Universität St.Gallen

Marketing Safe Water to the Base of the Pyramid

A Case Study on a Social Enterprise Approach in Nepal

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Abstract

Access to safe water is central in the fight against poverty and to the achievement of the UN Millennium Development Goals. Thus projects and technologies for household water treatment are numerous. This thesis examines the Antenna Technologies Geneva WATASOL approach to safe water through chlorination, and reviews its strategy based on pilots begun in Nepal. These pilots consist of setting up social enterprises to market chlorine to the Base of the Pyramid population. The WATASOL model finds itself at the intersection of several significant trends, both in the private and in the public sectors, toward bottom-up, financially sustainable interventions seeking to create positive behavior change. The pilot projects spearheaded by the two non-profit organizations ECCA and VSBK in Nepal have shown that the WATASOL chlorine reaches the economic Base of the Pyramid. There is a willingness to pay among consumers and the technology should lend itself well to the creation of a sustainable venture. The option of creating a microfranchise system around the technology to scale up is examined. While microfranchising is an appealing possibility, scaling up is currently a premature phase in the case of the social enterprise pilots in Nepal.

Table of Contents

List of Figures

List of Tables

List of Abbreviations

AED	Academy for Educational Development
ATG	Antenna Technologies Geneva
BoP	Base of the Pyramid
BRIC	Brazil, Russia, India, China
BTI	Bertelsmann Transformation Index
CDC	Centers for Disease Control and Prevention
CIA	Center for Intelligence Agency
ECCA	Environmental Camps for Conservation Awareness
ENPHO	Environment and Public Health Organizations
HIP	Hygiene Improvement Project
HWTS	household water treatment and safe storage
MDGs	United Nations Millennium Development Goals
MNC(s)	multinational corporations
N-MARC	Nepal Social Marketing and Franchise Project: AIDS, Reproductive Health and Child Survival
NGO	non-government organization
NRs	Nepalese Rupee
PAHO	Pan-American Health Organization
POU	point-of-use
POUZN	Point-of-Use Water Disinfection and Zinc Treatment project
PSI	Population Services International
SODIS	solar water disinfection
SWS	safe water system
UNDP	United Nations Development Programme
UNICEF	United Nations Children's Fund
USAID	United States Agency for International Development
VSBK	Vertical Shaft Brick Kiln
WHO	World Health Organization

1. Introduction

The staggering figures of deaths due to waterborne diseases – 1'600 per day (Hammond, Koch, and Noguera 2009) - are so large they become, in the infamous words of Stalin, merely a statistic. Children in particular are vulnerable. Around 1.8 million die yearly worldwide from diarrheal causes and chronic diarrhea in early years contributes to malnutrition, stunting and cognitive impairment (WHO 2007). The sheer number of projects and solutions launched both by the private and the public sector to address the need for clean water are in part a reflection of the immensity of the issue's proportions and its significance in the overall fight against poverty. Access to safe water is fundamentally in attaining the UN Millennium Development Goals (MDGs) in health, gender equality, nutrition and childhood survival. This paper takes one safe water initiative – the Antenna Technologies Geneva (ATG) WATASOL program – and reviews its strategy based on pilots begun in Nepal. Initial reactions to the marketing of the chlorine product and methodology suggest very promising potential for the WATASOL model and its eventual scaling up. More time is required, however, for concrete results on the financial sustainability to emerge before expansion should proceed.

One may well ask, if there are already so many technologies in circulation addressing the safe water issue, why add yet another voice to the profusion of proposed solutions? The reasons are simple. Firstly, the developing world is vastly complex. As the development industry has discovered, the developing world is far from homogenous and many macro-level approaches to poverty alleviation have been declared failures. The micro, bottom-up approach is now being advanced as the more effective and sustainable way forward. But even this approach has found its limitations in replication and scaling up. Because of the complex context within any given developing country, it would be naïve to argue that one solution (or even a mere handful of solutions) for providing safe drinking water will succeed globally. Communities have different access to water and water collection habits, thus a variety of safe water approaches are necessary.

Secondly, different safe water projects have different goals. Some aim simply at reducing incidences of water-borne diseases in emergency and monsoon seasons. Others focus on precipitating sustained behavior change. Still others strive for financial profit. While all objectives are interlinked, the context and implementing agency are likely to determine which goal is to be most prominent in a project.[1]

[1] This paper is not interested in questioning motives of the legitimacy of different programming goals or the question of access to clean water as an essential human right. That discussion goes beyond the scope of what is feasible or helpful here,

The safe water market of Nepal is not a virgin landscape. Significant resources have been poured into social marketing and advertising of safe water and sanitation practices, including specific products for water purification. Still, success and take-up has been limited. The introduction of the ATG WATASOL technology currently being piloted in Nepal seeks to build on the progress made by other chlorine products and awareness campaigns while at the same time targeting a market need others have failed to meet. As such, the WATASOL project sits at the intersection of the development sector (seeking to eliminate poverty) and the private sector (seeking to create financial sustainability and eventually financial gain).

In order to analyze the WATASOL program's potential for marketing safe water to the Base of the economic Pyramid (BoP) in Nepal and scaling up, the theoretical and practical background of this project must be understood. Thus in Part I, after a brief description of the ATG's proposed approach, a literature review will outline where the private sector, the development sector and the emergent fourth hybrid sector find themselves. Tracing the context of Nepal then locates the WATASOL's approach against this theoretical and cultural backdrop. Part II reviews the preliminary findings of the WATASOL operations through two local implementing partners in Nepal. It begins with a review of the social marketing mix of the WATASOL products and then an analysis of specific questions regarding successful access to the BoP, willingness of customers to pay, and financial sustainability. A final part addresses the question of scaling up, specifically the feasibility and appropriateness of setting up a microfranchise. In closing, the implications of assessment and evaluation are considered as paramount prior to any expansion. These initial pilots have great potential, but time is necessary for their models to mature before scaling can be attempted.

While on-site observational research was conducted in Kathmandu and in two rural districts in the spring of 2009, this paper does not rely on statistical information gathered there. (The projects were still at the very beginning of their pilot phases so this type of information gathering was not possible.) Rather, this paper draws on qualitative interviews with key stakeholders and first-hand field observations. It seeks to integrate this with trends and lessons from the evolving sectors outlined in the first part, and compares them to findings from similar projects by other agencies in different locations.

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although it must be acknowledged that the beliefs of certain development organizations and institutions on the matter heavily influence the type of programming they fund.

2. Context

2.1. The proposal of the ATG WATASOL program

The use of active sodium hypochlorite (also known as diluted chlorine solution) is not a new method for treating water.[2] The active chlorine kills pathogens causing diarrhea in water, while residual chlorine left in the water helps prevent recontamination during transport, storage and handling. The World Health Organization (WHO) has declared water with 5mg/l of residual chlorine in it as safe to drink (WHO 2008, 325). A growing number of studies suggest that point-of-use (POU) water treatment (which includes chlorination) can very effectively reduce incidence of diarrhea, by as much as 20-30% (multiple, cited in Zwane and Kremer 2007). There are several chlorine products on the market in a variety of countries already, and certain central water supply systems in metropolitan cities have been using chlorine for decades.

What is innovative about the ATG WATASOL approach is its unique decentralized production of the active sodium hypochlorite and the distribution model this enables. After explaining briefly how the devices work, an outline of the comparative advantage that the ATG WATA devices have over other chlorine products follows.

2.1.1. The Antenna WATASOL proposition

At the heart of the Antenna Technologies WATASOL model is a simple WATA device with two electrodes. Placing this device in a container of water that has normal table salt dissolved in it and running an electrical current through it, will over time create a solution of active sodium hypochlorite. At the right concentration three drops of the chlorine solution produced are enough to disinfect one liter of water. The WATA devices come in three sizes: the Mini-WATA produces 1.2 liters of chlorine per 12 hour productive period and can thus supply 240 people with clean water. The Standard WATA produces 1 liter per hour, covering 2'400 individuals and the Maxi-WATA can produce 180 liters per 12-hour period, equal to 36'000 individuals (for more detailed statistics on the three WATA devices see Appendix A; (Antenna Technologies 2010a).

[2] In the 1990s the Centers for Disease Control and Prevention (CDC) and the Pan American Health Organization (PAHO) launched the Safe Water Systems program (SWS) that promotes the use of dilute sodium hypochlorite at point-of-use globally (USAID 2007).

Because of this decentralized and localized production mechanism, quality control becomes particularly important. In order to ensure that the concentration of the chlorine being produced is correct, a testing kit accompanies each WATA device. This includes two chemical tests and the necessary equipment to carry them out. One test is for the chlorine solution itself and measures its concentration. The second is for the water that is treated for the chlorine and ensures that there is enough residual chlorine (the WHO standard of 0.5 mg/l) signifying the water is safe to drink.

There are of course certain technical difficulties that come with producing chlorine in this decentralized way. Although the testing kit is simple in theory, sound training is required to ensure the person operating the device and selling the chlorine is indeed doing it correctly. Furthermore, although only salt, water and electricity are required to produce the chlorine solution, these are not always as readily available as might be assumed. In Nepal the extreme load shedding during the spring of 2009 of 16 hours often caused difficulties when operating a Mini-WATA as this required 8 hours of power to produce 1 liter of chlorine. Unforeseen power cuts make it hard to judge how long the device has actually been running. While Antenna offers a solar option, this is more expensive and also does not guarantee a steady stream of electricity into the device (affecting the concentration of the chlorine after the set amount of time). While such difficulties are not negligible, many of the problems can be overcome with solid implementation, program training and monitoring.[3]

2.1.2. The WATASOL technology's comparative advantage

Using chlorine to make water safe to drink is not the only solution that has been proposed for point-of-use. Other options include boiling water (the most basic form), SODIS (using solar rays and plastic bottles to kill bacteria in water), a variety of filtration systems, and the use of flocculants. All methods have their advantages and drawbacks (for a more extensive review see Appendix B). The implementation models also vary greatly. While some initiatives are entirely government funded, others are structured to partially recover costs and require heavy subsidies. The programs can be run by NGOs or the private sector entirely (for a more comprehensive overview of implementation structures see Appendix C).

[3] Having briefly outlined the technical challenges that the ATG WATASOL devices still face, this thesis will not go much further in addressing them. The premise, upon which the research that follows took place, is that the technical difficulties can be solved and overcome by the ATG design team. Indeed, technical development and improvements are ongoing. My aim in glossing over this is in no way meant to trivialize the importance of technical quality control, but to address potential technical solutions goes beyond the scope of this paper.

The solution provided by the WATA devices differs from other safe water programs on a variety of fronts. For our purposes here, it is most useful to compare the WATASOL produced chlorine with other similar chorine products only (rather than all POU safe water products). This is because a chlorine market already exists in Nepal and it is in differentiating itself from the two main products (Piyush and WaterGuard) that ATG WATASOL's comparative advantage lies, both in its product and in its business model.

