May 24, 2007.

⁴⁸ "WaterHealth," www.whatsbubbling.com, June 12, 2007.

day.⁴⁹ The situation highlighted the need for focused interventions to prevent the occurrence of water-borne diseases. Despite the public investments in water and sanitation infrastructure, many low-income rural communities in India lacked access to safe drinking water because of the population of more than 1 billion with 70 percent of people living in rural areas.⁵⁰ Many of the people living in rural areas had no access to potable water. In 2004, it was estimated that around 10 million people residing in rural areas were affected by diarrhea. The reasons cited were unsafe drinking water contaminated by water-borne diseases.

In 2004, IFC made equity investments of US\$ 1.2 million in WHI since it had combined its UVW technology with a commercial approach. IFC further catalyzed co-investments of US\$ 1.35 million, enabling WHI to set up operations in India.⁵¹ WHI carried out its operations in India through its subsidiary WaterHealth India (WHIN).

The immense potential provided by the Indian rural market prompted WHI to launch a pilot project in Bomminampadu⁵² with the aim of preventing water-borne diseases and supplying clean drinking water to the poor in 2005. WHI set up a CWS in association with the NAANDI Foundation⁵³ (NAANDI). According to Gadgil, “We team up with local organizations because they understand the language and the culture. People in the villages trust them.”⁵⁴

WHI sold coupons to families that could be redeemed at CWS for potable water. Some families preferred water to be delivered to their houses for an extra amount. This opened up opportunities for local entrepreneurs who delivered water to houses for some extra money. As part of the CWS, an educational program was conducted by the NGOs that taught the villagers about issues related to health and hygiene and also encouraged them to use potable water.

According to WHI, the cost of this turnkey operation was US\$ 50,000 which was comparatively lower than similar capacities such as bore wells. In India, the financing for the installation of the CWS was done through ICICI Bank⁵⁵.

The village had a population of 3,200 and the launch of the water disinfection system was adopted by 60 percent of the households. The villagers and the local leaders noted that there was a drastic reduction in people getting affected by water-borne diseases. On seeing the improvement in the village, M Ganga Bhaima, *Sarpanch* (Head) of the village, said, “I feel as if I have given a new lease of life to my village. By drinking this good water, they will enjoy good health and live a good life.”⁵⁶ In addition to providing potable water, WHI also generated employment for the local community. Each CWS had three part-time employees – two technical workers and a social worker for educating the community on health issues.

⁴⁹ www.intwot.org

⁵⁰ “WaterHealth India,” www.waterhealth.com.

⁵¹ “Sustainability Business Innovator Annual Report 2008,” www.ifc.org, September 2008.

⁵² Bomminampadu is a village in the Krishna district of the Southern Indian state Andhra Pradesh.

⁵³ NAANDI Foundation is a public trust that works in affiliation with the government, the society, and the several corporate houses for serving the underprivileged.

⁵⁴ David Pescovitz, “Community Water Works,” www.coe.berkeley.edu, April 1, 2005.

⁵⁵ ICICI Bank is the second largest bank in India. It is a private sector bank started in 1994 and has subsidiaries and affiliates in the areas of investment banking, life and non-life insurance, venture capital, and asset management.

⁵⁶ “The Village of Bomminampadu is a Clean-water Pioneer,” www.waterhealth.com/worldwide-operations/study1.php.

In 2005, WHI installed its CWS at another village, Akividu⁵⁷. WHI conducted health campaigns in the village in an attempt to educate villagers about the benefits of using clean water. The community leaders also supplied clean drinking water to school children. The beneficiaries and people who partnered with WHI were all praise for these water systems as they had not believed that it was possible to have a solution to the problem of unsafe water that was both reliable and affordable.

Buoyed by the acceptance of the UVW technology, students at Berkeley Labs started conducting similar experiments to carry out water purification projects in the underserved communities of Mumbai in 2005. In the following year, WHI's operations in India got a significant boost with ICICI Bank deciding to support the company's expansion in India. On October 10, 2006, ICICI Bank extended around US\$ 865,000 for setting up CWSs in India.⁵⁸ In 2006, 50 CWSs were set up in Andhra Pradesh.

On February 9, 2007, WHI launched the 'Blue Revolution' initiative in India. The aim of the initiative was to eventually supply safe water to more than 2 billion people who had either little or no supply of potable water. The initiative was launched in association with several private companies, NGOs, and government organizations in a bid to solve the health crisis at a global level. WHI's Blue Revolution in India was inspired by the success of the Green Revolution⁵⁹ in the country. Commenting on the launch, Addy said, "India has been a touchstone for WaterHealth International to demonstrate the sustainability and viability of its clean water initiatives. We hope to have the same impact on India as the Green Revolution did on agriculture, and we intend to make this a global initiative."⁶⁰

WHI encouraged local franchisees, entrepreneurs, and village organizations in Andhra Pradesh to set up CWSs. It sold the equipment to NAANDI which took the responsibility of marketing the units. For local entrepreneurs, the cost of setting up a CWS was estimated at Rs. 2-2.3 million.⁶¹ Funding of nearly Rs. 1.5 million was offered through financial institutions while the remaining was funded by WHI. WHI offered water to rural consumers in 15 liter cans at Rs. 1.50.⁶² Using this money, the entrepreneurs repaid the loans (Refer to Exhibit VII WHI's operational structure in India).

Subsequently, WHI scaled up its operations in India at a rapid pace. On July 21, 2007, WHI announced that over 100 CWS had been set up in Andhra Pradesh. These centers were operational in Krishna and West Godavari districts⁶³ and offered potable water to over 250,000 people.⁶⁴ The number of CWSs installed in India had increased to over 200 by 2009. For its future installations, WHI planned to integrate rainwater harvesting capabilities to its UVW systems.