The key characteristics that set the WATASOL approach apart from other chlorine products are the production, the supply chain, the distribution model, as well as the chemical composition. First, while competing products (such as WaterGuard or Piyush in the case of Nepal) are produced at a central point and then distributed through conventional channels (traditional outlets that require a supply chain to stock them), the WATASOL chlorine is made on site. This can be in a city, but more importantly it can be in remote rural locations.

Second, because chlorine is produced close to its customers, the bottles that chlorine is sold in can be used for refills. This cuts down on the total cost of the product for the customer. The most expensive component of the supply chain is the bottle, costing 10NRs[4] per piece in Nepal. Thus while the first bottle will cost the customer anywhere from 12-15 NRs, the second refill is generally sold for a mere 5 NRs, making the WATASOL chlorine the cheapest product on the chlorine market.

Third, because the chlorine is made fresh on location, no other chemicals to stabilize the solution are added. This means the chlorine solution can be used in its concentrated form for cleaning as well as disinfection, making it particularly useful for hospitals or even to be sold cheaply in bulk to households. These options have not yet been explored in the Nepal pilots, but do deserve mention as they add to the potential of the development of a business around chlorine.

Lastly, while other chlorine products require heavy subsidies from large organizations for production and distribution, the aim of the WATASOL technology is that an independent self-sustaining business can be established. Thus it has a comparative advantage on the overall project level because it aims to provide an income and activity beyond merely supplying safe water to a community.

[4] In the spring of 2009 the exchange rate was approximately U.S. $1 = 75 NRs

2.2. Converging over the BoP: changing trends in the private and non-profit sectors

The ATG WATASOL technology finds itself at the intersection of several trends that have prompted increased research and classification in recent decades. These are: 1) the emergence of 'Base of the Pyramid' thinking in the private sector; 2) shifting paradigms in the development sector to an increasing belief in the power of business to address poverty issues; and 3) the emergence of social enterprises in what is coming to be know as the fourth sector. In order understand the full potential and nature of the WATASOL project, a brief summary of these overlapping and converging sector trends follows here. This will better position us to understand in the second part what is necessary for a successful implementation of a WATASOL program, from planning to implementing and expanding.

2.2.1. The Private Sector: new markets at the BoP

In 2002 C. K. Prahalad and Stuart Hart published *The Fortune at the Bottom of the Pyramid*, a seminal paper that precipitated a global movement and a radical rethinking in business markets as well as strategies for multi-national corporations (MNCs). BoP theory 1.0, as this initial version has come to be known (Hart 2007a, 195), argued that the global poor at the bottom of the economic pyramid should be viewed as consumers. Claiming there is an untapped market among the global population of 4 billion[5] low-income people, early BoP theory argued that with low margins but high sales volume and capital efficiency, MNCs could reap a fortune by targeting this population (Hart 2007a, 142). The future fortune thus rests with the 'aspiring poor' in the bottom tier of the world economic pyramid, who have so far been excluded from the market economy (Prahalad and Hart 2002, 2). Subsequent research revealed that the overwhelming majority of the BoP market is found in rural areas, especially in Asia, where informal, inefficient and uncompetitive markets dominate (Hammond et al. 2007). As shall be shown further on, this is precisely the case of Nepal.

The arguments advanced by Prahalad (2005) and Stuart (2005) in books they subsequently wrote – arguments supported by other academics such as Ted London and Erik Simanis – sparked opposition, largely because the argument claimed "when the poor at the BOP are

[5] This figure based on purchasing power parity in U.S.$ of an annual per capita income of less than $1,500 (Prahalad/Hart 2002; 4).

treated as consumers, they can reap the benefits of respect, choice, and self-esteem and have an opportunity to climb out of the poverty trap" (Prahalad 2005, 99). Pushback and criticism of the BoP argument came on a variety of fronts and generated much debate. Aneel Karnani (2006) for one took issue with the statistics used to describe this market, specifically the poverty line - a controversial measurement – and thus the size of the supposed market.[6] The claim that by selling non-essential consumer goods to those who already have little would improve their existence, proved to be another highly contentious point of the BoP argument.[7]

The debates have lead to extensive research and scholarship on the subject of targeting the BoP, which continues to evolve today. On the topic of statistics, for example, a report by Allen Hammond and others (*The Next 4 Billion*) in 2007 sought to quantify the exact nature of the various market segments in the BoP.[8] The BoP water market, as the relevant example for this study, is the smallest of the sectors, valued at around $20 billion (Hammond et al. 2007). Because privatized urban water systems had not yielded promising or successful business models, Hammond et al. note how the BoP, especially in rural areas is more likely to have access to surface water than piped water. This situation has led to the emergence of an even more expensive option for acquiring water by those at the BoP through vendors and tankers (Hammond et al. 2007, 58). The authors of the report point out how this leaves room for entrepreneurial and affordable home-treatment systems for water purification.

Partly in response to the criticism of strategies and the ethics of engaging commercially with the BoP, and partly because evolution and improvement are natural, it was not long before "BoP 2.0" emerged. Put forward by Hart in his book *Capitalism at a Crossroads* (2007a), and expanded upon in partnership with Erik Simanis in *The Base of the Pyramid Protocol* (2008), this new generation of BoP thinking moved from the mindset of *selling to the poor* to *creating mutual value* (Hart 2007a, 196). Born from the recognition that simply reformulating and repackaging existing products and pitching them to rural villagers would fail as a business strategy in the long run because of its alien nature to the indigenous communities (Simanis and Hart 2008, 1), 'BoP 2.0' sought to move "corporations beyond mere deep *listening* and into deep *dialogue* with the poor" (Simanis and Hart 2008, 2). It suggests, "a 'seed' value proposition is progressively evolved by the corporation together with community members

[7] A controversial example of this was Hindustan Lever's single sachet whitening cream.

[8] According to the report's data guide: "The BOP population segment is defined as those with annual incomes up to and including $3000 per capita per year (2002 PPP). The mid-market population segment is defined as those with annual incomes above $3,000 and up to and including $20,000 PPP. The high income segment includes annual incomes above $20,000 PPP. The report and accompanying country tables use annual income increments of $500 PPP within the BOP to distinguish six BOP income segments, denoted as BOP500, BOP1000, BOP1500, etc." (Hammond et al 2007, 1).

through constant and deep interaction with the wider community. The creation process thereby ensures that the business is in tune with the broader community's needs and wants" (Simanis and Hart 2008, 3-4). The three-phase process consists of: 1) opening up, 2) building the ecosystem and 3) enterprise creation (Simanis and Hart 2008).

Although much of early BoP theory centered on MNCs as actors, the strategies tested in the private sector can be useful for other actors as well, such as non-profits or social enterprises, seeking to set up a venture at the BoP (such as the WATASOL program). In the next section we will see that as the private sector turned its focus on developing nations, the development industry has begun to value private sector tactics. This will show how the WATASOL approach finds itself at the intersection of both and can learn from both.

2.2.2. The Development Sector: BoP as sustainable poverty alleviation

It has become increasingly clear over recent decades that the development aid industry as it was designed and implemented throughout the latter half of the 20th century fell miserably short of the goals it set out to achieve (Cohen and Easterly 2009). Economists such as William Easterly (2006), Glenn Hubbard and Paul Duggan (2009) and Paul Collier (2008) have demonstrated that the poor are getting poorer despite the billions of dollars that have been poured into poverty alleviation. Ever more, micro-level oriented approaches of fostering growth from the bottom up, through indigenous business creation (rather than top down aid, as Jeffrey Sachs (2006) and others have called for), are viewed as the more appropriate strategy. The argument advanced is that it is business, not aid relief that lifts people out of poverty (Hubbard and Duggan 2009). Examples such as Mohammed Yunnus' Grameen bank are heralded as examples that it can be done: BoP targeting, sustainable financial revenue, micro-level development and social enterprise creation are successful and can make the world a better place. BoP theory frames the debate "in terms of enabling opportunity and less in terms of aid" (Hammond et al. 2007, 6). This market based approach works to bring private sector business much closer to the aims of the development industry.

> Traditional approaches often focus on the very poor, proceeding from the assumption that they are unable to help themselves and thus need charity or public assistance. A market-based approach starts from the recognition that being poor does not eliminate commerce and market processes: virtually all poor households trade cash or labor to meet much of their basic needs. A market-based approach thus focuses on people as

> consumers and producers and on solutions that can make markets more efficient, competitive, and inclusive—so that the BOP can benefit from them. (Hammond et al. 2007, 6)

In order to do this, Ted London has proposed six guiding principles: "external participation, co-creation, connecting local with non-local, patient innovation, self-financed growth, and focusing on what is right at the BoP" (London 2007, 26). These are applicable both to MNC strategies as well as NGO programs. For example, just like MNCs are called upon to listen to their customers, so NGOs should also seek to listen to those they work with. We will see shortly how such principles are applicable to the WATASOL project as well.

Nevertheless, BoP targeting cannot be thought of as the panacea for poverty, solving all problems. Rather, it should be viewed as complementing other poverty alleviation strategies (London 2007). This is partly because often the context in which BoP ventures operate, require subsidies and additional investment into common goods such as education and raising awareness - particularly as regards health issues. As we will see, this is particularly relevant in the case of hygiene and safe water education in Nepal.

The convergence in thinking in the private and non-profit sectors can only go so far. Eventually sector boundaries are reached: the financial bottom line for private sector ventures and doing good for non-profits. As a result, a new hybrid sector is emerging, which the next section will discuss. It is in this space that the WATASOL approach finds itself.

2.2.3. The Emerging Fourth Sector: the rise of social enterprises

"The basic problem is this: When you find a need, do you 'design a project' or 'start a business'? These are two very different ideas, from two different worlds of action" (Hubbard and Duggan 2009, 81).[9] Hubbard's words nicely summarize the two angles from which the problem of poverty alleviation has been approached thus far. While *designing a project* and *starting a business* are indeed two different approaches, the two have become increasingly blended in recent years, with the emergence of what a report by the Aspen Institute calls the *Fourth Sector*. This is a sector comprised of for-benefit organizations, whose fundamental characteristics are that they "pursue social purposes while engaging in business activities" (Sabeti 2009, 5). Inevitably, the sector is still a highly fluid, geographically dispersed,

[9] Add 'restructure policy' to the mix and we have the three traditional sectors (non-profit, private, and public) and their approach to addressing the challenges the developing world is riddled with.

multidisciplinary and somewhat chaotic arena, in great need of structural and conceptual support in order to achieve its full potential (Sabeti 2009, 8). Further, the group and genre of actors found in this space is still evolving.

For our purposes here we will only consider one of the agents that has gained significant notoriety in recent decades: social enterprises[10]. Although this label is almost as indistinct as the sector it is in, social enterprises do have certain characteristics in common. They address social problems that private markets or governments have not met; they are motivated by social benefit; and they work with market forces (Brooks 2009, 4). Since research has shown that the BoP is largely an informal market consisting of a majority of extralegal small entrepreneurs (Soto 2003), fostering the creation of social enterprises (thorough the identification of social entrepreneurs) has gained significant support both academically and institutionally (see the programs of Ashoka, the Skoll Foundation, the Schwab Foundation, etc.). Targeting the BoP as a means for poverty alleviation has also allowed social enterprises to offer a solution to bridging the gap between strictly for-profit MNCs and non-profit aid programming.

One of the main hurdles social enterprises have faced is the question of growth and scaling up. While the number of social enterprises has multiplied exponentially, there are only a handful of large-scale examples and it has taken those decades to reach this point[11]. This has in part to do with the disadvantage they are at compared to conventional businesses, and some argue that the power of social enterprises lies not in the scale they achieve, but instead in the networks they create (Kumar 2010). This question will be examined in more detail in the final section of this paper, but the hurdle of scaling is worth bearing in mind when we turn to the example of the ATG WATASOL project. Given the extent to which even the developing world is increasingly connected through telecommunications, the potential of effective networks may not be such a far-fetched thought.

[10] Other types of actors Sabeti (2009) names are various forms of community corporations, faith and ethics based enterprises and social and sustainable businesses.

[11] Notable examples include BRAC and Grameen in Bangladesh.

2.3. Nepal is not poor, Nepal is poorly managed.[12]

2.3.1. Nepal's BoP

Nepal is not what BoP theory often uses to showcase examples of successful ventures in emerging markets. The Himalayan nation ranks among the world's poorest countries and has been racked with political conflict for decades. With a Human Development Index of 0.55 (BTI 2009), it placed 99th out of 135 on the 2006 Human Poverty Index I[13] (UNDP 2009). The majority of success case studies of BoP ventures, however, are found in places such as India, China and Brazil. This is noteworthy for, while these economies certainly have extreme poverty in their massive populations, the economy itself is growing in a relatively stable political environment. Development projects targeting safe water, however, are often located in poorer nations (many in Africa, but also such countries as Haiti or Bangladesh), similar in context to that of Nepal. Simply because Nepal's background is more precarious than that of the BRICs[14] does not mean that its great BoP potential should be overlooked. Indeed Nepal's BoP population is estimated at around 23,4 million, comprising 95% of the total population and amounting to 74,2% share of total income (Hammond et al. 2007, 111).

As is common in Asian BoP countries, an overwhelming percent of Nepal's population resides in rural areas, with only 16.8% of the population being urban (BTI 2009). Fifty years of foreign aid has failed to make much of a contribution to poverty reduction especially in rural areas (Bonino and Donini 2009, 15). Instead aid has been concentrated in the Kathmandu valley, often ending up in the hands of the elite (Bonino and Donini 2009, 15). This disparity between the top and bottom is so extreme that the household income or consumption by percentage share is a mere 6% for the lowest 10% of the population, while for the highest 10% it is 40.6% (CIA 2009). Many are excluded from opportunities of advancement because of ethnic, social or religious origin, cast or gender (Hutt 2004, 17).

These figures are striking, since despite being completely land-locked, Nepal is supposedly one of the world's richest countries in terms of water resources, second only to Brazil (Intensive Study & Research Centre 2007, 1). Indeed,

[12] Saying coined by Anil Chitrakar, ECCA founding member, Nepal, 2009.

[13] "The HPI-1 measures severe deprivation in health by the proportion of people who are not expected to survive age 40. Education is measured by the adult illiteracy rate. And a decent standard of living is measured by the unweighted average of people without access to an improved water source and the proportion of children under age 5 who are underweight for their age." (UNDP 2009)

[14] Term coined by a Goldman Sachs report in 2003 to describe the emerging markets of Brazil, Russia, India and China.

> There are more than 6000 rivers in the country. […] This water content has the potentiality of 83,000 Mega watt electricity production [sic]. It also has the capacity of irrigating 80 lakhs hectors land, supply of pure drinking water to all Nepalese, Water transportation, tourism and scope of fish farming to enhance the national income of the country [sic]. (Intensive Study & Research Centre 2007, 2)

Yet, a tiny 1% of this hydroelectric potential, which could even supply growing demands from northern India, are tapped (U.S. DoS 2009).

Nepal's infrastructure also poses complications to daily life. For one, out of 17'280 km of roads in the country, a mere 9'829 km are paved (figures from 2004, CIA 2009). Such statistics do not include the network of dirt paths leading to more remote settlements and houses in the hills or the plains. A more serious infrastructure failing is that despite the optimistic claim of potential power supply stored in Nepal's, load shedding (when electricity is rationed out to certain areas of the city only and the others are left without power for a given amount of time) is a constant fact of life and can reach up to 16 hours per day during the dry winter months.

Next to disrupting almost every aspect of daily life, high levels of load shedding also impact the central water collection and distribution system, especially in the Kathmandu valley. For World Water Day on March 23rd, 2009, a leading Nepali newspaper published a two-page spread on the dire situation of water supply within the city: not only was there a general lack in water available through the municipal system, with certain areas only receiving water once every four days (and some not at all), but the water that was being supplied directly to the customers was untreated and unsafe (Guragain 2009). Furthermore, "…23 out of 27 treatment plants were non-functional…[and]…only 13 treatment plants are said to have disinfection facilities. […] Chlorine content in 47 per cent of piped water samples collected from 120 places in Kathmandu was nil" (Guragain 2009). In short, "'unsustainable' is the word that springs to mind when one thinks of the future of Katmandu" (Thapa 2010).

Unlike in the Kathmandu valley, water supply is not as big of a problem in certain rural areas, although many of the riverbeds are dry in the winter season. Despite this, river water is the main source for many people in these districts, made available to them untreated through tanks and pipes. In the far southeastern districts of Morang and Jhapa (where the case study that follows is partly located), it is estimated that 95.1% and 82.8% respectively of the population has access to an "improved source of drinking water" (Intensive Study & Research

Centre 2007).[15] Lest this classification be misleading, it simply means that a family has access to a tap, pipeline, or well. This can include a nearby public communal tap, and is in no way a guarantee that the water being supplied is safe – it isn't (ECCA, the implementing NGO for the WATASOL program in the region, has conducted quality tests with all the schools and communities they work with on water purification projects.).

While summer diseases, such as dysentery, jaundice and typhoid (typical water-borne diseases exacerbated by the summer monsoon season), have apparently been on a decline in recent years, the incidents of diarrheal cases are on the rise (Shrestha 2008). Diarrheal diseases fall in third place among the top ten leading diseases in the country (Intensive Study & Research Centre 2007) and other major infectious illnesses resulting form waterborne diseases are Hepatitis A and typhoid (CIA 2009). Reports in the local media about the poor water quality, difficulties of water access, and unreliability of water supply, as well as outbreak of diarrhea in the East and the Western rural districts, are a regularity. When struck by waterborne diseases, rural areas are more likely to suffer the severe consequences of death because more remote location makes access to care more challenging (compared to families residing within the Kathmandu valley closer to the metropolitan centre of the country). During the summer of 2009 an epidemic claimed the lives of over 300 people in the western region of Jajarkot and lab tests confirmed the bacteria causing the outbreak was waterborne, and included cholera (*Republica* 2010).

There does seem to be a growing awareness among the population of the link between such diseases and water quality thanks to extensive publicity campaigns supported by the government and non-governmental organizations (including UNICEF and USAID). Nonetheless, "lack of proper sanitation and carelessness about diarrhea infection during the rainy season is leading to the increase in the number of diarrhea patients" (Tuladhar in Shrestha 2008). In the event of diarrheal illness, health care is often self-administered, since small pharmacies exist in most villages. Oral rehydration salts for a solution of 1 liter cost 10 NRS ($0.13) and in conversation with residents, both within Kathmandu and in the villages, it became clear that knowledge of this product is widespread, because of the frequency of diarrheal cases in every family.

[15] These are two of the districts where ECCA is active with their WATASOL program and where observations were conducted, but their statistics reflect the general state of remote rural districts in Nepal.

2.3.2. The Safe-Water Market in Nepal

Selling concentrated chlorine liquid as a means to purify contaminated water for drinking purposes is not an entirely new concept in Nepal. Several products are to be found on the market in Kathmandu and even in rural areas, however, only two key products deserve mention. One is WaterGuard, produced and distributed by the international organization Population Services International (PSI). The other is the locally supported and distributed Piyush, by the environmental Nepali NGO, Environment and Public Health Organization (ENPHO). Both have been launched through extensive and expensive marketing strategies, involving television advertisements, radio spots, large banners on the national highways, storefront posters, and a variety of free merchandise. As a result, it is not surprising that especially within the Kathmandu valley, knowledge about using chlorine (and the need to purify water generally) is relatively prevalent.

Although certain products have penetrated the rural market and some inhabitants have heard of the method of using chlorine to purify drinking water, others lack the basic education and knowledge about the necessity to treat water and the dangers of not doing so. Knowledge and practices of families seem to vary greatly from village to village and even within communities. Generally, the level of education and awareness is significantly lower than in the Kathmandu valley.

Figure 1: Standard storefront poster of Piyush found throughout the Kathmandu valley and in the Tarai (Source: author).

Piyush, a 0.5% chlorine concentrate solution, was launched in 1994 and only had limited success in sales and distribution. As a result, ENPHO, the sponsoring NGO, partnered with AED/N-MARC to implement a "Social Marketing of PIYUSH" strategy, as well as with the company CRS to outsource the distribution, in order to achieve the target of 300'000 sales volume (which they succeeded in surpassing in the time period from March 2008 – February 2009 (ENPHO 2009). So far its product has been a 60 ml bottle sold for 17 NRs, but a new product is currently being tested, Piyush Plus, a 500 ml bottle, to be sold for 35-40 NRs (ENPHO 2009).