⁵⁷ Akividu is a village in the West Godavari district of Andhra Pradesh.

⁵⁸ "ICICI Bank Funds WaterHealth International's India Initiative," www.waterhealth.com, October 10, 2006.

⁵⁹ The term Green Revolution is used to refer to the period from 1967 to 1978. India, post independence, struggled with food security. The Green Revolution started in 1967, is a term coined to denote the use of modern agricultural practices like double cropping, use of synthetic pesticides, using hybrid seeds, etc. adopted to solve the food crisis.

⁶⁰ "WaterHealth International Announces the Launch of the Blue Revolution," www.indiaprwire.com, February 9, 2007.

⁶¹ As of October 2009, US\$1 approximately equals Rs. 45.85.

⁶² Nachiket Mor, D Chattanathan, and Rajiv Panthary, "Enhancing the Flow of Credit and Managing Risks in Agriculture," www.nachiketmor.net/EnhancingFlowofCreditandManagingRisk.pdf.

⁶³ "WaterHealth Announces More than 100 WaterHealth Centres in Andhra Pradesh," www.waterhealth.com, July 21, 2007.

⁶⁴ "Global Philanthropy 2007 Year in Review," www.zicklincenter.org, 2007.

WHI in the Philippines

WHI had started its worldwide operations by setting up a subsidiary at Manila, the Philippines, in 1997. The company offered its franchisee model to local entrepreneurs in the Philippines so that they could sell potable water to the poor. The model enabled proprietors of 'mom and pop' stores to own and operate branded WHI water stores called 'Aqua Stores'. Moreover, they could benefit from the know-how of WHI – such as location of setting up a water store, expected level of delivery and foot traffic, and managing finances and technical services.

The franchisees had to pay US\$ 8,000 as a fee to set up a franchise and for the turnkey operation. The Philippine government regulated the water stores. A WHI store could occupy 20 to 30 square meters of storefront. The stores were given access to well water or municipal water and electricity. Experts felt that the franchise model offered by WHI established a commercial model and also offered entrepreneurship opportunities for people who planned to own and operate businesses on their own. The franchisees were offered training by WHI professionals on operating the stores in compliance with sanitary and quality standards.

The UVW system was purchased by the state government and a private entrepreneur took up the responsibility for distribution and installation and also provided follow-up maintenance of the system. The Rotary Club⁶⁵ also gave access to finances by offering loans to the local communities for installation of the UVW systems in Manila. The systems were installed in places where a centralized water piping system was expensive for local governments and chlorination was not a feasible option due to its maintenance costs.

The UVW systems were installed in three different approaches. In Manila, 90 units were installed on a for-profit basis. The Rotary Club installed 10 units in and around the slums of Manila by offering a revolving loan. After having targeted the rural areas, WHI also tapped the potential in the urban areas of the Philippines. In 1999, WHI set up a few WaterHealth Philippines and Aqua Sure Water Store franchises for offering clean water at affordable prices to more than 100,000 people living in urban areas.

By May 1999, the WHI distributor in the Philippines had 37 'Aqua Sure' water stores in urban areas and 30 water centers in rural areas. Nearly 50,000 people had access to safe and drinking water offered by WHI at one-third of the price of bottled water. In 1999, the Rotary Club allotted funds for setting up of UVW systems in nine schools in the Philippines. WHI's Manila operations resulted in income generation for workers and local entrepreneurs.

In 2003, WHI entered into a joint venture with Bendix Sales Corporation⁶⁶ (Bendix) in the Philippines and formed WaterHealth Philippines with WHI holding 65 percent of the shares and the rest by Bendix.⁶⁷ With this JV, WHI aimed to enter the water service provider market in the Philippines. By 2007, Manila had nearly 50 WHI franchisee water stores. Most of them were installed through the Rotary Club.⁶⁸

⁶⁵ The Rotary Club facilitated access to loans thereby helping in the establishment of a sustainable water disinfection system for people of Manila.

⁶⁶ Bendix Corporation was WHI's private partner in Philippines that facilitated the purchase of UVW units.

⁶⁷ "Project Sponsor and Major Shareholders of Project Company," www.ifc.org/ifcext/spiwebsite1.nsf/o/f81bc93eb0010f4785256e44007e87fa?OpenDocument.

⁶⁸ "Mobilizing Science-Based Enterprises for Energy, Water, and Medicines in Nigeria (2007)," <http://books.nap.edu>, 2007.

WHI in Ghana

On December 12, 2007, WHI launched its first WHC in Ghana through its subsidiary WaterHealth Ghana. The water facility was located at Afuaman, a rural community in Ghana. After launching the WHC, Addy said, “I am pleased to witness our first endeavor in Ghana come to fruition. As a son of Ghana, this project holds special significance for me. This has been truly a team effort among government officials, World Vision Ghana, and WaterHealth and I am confident that it will be the first of thousands in the country and West Africa.”⁶⁹

Addy saw potential in Ghana since there was a population of around 2 million people with around 50 percent of the population having no access to potable water. It was also estimated that around 70 percent of illnesses were due to water-borne diseases in Ghana.⁷⁰ WHI had worked with the local communities in Ghana to train them on the installation of water disinfection systems. The company also conducted several education campaigns for educating the community members on the significance of health and hygiene. WHI’s initiative to supply potable water to the people of Ghana was embraced by the government.

As of mid-2009, there were six WHCs in Ghana, five of which were funded by SafeWater Network⁷¹.

WHI Installations in Other Countries

In 1998, WHI started its operations at Guerrero, Mexico. The Guerrero Department of Health (DoH) bought 60 UVW systems from WHI.⁷² In 1999, the State Government of Guerrero purchased and installed 75 units in the rural areas of Mexico.⁷³ The UVW systems were installed near locations such as schools, households, and health clinics. The communities were entrusted with the responsibility of maintaining the system and paying for any replacement of parts and for the electricity required by the system.