Certain useful lessons can be drawn from ENPHO's marketing experience of chlorine in Nepal. A detailed report of their strategy came to the following conclusions about the chlorine market:

> The study clearly showed that the sales of PIYUSH has steadily increased and performed

better in urban area besides Kathmandu valley. The analysis was also done on percent of water purifier sold through "TO" [*traditional outlets*] and "NTOs" [*non traditional outlets*] …during January to December 2008. It shows that majority of PIYUSH (98.9%) is sold through TO whereas most of the Water guard [sic] is being sold through NTOs (58.7%). With compare to PIYUSH overall sales through TOs (60%), the PIYUSH sales in urban and peri-urban areas is quite high (98.9%) [sic]. This figure suggests that PIYUSH sale at rural areas are mostly covered through NTOs and/or institutional sales. This retail study of concluded that [sic]:

- PIYUSH is performing well, both within Kathmandu valley as well as outside valley
- PIYUSH has huge potential market in non-traditional outlets. So PIYUSH distribution should be focused through NTOs channels. (ENPHO 2009, 12)

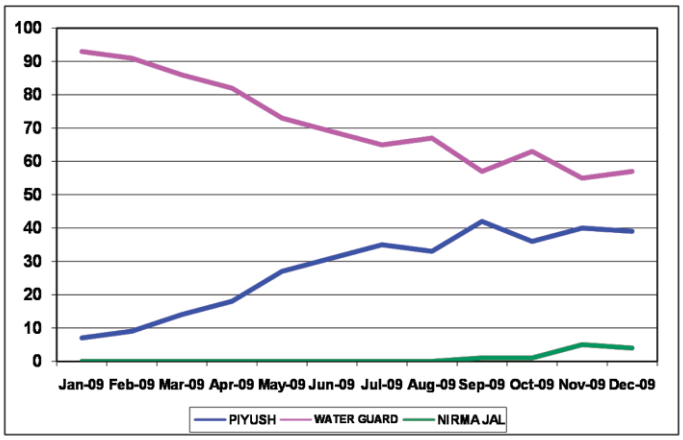

Figure 2: Market sale trend of chlorine solution by brand in Nepal (Source: ENPHO 2009)

WaterGuard is a product that PSI has been promoting globally for over a decade. PSI launched its Safe Water Program in Nepal in October 2005 and has since been selling and distributing WaterGuard through a variety of outlets. The WaterGuard product is a 240ml bottle costing 35 NRs. Like ENPHO, PSI Nepal imports concentrated liquid chlorine solution (made by the chlorine gas injection method) from India, and dilutes it for sale in Nepal (USAID 2007). It seems that Piyush has had greater success in penetrating rural markets throughout the year than WaterGuard has. In conversation with locals in Morang and Jhapa, although they knew of WaterGuard thanks to television spots, it was often only available in pharmacies during monsoon season. Sometimes it was even given away for free during these periods of higher infection risk.

A more comprehensive five-year (2004-2009) Hygiene Improvement Project (HIP) was launched by USAID in collaboration with UNICEF and Nepal's Department of Water Supply and Sewage, with the aim of reducing diarrheal disease prevalence in children under the age of five (HIP and AED 2006). Storage and treatment of safe drinking water at point of use were included in the hygiene practices being promoted. Although the baseline study (conducted in the four districts that the project targeted) found that the majority of the targeted communities did not perceive a problem with their drinking water, the general reception of the various water purification products was positive. The results of the initial phase showed the following:

> Without considering the cost of purchase or use, the most popular method across all districts was the CS [*ceramic*] filter for its ease of use, followed by chlorinating water. The other two methods, SODIS and to a less extent boiling were satisfactory to consumers. […] Most common dislikes of the methods included the warm temperature rendered by boiling, SODIS, and to a much lesser degree, perceived to be from chlorination. Some respondents found the smell of chlorination to be problematic, although none discontinued use because of the smell. Interestingly, smell rather than taste of chlorination was more commonly mentioned as disagreeable. Smell was mentioned to a lesser extent with other methods. (HIP and AED 2006)

Conclusions from the five-year pilot are telling. Although the project succeeded in raising significant awareness, it was argued that for sustained behavior change further strategic activities would be required (USAID 2009). Despite creating a demand for water treatment products, "producers continued to have difficulty meeting demand in remote locations because of limited human and monetary resources" (USAID 2009). Specifically as regards chlorine, because outlets for chlorine sales were largely restricted to district headquarters, it was clear that product development and distribution was lacking in this project (USAID 2009). The report concluded that there was, however, potential for scaling up in the future.

2.3.3. WATASOL in context

Given the groundwork done by USAID's HIP project and ENPHO's media campaign, entering the chlorine market in Nepal brings two key advantages with it. For one, regular media advertisements on TV, radio as well as billboards at major road intersections, mean that the concept of chlorine is not completely foreign to the average citizen. While in more remote

and uneducated communities one might have to begin sensitization and education from zero, in many communities at least a fraction will have heard of either Piyush or WaterGuard.

Second, evaluation of both the Piyush and the WaterGuard distribution have shown that there is a severe supply gap in remote rural areas. Piyush is distributed mainly through traditional outlets (ENPHO 2009) and WaterGuard is not readily available in traditional outlets outside the Kathmandu valley (USAID 2009). This is the gap that the WATASOL chlorine can fill because of its adaptability and flexibility.

As noted in the BoP overview, BoP strategies that work share common characteristics. These include focusing on the BoP with unique products, localized value creation through the use of agents and local vendors and enabling access financially to the good through packaging strategies (Hammond et al. 2007, 1). Successful business models not only serve the poor as customers but also engage them as producers. The WATASOL devices allow for all of the above. It finds itself straddling the non-profit sector and the BoP approach of the private sector. Currently launched by an NGO and still subsidized, it seeks to create a business solution to alleviate poverty not only by improving health and habits of a local population, but also by providing income to the operator and/or seller. Because chlorine can be produced in a decentralized manner and in remote rural areas, it allows for direct placement of the product in the BoP market itself (rural villages), and draws on a member of the local community to set up and run the business as well as reap the benefits. In essence, the Antenna WATASOL technology joins the world of bottom-up proposed solutions to the problem of safe drinking water in the developing world in that it involves external, non-local actors with local agents to co-create the best strategy possible for ensuring a community is consuming safe drinking water. It allows for the local agents to try models and innovate on their own, in order to achieve financial sustainability. Furthermore, because it allows for the sale of chlorine in drops, bottles, or as a means to selling purified water, a strategy most suited to the financial constraints of the local community can be implemented. Antenna WATASOL allows for BoP population to be both a consumer and a producer.

Having established and outlined the trends, tools and theories behind BoP targeting, it has been shown that Nepal, especially the rural areas qualify as a BoP. Having demonstrated how the WATASOL program fits squarely at the intersection of all of the emerging trends in both the development industry as well as the business sector, the next part will examine the initial results from the pilot implementations thus far. In the last part, the idea of microfranchsing will be presented as a possible model for standardizing the operation of the WATASOL devices and scaling up the program.

3. Case Study: Nepal

3.1. How the ATG WATASOL devices have been implemented

Two local partners in Nepal – Environmental Camps for Conservation Awareness (ECCA) and the Swiss sponsored Vertical Shaft Brick Kilns program (VSBK) - have been testing methods for distributing the WATA devices and testing possible methods for creating a sustainable business. In order to understand their initial findings, a brief overview of the implementation methodologies of ECCA and VSBK follows.

3.1.1. ECCA

Founded in 1987, it has an extensive network and strong, long-standing relationships with the people, the schools and the various entities it works with. Among their various and varied activities, in more than half of the districts in Nepal, is a strong commitment to educating the next generation, especially as concerns the environment. Their *Improving School Environment Program* – their strategy in schools – addresses 7 aspects of a child's school experience: a safe and healthy environment, school relationships, hygiene and sanitation, drinking water, classroom management, Nature Clubs, school ground beautification, and nutrition and health (Chitrakar 2006). Through this, ECCA engages with students, teachers, staff, parents, and the wider community to offer support where it is necessary and to share knowledge and educate the next generation for a more sustainable future. This is the network they have made use of to implement the ATG WATA devices. The first ones were introduced at the end of December 2008 (in the districts of Kavre, Morang and Jhapa) and January 2009 (in Lalitpur, Kathmandu).

In many of the schools ECCA works with, no water was available, let alone drinking water, and there were many cases of absenteeism, where when students (often girls) were sent to buy water they simply did not return to the school for the rest of the day (Sushil Anu, personal communication, Lalitpur, 18 March 2010). To address this problem and as part of the *safe and healthy environment* and *drinking water* aspects of a school's environment, ECCA has installed rainwater harvesting systems, sanitation facilities and biosand filters on many school premises.

Introducing the WATA devices in schools (the addition of chlorine to the filtered water before the children drink it) at the end of the safe-water chain, therefore, seemed a logical conclusion, especially given that one of the mottos of ECCA is to "support the development of

Figure 3: Topographical map of Nepal showing district areas where the ECCA and VSBK WATASOL projects are located (Source: UN 2010)

conservation-related entrepreneurship" (ECCA 2007). Because of their strong contacts and close relationship with the schools, ECCA was able to convince certain schools to buy a WATA device to use. The aims of these placements include providing the children with safe drinking water, educating them, taking the message to the community, and, in certain cases, selling chlorine to the community in the long run as well. This has become known as the *school model* of ECCA.

A few other implementation models are also being tested by ECCA in rural areas, under the term *entrepreneurship model.*[16] One is located in Jante, in the district of Morang, where they were able to sell a Standard WATA to the local Water Users Committee (WUC). The committee sells the chlorine through their central office where consumers must come to pay their water bill. The other model, which emerged somewhat fortuitously, is that of a social

[16] Over the course of three months (March-June 2009) ECCA also held meetings with other organizations and potential partners such as UNICEF, NGO Forum, squatter communities, women's groups, to name a few, in an attempt to explore possible new approaches and channels for operating WATA chlorinators and distributing safe water.

entrepreneur. Shiksha Vikash Secondary School in Letang gave their Mini-WATA to the school caretaker, Gopal Dhakal, to operate. In May 2009 he was selling the bottles of chlorine that he produces at home (at accurate concentrations) door-to-door in his community. The profit is split between him and the school.

3.1.2. VSBK

The Vertical Shaft Brick Kiln project, a joint program between the Government of Nepal and the Swiss Agency for Development and Cooperation, works to implement cleaner building and production technologies in brick kilns. In doing so, the goal is to improve the environmental performance as well as the social equity of the building material sector, by establishing sustainable building material production systems at the level of small and medium enterprises (VSBK 2008a).

Figure 4: Social mobilizer visits VSBK site brick houses of kiln workers (Source: author, Lalitpur, 2009)

The brick industry in Nepal relies on migrant workers who often come with their families from the rural countryside to live near the kiln in brick mud huts (see Figure 4) throughout the dry season. Because of this, the social environment of the workers is a particularly important consideration for the success of a kiln project; working and living conditions must take into account occupational health risks as well as facilities for the families living and working on the site (Heierli and Maithel 2008). Consequently each kiln has one or two social mobilizers responsible for promoting social activities. The issues they address include sanitation, shelter, health and nutrition, access to public schools for children, functionally literacy classes for adults, childcare centers, and clean drinking water (VSBK 2008b).

The WATA technology impressed the VSBK team because of its simplicity, affordability, and practicality. As a way for providing clean and safe drinking water to workers living on the brick kilns sites, the VSBK office set out to convince the building entrepreneurs of each kiln to operate a Mini-WATA. Although initial reactions were enthusiastic, the idea did not take off among them. VSBK attempted a new strategy through the workers themselves and although a few showed interest in setting up a business, the pilot never gained ground.

The approach that looked to be the most promising in 2009 was selling clean water to the workers, however, by an outside water-seller. One of the social mobilizers of a brick kiln in Lalitpur area produced the chlorine, purchased the water and paid a water seller to take it to the kiln site on his bicycle to sell to the workers. Although the entrepreneurs were hesitant to test this themselves, claiming workers would not be willing to buy the water and they, the entrepreneurs, would receive a bad reputation for exploiting their workers by forcing them to purchase water, the outcome has been quite different. The workers are proving very enthusiastic at the prospect of being able to purchase clean water delivered to their doorstep.