The installations of disinfection systems in Mexico adopted a public-private approach where the state government purchased the system and a private entrepreneur took care of the process of installation, maintenance, and distribution. The DoH entered into a contract with an engineer to visit places where the UVW systems were installed four times a year in order to make technical repairs if required and deliver replacement consumables.

By 1999, WHI had installed over 175 UVW units in rural villages of Guerrero in Mexico and Manila in the Philippines to provide safe drinking water to more than 300,000 people, according to WHI.⁷⁴ According to WHI, the total investment for setting up water stores at Guerrero and Manila was US\$ 5,690,000 of which 80 percent was invested by the private sector organizations like Bendix (US\$ 1,000,000), WHI (US\$ 3,500,000), and Pew Charitable Trust⁷⁵, Mertz-Gilmore Foundation⁷⁶, and Rockefeller Foundation⁷⁷ (US\$

⁶⁹ “First WaterHealth Centre Inaugurated in Afuaman,” www.waterhealth.com, December 12, 2007.

⁷⁰ “WaterHealth Ghana,” <http://www.waterhealth.com/worldwide-operations/ghana.php>.

⁷¹ Headquartered in Westport, Connecticut, Safe Water Network is a non-profit organization founded with the stated aim to provide potable water to the poor.

⁷² Carol Kolb deWilde, Anita Milman, Yvonne Flores, Jorge Salmerón, and Isha Ray, “An Integrated Method for Evaluating Community-based Safe Water Programmes and an Application in Rural Mexico,” heapol.oxfordjournals.org/cgi/content/abstract/czn01.

⁷³ “Ultraviolet (UV) Waterworks,” www.pi.energy.gov/documents/EWSLmexicoPhilippinesUVW.pdf.

⁷⁴ “Ultraviolet (UV) Waterworks,” www.pi.energy.gov/documents/EWSLmexicoPhilippinesUVW.pdf.

⁷⁵ Pew Charitable Trust is a US-based organization that adopts a rigorous approach to encourage civic life and improve public policy. The company partners with several public and private organizations that work for the benefit of the society.

105,000). The remaining funding was done by public sources such as Guerrero State with US\$ 750,000 and the United States Agency for International Development⁷⁸ (USAID) and United States Department of Energy (USDoE) with US\$ 335,000.⁷⁹

In February 1999, a UVW system was installed at a rural health clinic, Greenock Clinic, located near Dundee, KwaZulu-Natal, South Africa. The clinic mostly diagnosed children for diarrhea caused due to drinking of contaminated water. The installation was funded by the USDoE through Berkeley Lab and the US South Africa Binational Commission⁸⁰. The UVW units were donated by WHI.⁸¹

In early 1999, WHI installed its first UVW system in Bangladesh with the support of the USDoE. The company sourced surface water to disinfect and purify it since the water resources were heavily contaminated with arsenic. UVW systems could not remove arsenic from the water. The system provided water to nearly 2,000 people daily.⁸²

In September 2008, WHI in association with IFC started a project to offer 50 UVW systems in Sri Lanka. As part of this project, WHI aimed to offer potable water to nearly 100,000 people affected by the Tsunami^{83, 84}. WHI utilized private and public resources to identify the needs of the local consumers, provide training to local operators and partners, and maintain the systems. Over time, WHI intended to scale up its operations in the country by moving to permanent locations and increasing the access to clean and safe drinking water.

WHI's water systems were also installed in countries such as Tanzania, El Salvador, Nepal, Tibet, Uganda, Haiti, Nicaragua, and the Honduras in different configurations.^{85, 86}

SCALING UP

Many investors were attracted by the business model and ingenious technology adopted by WHI. This led to WHI scaling up significantly after it emerged from bankruptcy in 2002. It worked collaboratively with the local communities, government, and private sponsors to raise funds for installing the water purification systems in several places worldwide. Experts felt that the system could be easily scaled up to provide potable water to a broad range of population groups. The innovative UVW technology attracted several investors and this helped WHI in scaling up its business model.

⁷⁶ Mertz-Gilmore Foundation is a New York-based private organization that promotes and supports health communities, human rights, sustainable environment, and performing arts.

⁷⁷ Established in 1913, Rockefeller Foundation is a US-based philanthropic organization that funds intractable challenges faced worldwide.

⁷⁸ The United States Agency for International Development is a US-based federal government organization that provides humanitarian and economic assistance across the world.

⁷⁹ "Ultraviolet (UV) Waterworks," www.pi.energy.gov/documents/EWSLmexicoPhilippinesUVW.pdf.

⁸⁰ Founded in March 1995, the US South Africa Binational Commission facilitates a bilateral cooperation between the US and South Africa to make sure that the key mutual concerns are discussed at the highest level of the government.

⁸¹ "UV Waterworks Field Installations," <http://eetd.lbl.gov/iep/archive/uv/pdf/XBD9905-01059.pdf>.

⁸² "UV Waterworks Field Installations," <http://eetd.lbl.gov/iep/archive/uv/pdf/XBD9905-01059.pdf>.

⁸³ On December 26, 2004, an earthquake (measuring 9.3 on the Richter scale) in the Indian Ocean occurred off the coast of northwest Sumatra, Indonesia unleashed a tsunami that caused massive destruction and death across coastlines of Thailand, Indonesia, Sri Lanka, India, Maldives, and even distant Somalia.

⁸⁴ "WaterHealth International Tsunami Relief Effort," www.waterhealth.com.

⁸⁵ Patricia Sullivan, "Rx for H₂O, in Two Parts," <http://umassmag.com>, Fall 2006.

⁸⁶ "Global Water Solutions through Technology," www.calumet.purdue.edu, October 23, 2008.

The government provided support to WHI for setting up WHCs. In some countries, the government also provided funding.⁸⁷ The financing was offered through banks too in some countries. At a time when the global economic scenario was becoming grimmer, WHI was able to attract funds to fuel its expansion. In January 2007, (WHI) received funds of more than US\$ 11 million in venture capital from Dow Venture Capital, ICICI Bank, SAIL Venture Partners, and Plebys.⁸⁸ In September 2007, WHI received loan guarantees of US\$ 30 million from Dow Venture Capital to expand its operations in India.⁸⁹ Experts felt that the company would set up nearly 2,000 WHCs using these funds.⁹⁰

In September 2008, IFC signed a mandate with WHI for an equity investment of US\$ 25 million for WHIN. WHI planned to install CWSs in more than 2,000 villages, serving a population of 10 million rural consumers by the end of 2009.⁹¹

In January 2009, WHI received funding of US\$ 10 million in venture capital from Dow Venture Capital to expand its operations globally.⁹² This marked the first close of its Series D funding for scaling up its operations. According to Addy, “We are pleased by the confidence exhibited in WaterHealth by our current investors. As we move to rapidly expand the number of communities we serve and achieve unprecedented scale, access to capital is critical to our continuing success.”⁹³

In February 2009, WHI entered into an agreement with IFC to fund over 600 communities for the purchase of UVW systems over a period of 18 months. IFC offered a funding of US\$ 15 million to serve over 3 million people in India.⁹⁴

The funds helped WHI to scale up and as of January 2009, the company had installed around 600 water systems in developing nations worldwide.⁹⁵ “Today, Water Health International serves over 350,000 paying customers in over 200 villages. And so we have a model that we know can be sustainable, that we know can scale and now we face a whole different set of choices around [...] supporting the company to help the government see if there are possibilities for outsourcing. Using it as a model for replication in other countries, in other areas, and using the company to scale itself,”⁹⁶ said Jacqueline Novogratz, founder and CEO of Acumen Fund. (Refer to Table II for number of WHC installations: 2005-2008)

Table II
Number of WHC Installations: 2005-2008

Year	New sites
2005	2

⁸⁷ “Drinking Water Treatment Becomes More Affordable with U.S. Help,” www.america.gov, January 12, 2009.

⁸⁸ Lauren Abendschein, “Major Investments Open New Markets for Water Services,” www.nextbillion.net, January 10, 2007.

⁸⁹ “Sustainability Business Innovator Annual report 2008,” www.ifc.org, September 2008.

⁹⁰ “Dow & WHI to Provide Water Systems for 11 Million People in India,” <http://news.dow.com>, October 2, 2007.

⁹¹ “Sustainability Business Innovator Annual Report 2008,” www.ifc.org, September 2008.

⁹² “O.C. Clean-water Firm Gets \$10 Million Investment,” www.oregister.com, January 19, 2009.

⁹³ “WaterHealth International Announces First Close of Series D Funding,” www.waterhealth.com, January 13, 2009.

⁹⁴ “WaterHealth International Announces \$15 Million Financing by IFC,” www.reuters.com, February 16, 2009.

⁹⁵ “WaterHealth Completes \$10 m Series D Funding,” www.financialexpress.com, January 16, 2009.

⁹⁶ David Serchuk, “Debriefing Jacqueline Novogratz,” www.forbes.com, May 5, 2009.

2006	>40
2007	>140
2008	>300

Source: WaterHealth International, Inc. (WaterHealth Ghana), Presentation at the AQUAYA Workshop in Nairobi Kenya 26th June 2009.

THE CHALLENGES

WHI had to negotiate various challenges over the years. Some of these still posed significant obstacles in the way of its achieving its mission. WHI's initial challenges lay in the cost of its UVW system since most of the communities targeted by WHI were under-served and lacked adequate capital to install the system. Moreover, a few villagers were unhappy that they had to pay for drinking water which, till then, had been free. It was also reported that several local residents still fetched water from contaminated resources despite the availability of potable water. "The old water is free,"⁹⁷ said Dhana Lakshmi, a local resident in a village in India. To tackle this problem, Addy partnered with several NGOs to educate villagers about the significance of drinking clean water. This also led Addy to advocate the use of a financing structure that required communities to make 30 to 40 percent down payment while the rest of the amount was arranged as a loan by WHI.⁹⁸

Critics also felt that the UVW systems were expensive. Verghese Jacob (Jacob), lead partner at the Byrraju Foundation⁹⁹, which installs water purification systems in the villages of India, said that his plants cost less than that of WHI's and that they also charged less for water. Jacob added, "WaterHealth has good intentions, but unless they can bring the costs down, it's not really sustainable."¹⁰⁰ But Addy argued that the model adopted by Byrraju Foundation was not sustainable as it depended on subsidies. However, some of WHI's investors too believed that WHI's business model was expensive. According to Brian Trelstad, chief investment officer for Acumen Fund, "The business model is still a little too expensive to be easily affordable for villages, but we think it will work long-term."¹⁰¹

In addition to the installation costs, experts contended that the system did not address risks associated with post-contamination. They said that there was no residual disinfectant in water that could address this challenge. Moreover, the UV lamps required electricity to operate the system, which was challenging since most of the rural communities had little or no access to electricity. The company addressed this concern in Ghana by including a solar panel with the WHCs. However, this option was not configured in WHCs in other countries.

⁹⁷ Peter Wonacott, "Behind One Effort to Tap into India's Water Market," <http://online.wsj.com>, August 14, 2007.

⁹⁸ "WaterHealth Lands \$10M for UV Water Purification," www.greentechmedia.com, January 14, 2009.

⁹⁹ Founded in July 2001, by Satyam group of companies, Byrraju Foundation is a philanthropic organization.