Due to logistics, water supply and chlorine supply have been separated again: water is now supplied to the kiln and the social mobilizers sell bottles of chlorine to the kiln workers. As of June 2010, 368 workers in 2 kiln sites had benefited from easy access to water (one kiln provided water free of charge, the other kiln sold it at the minimum charge of 4 NRs for 20 liters) (Manandhar 2010). In total 201 households on the kilns where the program is running have been purchasing chlorine. Furthermore a random check of water in 32 of these households showed 23 households had the correct amount of residual chlorine in their water, 6 households had a concentration that was too high and 2 had values that were too low (Manandhar 2010). The aim of this initial phase is to prove to the entrepreneurs that there is indeed a willingness to pay for safe water among the workers and that easier access to water for their employees is ultimately good for their business.

3.2. The Marketing Mix for the BoP

Before delving into an analysis of the preliminary results of the WATASOL program, its marketing strategy in Nepal must be articulated. In the realm of marketing, the magic mix of the *4 P's* (product, price, placement, promotion) is what determines success.[17] As such, reviewing these four components of marketing the WATASOL approach to the BoP reveals the strengths and necessary areas for improvement. Important to note is that in essence two products are contained in the WATASOL program: 1) the chlorine product, and 2) the device as a product for business creation. The marketing of both of these are considered below, since success depends on the perception and reception of both.

[17] Originally articulated by E Jerome McCarthy in his book *Basic Marketing: A Managerial Approach* in 1960 and now widely applied.

3.2.1. Product

Figure 5: Bottle of chlorine produced by ECCA in 2009 (Source: author).

The chlorine the WATA devices produce can be marketed either as an undiluted solution (see Figure 5), or as treated safe water. Both these products versions have shown to have advantages and drawbacks in the pilot cases in Nepal.

The chlorine solution as a product is not new or unique in Nepal. In bottled form it demands some education of the consumer, to ensure proper storage, handling and dosage of the chlorine in the household of the end-user. Quality control on the production side of the chlorine concentration is one issue that has surfaced as a technical problem. Because there is no stabilizer in the chlorine solution produced by WATA devices, the expiry time frame ECCA has given the 50ml bottles of chlorine is one month, which is less than other products on the market. The fact that it is pure chlorine, however, also allows it to have more versatile uses, such as disinfection and cleaning. Standardization and improvements in the packaging of the chlorine bottle along with more professional branding, which have been undertaken since this research was conducted, significantly improve the quality of the product. Further, a more official-looking bottle has helped the appeal and the credibility of the product.

The approach to sell previously chlorinated and purified water tested by the VSBK office has the advantage that only one person need know how to correctly dose the chlorine for the amount of water, including how to test for correct residual chlorine concentration. Indeed, should the concentration of a batch of chlorine turn out lower (or higher) than the intended value (due to unforeseen production difficulties), a person who distributes and sells water can still use the solution by simply adjusting the amount put in the water. The difficulty with selling water has been, however, that many believe they should not have to buy water, but should receive it free of cost. Adding the service of delivery to the product has been one way around this resistance (see the following section on the customer's willingness to pay).

If we consider the WATA devices themselves as a product to market to potential entrepreneurs, the strengths operators of the pilots in Nepal listed included the simplicity of the device (many claimed initial disbelief at the true potential of the "little plastic tube" – the Mini-WATA), the ease of operation and the flexibility in transportation. Users were also impressed by the seeming durability (none of the devices have been in use long enough to substantiate this, however, given the rough conditions they operate in, it can be assumed that they are indeed rather resilient).

There are still some technical hitches that must be worked out before branding, franchising, and scaling up of the WATA devices can take place, which include creating simpler mechanisms for chemical testing. Furthermore, several of the distributors (such as Gopal in Letang; a pharmacist in Letang; and a headmaster in Kavre) commented that it is paramount in the long run to have some form of certification or legal document so they can prove the quality of the product they are selling.

3.2.2. Price

ECCA suggests the bottles be sold at is 12-15 NRs. This essentially makes it the cheapest product on the market, as ENPHO's bottle is sold for 17 NRs, in single-use bottles. As will be shown in the following section, consumers deem this price of 12-15 NRs appropriate. After the initial investment in a WATA device, the price of the empty plastic bottles (10NRs) is the most expensive component in production (costs of power, water and salt for the production are minimal and vary depending on the water source). Because the WATASOL approach allows for refills, the price is reduced even further to 5 NRs – by far the cheapest offer on the market.

Among the other advantages of producing chlorine with a WATA device is that it allows for flexibility in product pricing. A teacher in the rural hills of Jante noted that those families with 10+ members in their household could not afford a 12 NRs bottle (personal communication, Jante, 19 May 2009). For such cases one needs to look into a pricing mechanism that breaks the product down into even smaller packets, and thus reduce the cost even more. At the time of the last visit in May 2009, the Jante Users Committee was looking into selling chlorine directly at the public spouts in drop form, which would cut price more.

In the spring of 2009 a Mini-WATA cost 40 Euro (roughly $50) and a Standard WATA 200 Euro (roughly $260) (Antenna Technologies 2010a). Although it may seem that these prices are not high given the potential returns, other costs must be factored in to the initial price. For one, in Nepal there are very high customs and import taxes. This almost doubles the price of a WATA device. Initial WATAs distributed by ECCA were being subsidized by 50% thanks to a fund from the World Development Marketplace competition ECCA won. Still, this only brings the price of a Mini-WATA back to 4000 NRs ($51) (because the full price contains taxes and customs). It is then being sold to the school in two installments (up front payment of 2000 NRs and the second half once they have started earning some money). For institutions such as schools, Water User Committees (WUC) or Village Development Councils (VDC), such prices are

manageable. Indeed, the Jante WUC was able to finance its Standard WATA (18'000 NRs - $231 – with the 50% discount) thanks to a fund it had received from the local VDC. For individuals, however, this price is very high. Gopal in Letang, for example, was granted the use of a Mini-WATA purchased by the school. Given his distribution success, a Standard WATA would certainly be better for him, but he would never be able to afford the investment of one on his own.

3.2.3. Placement

The simple technology of the WATA device allows for production of chlorine almost anywhere as long as there is some source of power (be it the grid, a battery or a solar panel) and a person capable of using it. The locations where a device has been placed and tested in Nepal are schools in Lalitpur (urban), Morang and Jhapa (rural districts), with the Water Users Committee in Jante (rural village), and with a social mobilizer who works with the VSBK kilns (Kathmandu valley). These are places where WaterGuard and Piyush have reached sporadically and lack a steady supply-chain.

The WATA devices' flexibility in placement has positive consequences for the distribution network of chlorine and purified water. Unlike the other chlorine products that rely on a traditional distribution strategy (central production, standardized transportation, and distribution through traditional outlets), the WATA, by being placed and operated locally, doesn't face these limitations. This allows for greater possibilities in sales through non-traditional outlets. Such non-traditional outlets can mean a central point of access or it can be through a door-to-door sales person. Both these methods are being tested in Nepal and look promising. In talking about placement, Gopal wished for a bicycle so he could reach more people (interview with author, Letang, 17 May 2009), implying that his door-to-door method of accessing his customers was being received positively.[18]

3.2.4. Promotion

Both heads of the other chlorine projects in Nepal - Rajesh Adhikari of ENPHO (personal communication, Kathmandu 6 May 2009) and Arinita Shrestha of HIP/USAID (personal

[18] The door-to-door sales method is essentially the Avon model of distribution where a representative agent goes from house to house to make personal sales. This is also similar to Tupperware marketing strategy of bringing the product to the customer.

communication, Kathmandu, 5 June 2009) - emphasized that the need for social marketing for safe water is overwhelming and continuous.

One of the unfortunate perceptions of chlorine has been that it is merely a seasonal product (Rajesh Adhikari - ENPHO promotional manager, interview with author, Kathmandu, 6 May 2009) because it is frequently distributed during monsoon months. The pharmacy in the village of Letang, which has stocked WaterGuard, did not have any in early May because, as the pharmacist explained, the product is only used in the summer and there is no use for chlorine during the other seasons (personal communication, Letang, 12 April 2009). The operator producing chlorine at a school in Lalitpur also admitted to viewing chlorine as a more medicinal product (Dhruba Amaty, interview by author, Lalitpur, 31 May 2009). This stigma of chlorine as something medical and seasonal must therefore be dispelled through education and social marketing, in order for the product to become more mainstream.
At the time of this research WATASOL branding and promotional materials were still scarce. By June 2010 ECCA had, however, designed caps, t-shirts cloth bags and labels for their bottles. This will undoubtedly help raise the trust that people have in the product. Essentially, it is important to cast the product not as an occasional medicinal remedy, but to position it as a naturally daily commodity on the market, such as soap. Although it is certainly important to highlight the negative effects of not consuming purified water, it will be more effective to focus on more positive marketing of a healthier and happier body.

When considering the WATASOL device as the potential for creating an enterprise, the approach must be promoted as a holistic endeavor to make money, while promoting healthy practices within the community. It is not a non-profit handout; it is a project that needs investment, engagement, and dedication from the person or institution operating it. This component of the WATASOL idea must be at the forefront of its promotion. It is a project with a future that communities can build upon, rather than simply the end of a supply chain.

3.3. Analysis of initial results

Now that the implementation strategies have been described and the marketing mix as it exists thus far in Nepal reviewed, the questions at hand are:

- Does the Antenna WATASOL method reach the BoP?
- Are consumers willing to pay?
- Can the Antenna WATASOL be financially sustainable?

In the sections that follow, the initial observations, feedback and results from these field tests will be compared to results obtained by similar projects in different regions. It is important for these questions to be addressed before any recommendations can be made on the marketing of this safe water mechanism to the BoP or strategies to scale up.

3.3.1. Does the ATG WATASOL method reach the BoP?

Although there has been discussion around how best to define the BoP, income level continues to be the most basic marker. Extrapolating from this point of departure, "the base of the pyramid is a term that represents the poor at the base of the global socio-economic ladder, who primarily transact in an informal market economy" (London 2007, 11). Additional definitions have included, gender, education, caste, politics and other social barriers in the facets of the pyramid (Lall 2010). These later categories undoubtedly characterize the BoP in Nepal.[19] For simplicity's sake only the two largest hurdles segregating the BoP population from the rest will be addressed in this section. These are 1) physical, and economic isolation of the population; both remote geographic location and the problem of minimal purchasing power must be overcome in order to reach the BoP in Nepal. Both can be overcome using the WATASOL technology.