¹⁰⁰ Steve Hamm, "A For-Profit Brings Clean Water to the Poor," www.businessweek.com, November 25, 2008.

¹⁰¹ Steve Hamm, "A For-Profit Brings Clean Water to the Poor," www.businessweek.com, November 25, 2008.

Another significant challenge was that the UVW system was not suitable for brackish and saline water. Also, it could not purify arsenic and fluoride from water. However, the company said it was making efforts to address this issue. According to WHI, “WaterHealth is continually innovating, as well as evaluating, new technologies that will eventually enable us to reduce the salt content of brackish water in addition to disinfecting it.”¹⁰² As of 2009, Gadgil was leading the company’s effort in this area.¹⁰³

OUTLOOK

By mid-2009, WHI was providing safe drinking water to more than one million people around the world. The company was successful in attracting capital for scaling up its operations despite the economic situation continuing to be grim.

Experts felt that WHI’s efforts at providing potable water to the poor would significantly contribute to achieving the UN Millennium Development Goals (MDG) by 2015. They also noted that various organizations with different business models had come up to address the problem of providing safe water to needy communities (Refer to Exhibit VIII for some business models adopted by organizations operating in the safe water sector). WHI contended that the BoP segment offered a lot of opportunities for competitors to tap the segment since it was estimated that there were nearly 2 billion people who lacked access to clean water. According to Addy, “We want to play a leadership role in delivering clean water, but the market opportunity is certainly large enough to accommodate a number of players.”¹⁰⁴

As of 2009, WHI was led by a professional management team with Sanjay Bhatnagar¹⁰⁵ as the CEO. Addy was a member of the board of directors while Gadgil acted as the scientific advisor to WHI (Refer to Exhibit IX for WHI’s management team and board of directors). The management team planned to expand WHI’s reach globally. According to WHI, “WaterHealth plans to develop its business on a worldwide basis. Our choices for near-term market entry will be influenced by the areas of greatest need, where our business approach and market conditions will allow rapid deployment of our systems to make a meaningful impact on water-borne diseases on a sustainable basis. Beyond our current initiatives in India, the Philippines, and West Africa, we are evaluating needs and opportunities in other parts of the world, including the U.S., Latin America, and several Asian countries.”¹⁰⁶ WHI was also designing a Home/Institutional system that would bring potable water to homes at affordable prices. Experts opined that such point of entry (POE) systems were suitable to institutions or homes that lacked a connection to a municipal water system. Furthermore, WHI was engaged in developing an Emergency Relief Unit (ERU) that had the ability to be deployed in any place across the world for supplying clean drinking water in cases of any emergencies or natural disasters.

¹⁰² www.waterhealth.com/water-crisis/faq.php

¹⁰³ “Global Water Solutions through Technology,” www.calumet.purdue.edu, October 23, 2008.

¹⁰⁴ “Go Green, Get Rich,” <http://money.cnn.com>, April 4, 2007.

¹⁰⁵ Sanjay Bhatnagar is also the founder of the THOT Capital Group (TCG), a private equity firm based in New York. Prior to setting up TCG in January 2001, Sanjay was the CEO of Enron Broadband Services for the Middle East and Asia. He was also Chairman and CEO, Enron South Asia. Before this, he worked for Schlumberger as an engineer and manager in several countries worldwide.

¹⁰⁶ www.waterhealth.com/water-crisis/faq.php

Experts too felt that WHI should ramp up its presence since there was tremendous potential to be tapped in the safe water sector. According to experts, in the estimated US\$ 400 billion global water industry, billions of people remained underserved.¹⁰⁷ (Refer to Table III for the underserved rural population worldwide).

Table III
Underserved Rural Population Worldwide

Country	Rural population (million)	Villages (approximately)
India	800	650,000
China	740	600,000
Africa	600	500,000
Rest of the World (excluding North America and Europe)	1,000	>750,000

Source: WaterHealth International, Inc. (WaterHealth Ghana), Presentation at the AQUAYA Workshop in Nairobi Kenya 26th June 2009

Experts opined that WHI, with its unique offering and business model, was well placed to take advantage of the opportunities before it. However, they also pointed out that the road ahead would not be easy. Part of the challenge was to further improve its offering to make it more relevant to the target segment and also make them realize that spending a small amount of money for such a vital resource was well worth the investment. Obtaining the capital to help more communities finance these water systems, so as to ultimately achieve significant scale relative to the magnitude of the problem, was another challenge.

¹⁰⁷ "WaterHealth International, Inc. (WaterHealth Ghana)," www.aquaya.org/files/nairobi.../Mawunyo_Puplampu.pdf, June 26, 2009.

Exhibit I: WHI's Vision and Values

The WaterHealth Vision

To be a part of a focused, long-term solution to the global water crisis.

- To find sustainable and affordable ways to provide safe water to the underserved, worldwide.
- To inspire business success and innovation, with a core social purpose.

Commitment to the Environment

WaterHealth is committed not only to reach safe water to the underserved but also to recharge and replenish the global water table in a mission to return to the environment what humankind is taking from it. We provide solutions that minimize negative impact on the environment and see a greater role today and in our future in the sphere of green economics.

Commitment to Human Health

Products and services from WaterHealth stem from a powerful sense of concern about the impact of unsafe water on human life. We believe that those deprived of safe water are deprived in the truest sense of the term and we are guided by a commitment to these millions of underserved, everywhere. We constantly innovate to seek out solutions that can be afforded by even the underserved poor.

Commitment to the Future

The future is a fundamental *raison d'être* for us at WaterHealth. We bank on our uncompromising ethical considerations above all else and this, with our constant endeavors to define new standards in quality, makes us a sustainable, future ready business ecosystem. A thriving force that inspires and empowers our employees, beneficiaries and all stakeholders.

Source: www.waterhealth.com/company/vision.php

Exhibit II: How the UVW Technology Worked

The UVW technology included a UV disinfection system that delivered UV light for inactivating microorganisms by disrupting their DNA. The small-scale, energy-efficient, and low-maintenance design of the UVW unit was a uniquely affordable and effective device. It operated using the equivalent of a 60-Watt light bulb at a cost of 4-5 cents per ton of water to provide drinking water to 2000 people. The flow of water into the UV chamber was powered by gravitational force. It purified 15 liters of water per minute. It deactivated 99.995 percent of the microbial contaminants with the help of a germicidal UV lamp which employed a UV dosage of 120 Mj/cm², disabling the DNA of the micro-organisms in the water.¹⁰⁸ This UV dosage was three times higher than the 40 mJ/cm² prescribed by the Environmental Protection Agency¹⁰⁹ (EPA) and the National Science Foundation¹¹⁰ (NSF). This very high safety margin ensured that communities had an adequate amount of purified drinking water even when their only drinking water source was one which was highly contaminated.

The UVW unit required very little maintenance and was designed in such a way that in case of any malfunction, an electrical valve would shut down the entry port to the device, so that water did not enter it.

WHI tested its UVW technology in third-party laboratories in order to know its efficacy across several viruses, bacteria, and parasites causing water-borne diseases. It received certification from the State of California as a 'Class A device'. It also received validation in South Africa, the Philippines, Mexico, and India.¹¹¹ Experts felt that the UVW system was an absolute water disinfection system that removed bad taste, odors, and silt in addition to killing microorganisms causing waterborne diseases. The water purified through this technology exceeded the WHO standards of potable water.

WHI's UVW technology differed from conventional UV systems, ozonation, reverse osmosis, and chlorination. The benefits of the technology included high efficacy combined with high throughput, a small footprint, and long-term reliability. The modular design meant that systems could be scaled to serve communities of various sizes. Non-proprietary components that were coupled with UVW in WHI's installations were readily available in most parts of the world. Ease-of-use and low maintenance requirements meant that the systems could be deployed even in the most remote locations. It released no by-products, no toxic waste, and no water waste. Moreover, it was robust and long-lasting (Refer to Table for a comparison between WHI and other technologies for water purification). WHI's water purification system had a modular design that had the ability to scale itself depending upon the need to serve the communities (Refer to Figure for a diagram of WHI's UVW system).

¹⁰⁸ http://www.lbl.gov/tt/success_stories/articles/WHI_more.html

¹⁰⁹ Headquartered in Washington, the Environmental Protection Agency is set up to protect the environment and human health.

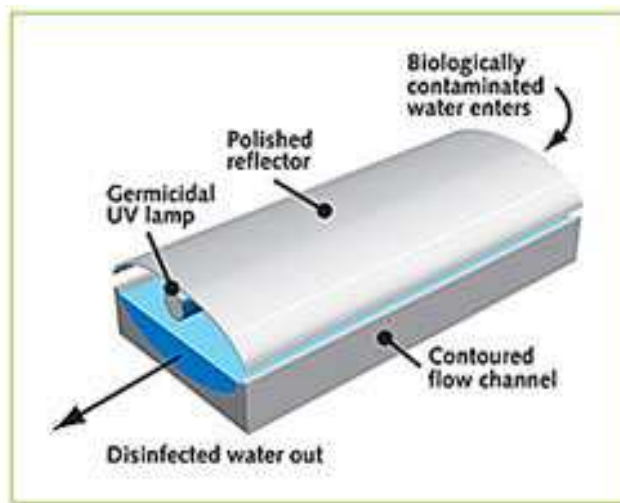
¹¹⁰ Founded in 1950 by the US Congress, the National Science Foundation is a federal agency set up "to promote the progress of science; to advance the national health, prosperity, and welfare; to secure the national defense..." (Source: www.nsf.gov).

¹¹¹ "Frequently Asked Questions," www.waterhealth.com.