As the report by Hammond et al. (2007) demonstrates, the overwhelming majority of the BoP market is found in rural areas, especially in Asia, where informal, inefficient and uncompetitive markets dominate. This is certainly the case in Nepal. As the statistics for Nepal show, average income in the Kathmandu valley is nearly five times that of other rural districts (Hutt 2004, 17). Thanks to deplorable infrastructure conditions, although the country is not very big (roughly 1400 km in diameter, CIA 2009), it can take more than 24 hours to

[19] ECCA installed one Mini-WATA through a different organization the district of Kavre. When interviewed, the teachers explained that the majority of the local community came from a lower cast and that as a result "they are a little bit behind. So they don't have awareness of cleanliness and sanitation. So it is difficult to talk to them about chlorine" (Bijay Gurun – schoolteacher, interview with author, Baluwa, 3 June 2009).

travel over land from the capital to the far corners. What this means specifically regarding access to safe water among the largely rural BoP, is that there is ample room for entrepreneurial solutions for affordable home-treatment water purification systems (Hammond et al. 2007). Further, because most of the water supplied in rural areas is not through a centralized system, point-of-use water treatment, such as with chlorine, is particularly appropriate.

WaterGuard and Piyush are available both in Kathmandu as well as in rural villages. However, the preliminary HIP report (HIP and AED 2006) found that among women who were enthusiastic about the use of chlorine, there were also complaints that the product was not readily available on the market or easily accessible (HIP and AED 2006, 31). The Piyush report also noted how it was predominantly available through traditional outlets, and should make more of an effort to be sold through non-traditional outlets (ENPHO 2009). The physical delivery of the chlorine product to remote sales points is thus a major difficulty faced by both WaterGuard and Piyush. Even if delivery is successful, it can be costly and sporadic, depending on the political situation at any given time. This clearly is the drawback to the Piyush and WaterGuard distribution models. The WATASOL technology overcomes this hurdle in the distribution chain by essentially eliminating it. Because the chlorine is produced locally on site, it can be done so in the hard-to-reach remote rural areas. Given that those at the very base of the BoP live in remote rural areas, WATASOL chlorine not only reaches them, but is able to keep the supply flowing (assuming no device malfunctions).

This was seen in locations where ECCA had implanted WATA devices. Several schools[20] located in the inner foothills of Morang and Jhapa districts, several hours walk from the nearest village node were producing chlorine with a Mini-WATA. The school as a central community node is able to function as a transmitter for the chlorine, since children purchase it there to take home. The Standard WATA operated out of the Jante Water User's Committee office reaches the community since all water users must necessarily come to the office once a month to pay their bill. Lastly, Mr. Gopal's door-to-door sales technique and the distance he can cover on foot and by bicycle succeed in reaching those who would not otherwise come to the center of the village regularly. Geographically, the WATASOL technology clearly accesses the rural BoP.

[20] The schools ECCA had implemented and monitored the WATASOL activity by May 2009 included 4 schools in the village Letang (Morang district), 2 near Dhulabari (Jhapa) and 3 in Lalitpur (Kathmandu valley).

The second significant hurdle to reaching the BoP is the economic one. WATASOL's flexibility in structuring the product (chlorine or water, drops or bottles) and determining margins means a seller can adapt his sales strategy to suit the market he is operating in and adjust his price according to the service he provides. Single-serve packaging is one of Prahalad and Hart's many suggestions for marketing to the BoP (Prahalad and Hart 2002), and the sale of small chlorine bottles to purify water, rather than the purchase of a large expensive filter, offers the prime example of this. Because chlorine is a product sold in small quantities, it is more accessible to the BoP; it can be purchased with a few extra rupees each month, rather than in one bulk installment such as a filter.

So far the examples presented have been in the rural BoP segment. Although the rural populations represent the largest untapped market of the BoP in Nepal, one must not overlook the BoP living in the Kathmandu valley. Not as geographically remote, they can still be socially and economically isolated. The VSBK projects present such an example. The migrant kiln workers who travel to the Kathmandu valley to work might be closer to the urban capital where the safe water product options are greater, but in their social standing and confined living conditions on the kiln site, they are very limited in their access to the market. Although water on kilns is currently being subsidized (either fully or partially in the two pilots VSBK is running), the workers are purchasing the chlorine. Because of the low production and even lower refill costs of bottles of chlorine, even this economically marginalized population can afford it (and as we will see shortly, is willing to purchase it).

A final note on reaching the BoP addresses the various layers of these bottom 4 billion. As Hammond et al. highlight (2007), the BoP can encompass several income layers. In the case of safe water, this means that higher layers have more choices. For one, they are more likely to live closer to a village center or even in the Kathmandu valley. If they do so, they have access to a greater range of products beyond chlorine, such as filters. As the success of the PurIt filter sold by Hindustan Lever in India has shown, even those considered to be part of the BoP statistically still make purchase choices based upon marketing and the symbolic prestige of a product (Heierli 2008, 86). Those at the very base of the BoP in remote rural areas, however, have no such luxury. The bottom of the base is what the WATASOL-produced chlorine is best suited to target because it can overcome the two barriers – geography and purchasing power.

3.3.2. Are consumers willing to pay?

While the consumption of clean water is certainly one of the central end objectives of the WATASOL technology, its versatility and method of operation are not designed to be supplied free of cost, and are supposed to eventually be profitable for the operator/seller. For this to be possible there must be demand on the consumer's side and a willingness to pay. Initial results suggest this exists in Nepal. This willingness stems from the belief in the necessity of the product, the opinion that it is being priced cheaply enough, and the behavior change required to adopt a new habit.

Studies in both Nepal and certain countries in Africa have sought to determine this willingness to pay in the safe water market among customers. The initial assessment in 2006 of the USAID HIP project in Nepal found that chlorine was the second most popular method to use to disinfect drinking water, after the ceramic (CS) filter (HIP and AED 2006, 10). Interestingly, mothers partaking in the study claimed to being able to pay for the chlorine at market price, and preferred paying the repeat price of chlorine than the bulk price of a CS filter (HIP and AED 2006, 10). Women respondents stated that as long as the bottle of chlorine was within 50 NRs, they could afford it and would be willing to purchase it (HIP and AED 2006, 10). The Piyush report further found that non-users would be willing to pay around 21 NRs for a 60 ml bottle of chlorine (ENPHO 2009, 12). Incidentally both of these findings are for values higher than what the ATG WATASOL chlorine is being sold for.

Kremer et al. (2008) in their study of the role of price, knowledge, and social networks as determinants in the take-up of WaterGuard in Kenya concluded that a willingness to pay was very price elastic. While demand was significantly higher at a price of zero, only a fraction of households actually purchased the chlorine product after the intervention (Kremer et al. 2008, 38), and a change in price from 10 to 20 Ksh barely affected demand (Kremer et al. 2008, 38). This is contrasted with the studies by (Ashraf, Berry, and Shapiro 2008) and Garrett et al. (Garrett et al. 2008) who did find a high willingness to pay for WaterGuard, especially when it was being offered at a 50% discount price.[21] Acknowledging that results and consumer disposition towards price will vary enormously from context to context, it is nonetheless useful to consider Kremer et al.'s results, in the absence of more comprehensive price studies of willingness to pay for WATASOL chlorine in Nepal. Specifically, it is of interest

[21] Kremer et al. (2008) do note how these starkly contrasting results could have also been influenced by the rural/urban context of their two projects, as well as the method of distribution. Garrett et al's sales were conducted regularly door too door and follow up was on a weekly basis which might have induced higher take-up rates (Kremer et al. 2008, 26).

to note that price elasticity from one price to the next is very low (provided the first price isn't zero).

This has significant implications for the liberty WATASOL producers in Nepal may take in pricing the chlorine product they sell, as we shall see shortly. Overall, there was little negative feedback on the subject of the price of the chlorine among the users of the WATASOL pilots. ECCA's plan of selling bottles for 12-15 NRs is the cheapest option in comparison to Piyush (17NRs) and WaterGuard (35NRs) and certainly cheaper than a filter. Moreover, the option of simply purchasing a refill eliminates the cost of the bottle and brings the price down to 5 NRs. For the really poor who cannot afford to spend even this, the WATASOL technology allows for creativity in pricing and distribution. The Water Users Committee in Jante, for example, considered selling drops by the community well in order to reach even those families who cannot afford a water connection, let alone a bottle of chlorine.

The proven willingness to pay in Nepal deserves a closer look. Interestingly, what early consumer feedback from the VSBK sites and the entrepreneurship model of ECCA indicated was that often it is not the product of chlorine per se, but the *service* that comes with the product for which customers are willing to pay. One of the early models that the VSBK project tested was not to sell the bottles of chlorine, but instead to sell pre-chlorinated water directly to the kiln workers on site. To test what the workers' reaction would be to the opportunity of purchasing safe water, the VSBK project management hired a water seller to bring the jugs of safe water on a bicycle cart to the kilns. The response showed a clear demand.

> "There has been a positive response to the willingness to pay of the workers for the supply of water that has chlorine in it. The success seems to come from the fact that water is available on site for the workers and they don't have to go into town to collect it. This humiliates them among the villagers. Sometimes they get harassed by the villagers." (Sharda Nepali - VSBK Social Mobilizer, interview with author, Lalitpur, 28 May 2009).

Being offered the service of access to water on the kiln site spares the workers the ridicule and discrimination they are subjected to when they venture into the village.

Furthermore because the kiln sites are usually far from the nearest shop, collecting water is time consuming and can take more than two hours out of the day of a worker, resulting in significant economic loss for them. For this reason, having the option of purchasing water cheaply directly on the kiln site (where the workers live) saves each worker time, and allows them to make more bricks. Because time is directly related to the number of bricks produced and thus the income of a worker, the financial gain of the investment is easy to calculate. One

worker who gladly purchased 20 liters of water per day claimed she was able to produce 500 more bricks with the time she saved by not having to collect water herself (kiln worker, Ram Kaji kiln 05.06.09).

The same can be said for the loss in profit suffered due to absenteeism caused by diseases resulting from contaminated water. They inflict a loss on both the workers as well as the enterprise. The estimate is that the profit foregone (at 1 NRs/brick) for 84 molders in 58 days was 59'700 NRs ($783). The income loss for the 84 molders (at NRs 300/1000 bricks) was NRs 17'900 ($235) (Manandhar 2009). Needless to say, such figures alone are very persuasive, both for the workers and the entrepreneur. Knowing that consuming safe water will prevent them form getting sick is certainly a motivator for purchasing water. However, feedback from the workers suggested that it was ultimately the *delivery service* of the water that prompted the regular demand and clear willingness to pay. Similar results were found in neighboring India. An extensive study by the Monitor Group (Karamchandani, Kubzansky, and Frandano 2009) found that one of the financially successful business models had customers willing to pay for the service of being provided with pre-filtered water (42).

Another example of willingness to pay for a *service* with the chlorine is the entrepreneurship model tested by ECCA. The pilot launched with the school caretaker Gopal involved him producing the chlorine, filling it in bottles and going house to house to promote, explain, educate and sell the chlorine. Taking the chlorine door-to-door and what's more, returning regularly to check up and sell a refill after the appropriate amount of time had passed meant they did not have to go out and find the product when they needed it.