Table
WHI and Other Technologies for Water Purification

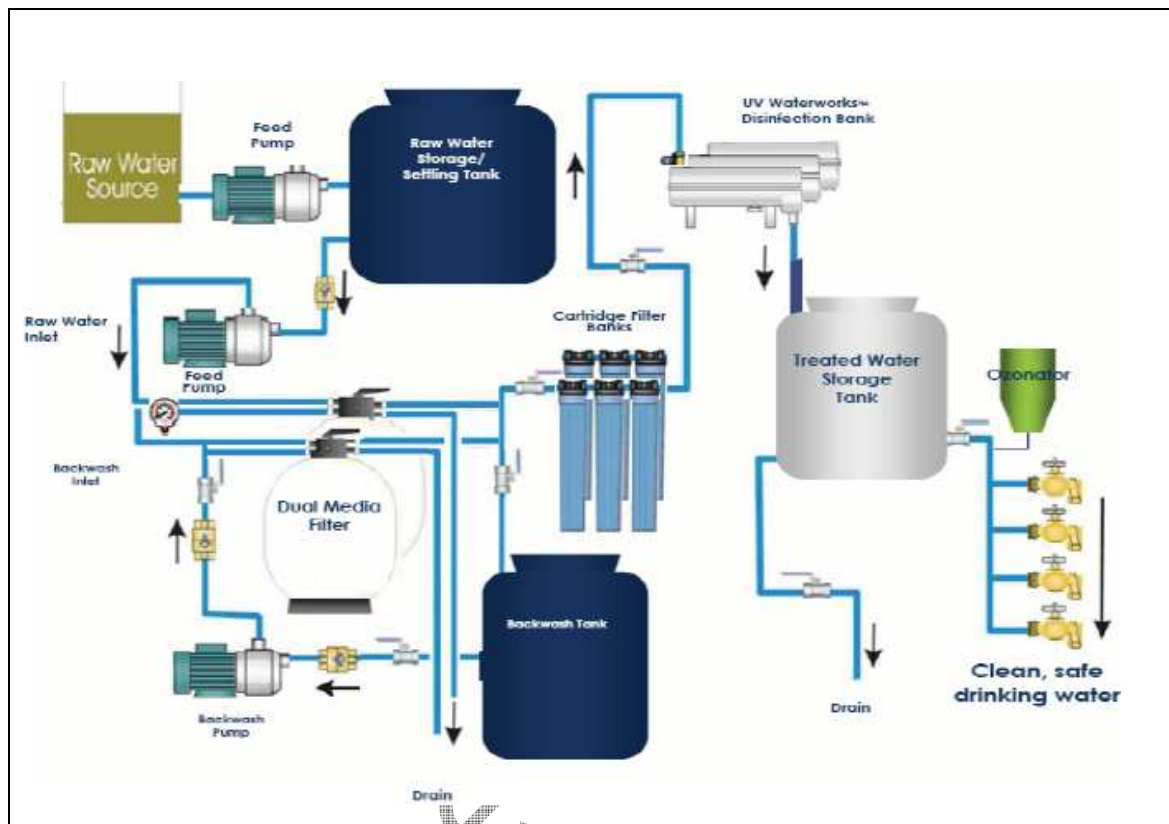
Factor	WHI Technology	Conventional UV	Reverse Osmosis	Ozonation	Chlorine
Suitable for treating bacteria & viruses	Yes	Yes (if sufficient UV dose)	No (if low pressure household unit)	Yes	Yes
Suitable for treating cysts	Yes	Yes (if sufficient UV dose)	Yes	Yes	No
Cost/performance ratio	Low	High	High	High	High
Operations & maintenance needs	Low	High	High	High	High
Energy use	Very Low	Low	High	High	Very Low
Inventory, storage & transport needs	Low	Low	Low	Low	High
Overdose risk	No	No	No	No	Yes
Harmful by-products in water	No	No	No	No (unless bromide is present)	Yes
Requires Pressurized System	No (unless pumps are required)	Yes	Yes	No	No

The UVW systems had several applications. It could source surface water from lakes, ponds, rivers, and could also access groundwater resources. WHI was also developing solutions which could remove arsenic and fluoride from water.

Figure**WHI'S UVW System**

Compiled from various sources.

Exhibit III: A Typical System Configuration of a WHI System



Source: WaterHealth International, Inc. (WaterHealth Ghana) Presentation at the AQUAYA Workshop in Nairobi Kenya 26th June 2009.

Exhibit IV: Photographs of WHCs



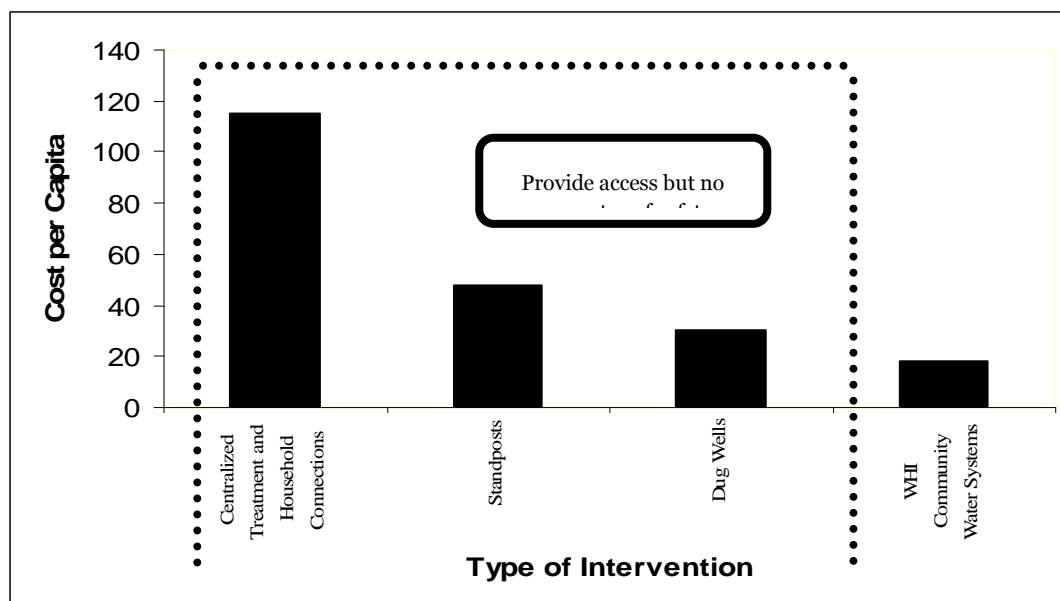
A WaterHealth Center in AP, India



A WaterHealth Center in Amasaman, Ghana

Source: <http://floatingsun.net/udai/files/Water%20Water%20Everywhere.ppt>;
http://www.aquaya.org/files/nairobi_presentations/Mawunyo_Puplampu.pdf.

Exhibit V: WHI's Investment Cost Advantage vs. Other Options



Source: "Global Water Solutions through Technology," www.calumet.purdue.edu, October 23, 2008.