This is essentially going the *last mile* to reach the BoP, the most difficult distance as many BoP ventures have found – including WaterGuard and Piyush. The last mile not only consists of physically getting the product to the consumer but also making the consumer aware of the presence of the product. There was a general lacking awareness about the availability of chlorine in the Letang region. A pharmacist questioned in the village claimed that neither WaterGuard nor Piyush were available in her village, and that WaterGuard was too expensive. A survey of the remaining 5 pharmacy shops in the village, however, showed that Piyush was actually available in 2 of them, although stocked at the back, in a corner and full of dust. In one case the person working at the stall didn't know himself that he had Piyush (until the author spotted it). If even those running the pharmacies are not aware of having Piyush or WaterGuard in stock, it can't be expected that the villagers would. One random household that Gopal visited had a bottle of Piyush, which had been prescribed by a doctor but had not been touched for months.

The WATASOL distribution model also solves this problem of lacking awareness of the presence of the product, since inevitably a component of social marketing is required in successful door-to-door sales. Indeed this is part of the process of creating demand. Arinita Shrestha the HIP coordinator in Nepal concluded after their pilot that the people they worked with that the communities were aware of the different methods and could talk about them, but that regular practice was missing (personal communication, Kathmandu, 4 June 2009). Focus on encouraging regular habit was the necessary next step.

The door-to-door model, while providing easy access to chlorine, also works as a method to encourage and remind people to use the solution with regularity. In setting up a pattern (every four weeks a salesperson comes by) a customer might begin to use the product with more regularity, knowing that by the time the sales person comes by again, the chlorine should be finished. If we consider the traditional behavioral bell curve of the way innovations are adopted (as identified by Everett (Everett M. Rogers 1995), see Figure 6), a sales mechanism such as that of Gopal's might have the effect of increasing demand for chlorine by helping to move individual members of community along the line of behavior change. Gopal, as one of the *innovators* begins to sell the chlorine. At first *early adopters* purchase products. As word spreads and he continues to come back to houses that at first are not interested, an *early majority* of users eventually emerges. This is in large part thanks to his persistence and sales model of going door-to-door. Kremer et al. (2008) in fact suggest that the results of the study conducted by Garret et al., which showed higher take-up rates among the population (than the study by Kremer et al.) might have been influenced by the frequent monitoring visits of the research team. In a similar way, it is likely that the regular visits of a salesperson will eventually convince a household to purchase the product, especially if their neighbors are all using it already. This happened on several occasions with Gopal: on an afternoon when the

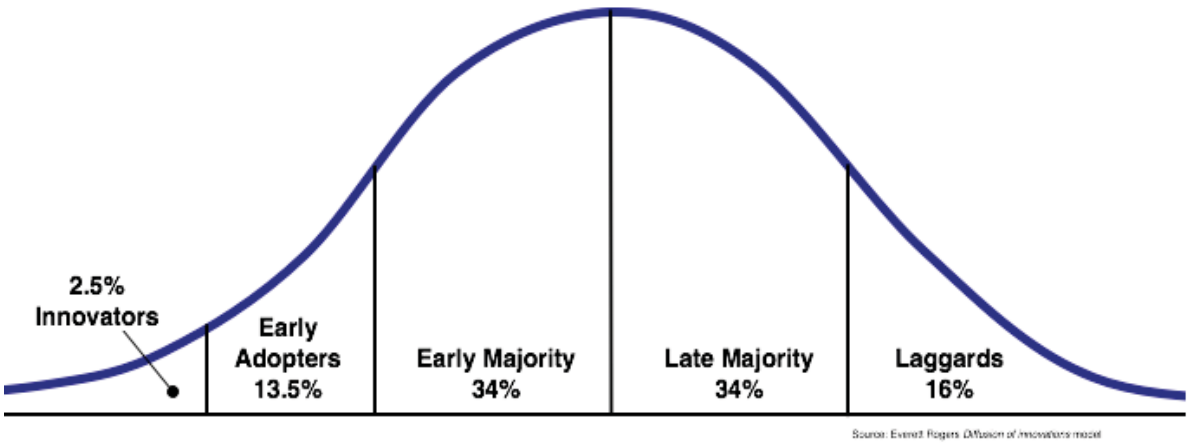

Figure 6: Diffusion of Innovation (Source: Rogers 1995)

author accompanied him on his rounds, several women who had up until that point resisted deiced to purchase a bottle of chlorine stating “my neighbor has been buying it for a few months now and says it makes her feel better, so I think I will try it too” (woman villager, interview with author, Letang, 18 May 2009). Of course one must acknowledge the effect of having a foreigner along and the influence that has on the perception of the product among villagers. In response questions about what would help sales and marketing Gopal answered “having someone from Kathmandu, an outsider, come along every couple of months. This would help convince the villagers of the legitimacy of the product (Gopal Dhakal, interview with author, Letang, 18 May 2009).

Thus the door-to-door service *and* regular delivery along with the chlorine can positively affect sales rates in this model and the willingness to buy. As with any behavior change, time is necessary. The Jante WUC gave the example that before there was a centralized water distribution system in their rural village, the concept of paying a water bill was foreign. The behavior change from non-paying to paying was gradual but inevitable, and their opinion was that the same was to be expected of the awareness about the necessity to consume safe drinking water and paying for chlorine to do so (interview with author, Jante, 18 April 2009).

A note should be made here on the history of Nepal as a long-standing recipient of development aid and the effect this has on attempts at market creation. The head of the Jante WUC did remark that it was often difficult to convince community members to purchase the chlorine because of the stigma associated with development projects originating from international organizations. Other projects have set a precedent of giving out products free of charge and even going so far as to pay participants to take part in trainings (Mr. Nanda P. Khatiwada – chairman WUC, personal communication, 18 April 2009). Market distortion through international development aid projects is not an uncommon phenomenon. Given that ATG seeks to introduce its technology explicitly through local partners, one can hope that through sound programming, planning and marketing this difficulty can be overcome.

3.3.3. Can the ATG WATASOL be financially sustainable?

The development industry is moving away from subsidized interventions and pushing towards initiatives that achieve some degree of financial sustainability. Particularly in the areas of public health and water supply, there have been attempts at cost recovery from beneficiaries. These have met with limited success (Kremer and Miguel 2007), which does not signify that it

cannot be done. The particular challenge facing BoP ventures and which greatly increases the initial financing,

> is the need for investment in common goods in the informal economy. For example, promoting a product that cleans contaminated water requires that the local population understand the link between dirty water and disease. If this awareness is low, then an investment is required in educating this population. Unless there is a local monopoly, this investment is a common good, and the investing organization will struggle in generating a competitive advantage from these expenditures. (London 2007, 29)

It is ATGs intention that through their innovative technology, ownership and profit are possible for local operators. The particular advantage in Nepal is that other organizations have already invested heavily in the common good of raising awareness and educating the public. Furthermore, both ECCA and VSBK count education and sensitization to issues among the communities they work with to their core missions.

For our purposes here in examining if the model can become financially sustainable we will factor out the cost of social marketing campaigns and education. On the one hand this is because much has already been done in Nepal. Further, it might be argued that social marketing and basic education is the responsibility of the government and non-profits, not of businesses. Factoring out the large-scale social marketing cost in the current pilots means final costs at the most basic level consist of the initial investment in the WATA device, bottles, salt, and electricity. Cost for other investments such as bicycles, bags, merchandise, etc. are extra and negotiable. The financial return rests on the minimal prices and even smaller margins charged for the chlorine and water sold in Nepal.

The figures suggested by ECCA in July 2010 estimate that an entrepreneur would have to sell 200 liters per month, work a total of 25 days and produce 8 liters a day to be successful financially. In order to do this a Standard WATA (producing 1 liter per hour, for 8 hours) is to be used. Table 1 shows the breakdown of how these 200 liters would be sold.

Size (ml)	**No. of bottles**	**Total volume of WATASOL (ml)**	**Solution refill rate (Rs.)**	**Amount received (when all sold) (Rs.)**
1000	100	100’000	50	5000
200	350	70’000	15	5250
50	600	30’000	5	3000
Total		200’000		13250

Table 1: Sales volume breakdown and income of chlorine bottles totaling 200 liters (Source: ECCA 2010).

If an entrepreneur produces and sells the chlorine as Table 1 suggests, he can expect a return of NRs 13'250 (approximately $180). This is certainly above the poverty income of $2 per day. ECCA suggests splitting this profit between ECCA, the entrepreneur and social mobilizers (see Figure X). This of course significantly reduces the profit for the entrepreneur.

Sharing of income		
	%	Amount NRs
ECCA	30%	3,975.00
Entrepreneur (1 person)	25%	3,312.50
SM (3 persons @ 15%)	45%	5,962.50
Total	100%	13,250.00

Table 2: Sharing of income of profit from sales of 200 liters of chlorine over 1 month (Source: ECCA 2010).

It is difficult to judge, however, whether the operation of a WATASOL device in Nepal can become financially sustainable for the simple reason that the initial implementation as of summer 2009 had not yet yielded conclusive results. Although there is a willingness to pay, it has yet to be proven that a single entrepreneur can sell 200 liters of chlorine in successive months.

The Monitor Group report (Karamchandani, Kubzansky, and Frandano 2009) identifies seven models of successful businesses that target the BoP and it lists specific characteristics of each. In the absence of quantitative data, it is helpful to compare the feedback from the WATASOL projects thus far, to the requirements of the models they propose. Three models in particular are relevant to the WATASOL proposed programs, namely the *pay-per-use*, *no frills service* and the *shared channels* models.[22] Taking these as a point of departure will help in assessing whether the WATASOL approach is well positioned to become financially sustainable in the future. Table 2 summarizes the assessment.

[22] The Monitor Group report by Karamchandani, Kubzansky, and Frandano (2009) outlines four other models, namely Paraskilling, Contract Production, Deep Procurement and Demand-Led Training. These, however, are less relevant to the business model that the WATASOL is capable of becoming and are therefore not reviewed here.