Exhibit VI: List of Awards and Recognition Received by Gadgil and his UVW Technology

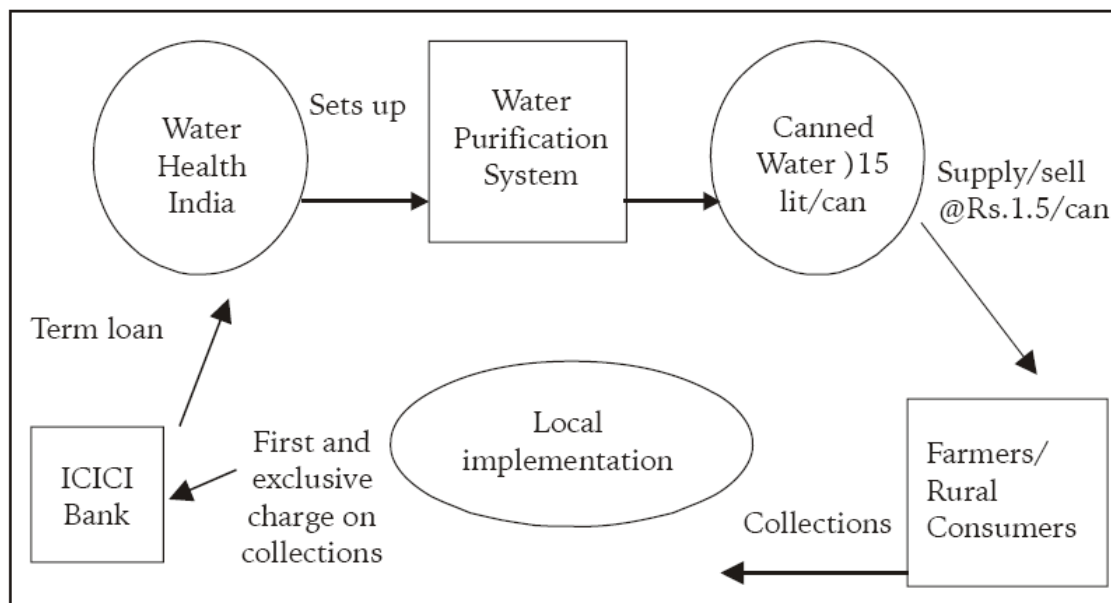
1996	UVW technology was named as the 'Best of What's New' by Popular Science magazine.
	Gadgil received an award for technology innovation by Discover Magazine.
1997	UVW technology listed in US News and World Report's '20 Ways to Save the World'.
1999	Discover Magazine honored the UVW invention as 'Best of the Decade'
2004	Gadgil received the Tech Museum Awards Laureate for inventing a new technology for the benefit of mankind.
	Gadgil received the Affymatrix Health Award as part of Tech Museum Awards.
2005	Gadgil was named Trendsetters and Heroes of Public Works by Public Works Magazine.
2006	Gadgil was included in the 'Modern-day da Vincis' list by the Chicago-based, Museum of Science and Industry.
2007	WHI listed in the 'Ten to Watch' list of 'The Clean Tech Revolution', a Harper Collins Publication book.
2007	<i>Business 2.0</i> profiled WHI in an article titled 'Saving the planet has suddenly become good business'
2007	Toshiba Green Innovation Award by Toshiba America Inc. ¹¹² and Orange County Innovation ¹¹³ (OCI)
2007	Listed in Clean Tech Revolution's 'Ten to Watch'

Compiled from various sources.

¹¹² Toshiba America Inc. is one of the leading manufacturers of electronic and electrical products.

¹¹³ Orange County Innovation is an association of service, academic, and business leaders devoted to promote the OCI as an innovation powerhouse.

Exhibit VII: WHI Operational Structure in India



Source: Nachiket Mor, D. Chattanathan and Rajiv Panthary, "Enhancing the Flow of Credit and Managing Risks in Agriculture," www.nachiketmor.net.

Exhibit VIII: Some Business Models Adopted by Organizations Operating in the Safe Water Sector

Business Model	Definition	Examples	Key Risks
Earned income—unit sales	Revenue from volume or unit sales of product	Hindustan-Unilever Packaged-water vendors (such as those found in Ghana, the Philippines, and Indonesia)	Creating aspirational demand through branding, pull-marketing; competition from knock-offs; rural distribution
Earned income—advertising and leasing revenue	Revenue from sale of advertising space and easing of retail space	Iko-toilet	Maintaining high visibility of facilities

Business Model	Definition	Examples	Key Risks
Earned income—microfinance	Deferred payment for product	Safe Water and AIDS Project ACCESS AED/POUZN	Transaction costs; interest rates; long payback period; MFIs' capacity and reputation; credit default
Earned income—franchising	Income from licensing branded water-vending service	Odanthurai Packaged Drinking Water Federation IKOtoilet	Maintaining consistent quality and execution among franchisees
Earned income—blended	Fees from products <i>and</i> services	IKOtoilet WaterHealth International	Maintaining adequate revenue mix
Contributed income	Indirect beneficiary (e.g., government or NGO) pays for product or service	Vestergaard-Frandsen	Donor dependence; competing technologies
Hybrid blended income	Earned and contributed income sources	International Development Enterprises Population Services International NAANDI Foundation	Donor dependence; market distortion from subsidies; balancing cash flows from different sources; maintaining sustainable ratio of donor versus market revenue sources

Source: International Finance Corporation, "Safe Water for All: Harnessing the Private Sector to Reach the Underserved," www.ifc.org/ifcext/...nsf/...SafeWaterReport/.../IFC_WaterReport.pdf -

Exhibit IX: WHI's Management Team and Board of Directors

Management Team

- Sanjay Bhatnagar: Chief Executive Officer – Global
- Vikas Shah: Chief Operating Officer, WaterHealth India
- Ranabir Dutt: Chief Financial Officer - Global
- Thomas Weil: General Counsel
- Andrew L. Lux: Vice President, Worldwide Operations and R&D
- Mawunyo Puplampu: General Manager, WaterHealth Ghana
- Donald I. Palomar: General Manager, WaterHealth Philippines

Board of Directors

- F. Henry Habicht II, (Managing Partner of SAIL Venture Partners)
- Dennis Merens, (Director of Corporate Venture Capital)
- Richard C. Nell, (a J & J Veteran)
- Sanjay Bhatnagar
- Tralance Addy

Source: www.waterhealth.com

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