Model identified by Monitor Group	**Elements of the model**	**WATASOL potential**	**Rating**
Pay-per-use: customers pay for each use rather than owning an asset	*Accommodating terms* – customers pay as they have available cash; they collect the product at centralized distribution point or pay surcharge for delivery; products are sold in single portions.	The chlorine produced with the WATASOL technology is sold in single package portions for purchase at low cost, especially the refills. Models that include service delivery (Gopal's enterprise model; the VSBK distribution model) can charge a fraction more for the added service. Given the findings regarding price elasticity (Kremer et al. 2008) this addition in price for service should not greatly affect take-up.	✓
	Group infrastructure – yield is for a larger aggregation rather than individuals; local village-level management responsible for daily operations, sale and collecting payment.	Standard and Maxi WATA devices lend themselves to bulk production. Chlorine can thus be sold to an entire village through a local network (such as the Jante Water Users Committee; ECCA has also considered approaching Village Development Committees).	✓
	Third-party administration – an external entrepreneur or village group organizes and provides the service with the necessary expertise/ experience.	Both ECCA's enterprise model, their school model and VSBK's approach through their social mobilizers involve an external entrepreneur producing the chlorine, with the knowledge and training they have been given. In the case of Kathmandu, ECCA has taken to producing the chlorine themselves and selling it where necessary as the word of the product spreads.	✓
No frills service: economizes at every stage of the process.	*Setup and service* – provider supplies 'bare bones' service to lower unit cost; quality is high enough to be superior to other options.	Chlorine has the option of being sold even without the cost of bottles, either through drops, or as refills. These options are significantly cheaper than alternatives on the market. Quality control can be guaranteed through the testing kit, although this requires exact skill and dedication. Nonetheless, chlorine remains the superior option over boiling, SODIS and even ceramic filters (because of the high initial cost).	✓
	High throughput/high asset utilization – high customer volume drives capacity.	Although the potential exists (especially if using the Maxi-WATA which no project in Nepal has implemented), the potential for high volume remains to be proven. The early pilots have not achieved high throughput. Likely to require stronger networks and more marketing.	✗
	Service specialization – limited service focus allows provider to focus and only limited training is necessary.	Producing chlorine and checking for proper concentration requires only limited and specific skills, training and processes.	✓
	Services/protocols – standardized, documented and easy for low-skilled staff to carry out.	A basic education is necessary to produce chlorine making it generally unsuitable for low-skilled staff. Standardized and routinized protocols are still to be worked out, but this should be fairly feasible once the pilots have progressed.	✓

Shared Channels: aims to reach the rural poor by piggybacking on distribution channels of other enterprises	*Use of existing distribution platforms* – piggybacking off of already functioning networks.	ECCA's model does this through schools as well as through the WUC in Jante. It seems WATASOL has the most potential to be successful if it feds into an existing network.	✓
	Increased field force responsibility – carrying multiple products from a single hub into rural areas.	No pilot in Nepal has keyed into a network that carries other products to the BoP, except the WUC in Jante regulates water (this method does not necessarily involve a network 'carrying' other projects per se). The potential exists but has yet to be tested.	--
	Proper incentives to all participants in the distribution chain – including distributors, end dealers.	Given the WATASOL approach eliminates most of the distribution chain, this characteristic is not very present. However, marginal financial gains for ECCA and Antenna, as the entities at the very top of the distribution chain are unlikely to see any real profits given the low margins and the as of yet low sales volume.	✗
	New alliances – can allow specialization for those logistically better suited to tasks such as physical delivery.	This is similar to the first characteristic, which involves linking in to other networks, for the distribution, for example. Given the very limited number of steps between production and sale of chlorine with any WATA device, however, reduces the change of specialization – the whole process is already quite specialized.	--

Table 3: Assessment of WATASOL approach against elements of successful business models targeting the BoP (Source: author's depiction based on the models outlined by (Karamchandani, Kubzansky, and Frandano 2009).

As the Table 3 shows, the WATASOL devices lend themselves to the establishment of several potentially profitable and successful business models. The *pay-per-use* model is an appropriate approach because the WATA devices allow for the production of single portions in smaller bottles, and even the sale of enough chlorine to purify one water collection vessel at a time (such as directly at the source of water). It can be operated and managed by a third party and enough can be produced to supply an entire group infrastructure. The *no frills service* model is an option because the sale of chlorine produced is a very simple and reduced process. The most cumbersome part involves the production and sale of the bottles and this can be largely reduced once the initial bottle has been sold to a customer. Although not all of the *shared channel* model characteristics apply to the WATASOL pilots in Nepal, the basic idea of piggybacking off of an existing network and using it to penetrate deep into the rural BoP is a valuable component to consider in any strategy. This is in effect what ECCA does through its school model, and involving other WUCs and VDS would have the same effect. The key point to take from the comparison between the WATASOL approach and these models, is that the implementing entity (ECCA or VSKB in the case of Nepal) decides which of the models

outlined they would like to pursue. Once they have done this, they must make sure all the necessary characteristics are included. Generally, judging by the criteria the Monitor report outlines, the WATASOL pilots should be able to achieve financial sustainability in the long run.

Briefly considering other similar projects, there appear to be positive results in some African countries such as the Great Lakes region where WATASOL devices are in operation (Osborn 2009; Antenna Technologies 2010b), but there are also studies that suggest otherwise. In Kenya, Kremer et al. concluded in their chlorine pilot project, "it seems unlikely that the significant benefits from WaterGuard use can be realized in a market environment in which consumers have such low valuation of the good, and ongoing subsidies will likely be necessary to achieve sustained widespread adoption" (Kremer et al. 2008, 39). Thus far this echoes what USAID and ENPHO have found in Nepal: both the WaterGuard and Piyush are heavily subsidized. Given how the WATASOL model differentiates itself from the WaterGuard and Piyush models, subsidies should prove to be less important. Nonetheless, in examining the appropriate model to scale up the WATASOL approach, the role subsidies play will also be considered.

4. Scaling Up at the BoP

The theory behind BoP marketing is that where the development industry has failed to provide sustainable solutions to a host of problems, a market-oriented approach is the only avenue that can scale to meet the needs of the 4 billion at the base (Hammond et al. 2007, 21). The hurdle of scaling up is one faced by development projects, BoP ventures and social enterprises alike and successfully overcome by few. The aim of the WATASOL program is to eventually scale up and reach as many people as possible. The question remains how best to attempt this. After a review of the ways in which scaling up can be understood, the model of microfranchising as a possible method for expansion is applied to the WATASOL approach. This is because microfranchsing allows for business creation and model replication that minimizes start-up failure that prevails in the informal economy (Hart 2007b). As such microfranchising offers possible way for transferring knowledge about WATASOL enterprise creation from current entrepreneurs in Nepal to future ones.

4.1. Is the ATG WATASOL model scalable?

Scaling up is and remains a fuzzy term (Uvin 1995; Clasen 2009), and growing a system is not necessarily the way to successfully meet vast needs and achieve greatest impact (Dees 2010). Typical dimensions of scaling up development projects include increasing size, diversifying the types of activities an organization provides, expanding mission from service to empowerment and working towards structural change, or scaling for financial diversification of funding sources (Uvin 1995). Related specifically to HWTS projects Clasen (2009) defines scaling up as encompassing coverage (supply) and uptake (demand). However, when considering projects that involve social enterprises, alternative opinions exist. Dees argues,

> if we care about large-scale change, we need to keep in mind that social entrepreneurs can scale their impact by getting new legislation or regulations passed; getting old legislation or regulations enforced; shifting social norms, behaviors and attitudes among fellow citizens, corporations, government personnel; changing the way markets operate; and finding ways to prevent the problems they have been solving or reducing the needs they have been serving. None of these methods of scaling impact necessarily requires massive organizational growth, which can slow the process down. (Dees 2010)

In essence, “how big you are is in no way a measure of how good you are at driving change”

(Osberg 2010). Kumar (2010) posits that it may actually be unnecessary for social enterprises to scale up to the size of a Grameen Bank. (Mohamed Yunnus's ventures are generally held up as the prime success example of a large-scale social enterprise; let us not forget, however, that it took Mr. Yunnus over 7 years to get there.) Rather he proposes that financial scale and impact can be achieved at the network level, not at the individual enterprise level.

As has been demonstrated, current WATASOL implementation models in Nepal involve networks. Especially in the case of ECCA, networks have been key in finding potential entrepreneurs and achieving buy-in from early adapters. The main network ECCA has target is schools:

> If we involve the children they know the value of chlorine. [The] activity is done through the Nature Club. It is part of the program for the clean drinking water so we want to involve the students so they will have knowledge how to purify, so they can teach others - students, parents and community. (Rajesh Pandey - schoolteacher, interview by author, Lalitpur, 7 May 2009.)

In this way, information is not only given to the young generation who constitute the future, but students are also used as a channel to convince parents and their peers. Indeed, the benefit to using networks is that knowledge can be disseminated beyond the direct reach of the ECCA network, as happened on the outskirts of the village of Letang:

> We have shared these materials with other schools and have shared it with the community. In the other schools we have demonstrated it to, they also want a chlorinator and are searching for a way to find one. […] They have no Nature Club. Some communities also seem to want the chlorinator to use at home. (Rajendra - schoolteacher, interview by author, Letang 17 May 2009.)

Even the entrepreneurship model promoted by ECCA establishes networks. As Gopal reported: "I visited Thankuta [*different district*] and carried some with me and sold them there. They are also very interested in the chlorine/chlorinator for the monsoon season" (Gopal Dhakal, interview by author, Letang, 17 May 2009.).

The way this kind of information has spread is similar to the MNC models proposed by other voices on BoP theory scaling up. Simanis and Hart (2008) in their BoP protocol speak of a form of cross-pollination from one location to another as a means for achieving scale. First a project is co-created within a community and then once it has been proven successful the core business value is scaled *out* (rather than *up*) as propagation of the initial model occurs

(Simanis and Hart 2008, 42). As might be expected, different theories on how MNCs should successfully scale up their BoP ventures abound.

Another model relevant to the WATASOL case study is proposed by Bachmann, who argues scaling happens on three vectors, namely *scope, coverage* and *penetration* (Bachmann 2008). In his more top-down model, first a pipeline to customer is created, which is expanded geographically and eventually loaded with more products. Similarly, ECCA and VSBK already have existing channels of information to their target audience. In taking on the WATASOL technology they are merely loading an established and proven pipeline that has great geographic reach with more information and another product. Important to note here is that the product these two NGOs (if we substitute ECCA and VSBK into the model in place of an MNC) are pushing is *not* necessarily the chlorine, but the WATA device and the opportunity to set up a business (see section 3 on the social marketing of the dual product components of the WATASOL approach).

All theories show that working through a network to achieve impact is undoubtedly the method for scaling up in Nepal. This holds especially true considering the current early phase where large-scale production of chlorine has not yet been proven feasible. Only one Standard WATA was in operation at the time of this research and due to load-shedding the amount of chlorine produced with a Mini-WATA was inherently limited. Scale is more likely achieved through the employment of many Mini-WATAs by many different small producers – i.e. scale up of device-as-product coverage and thereby chlorine reach - rather than one or two Standard or Maxi-WATAs - massive scaling up of chlorine product coverage.

Before a more exact *how* on the topic of scaling the WATASOL projects can be addressed, however, two observations on the nature of social enterprises are helpful to remember: 1) they generally pick “the most difficult, not the most lucrative, markets in which to work,” and 2) “much of the impact that social enterprises achieve is the result of influencing others to follow their lead” (Kumar 2010). Thus, “the comparative disadvantage of social enterprises against businesses and the fact that social impact happens more through influencing others than through direct action – suggests that social enterprises themselves are likely to remain relatively small in financial terms” (Kumar 2010).

Both points Kumar raises about the nature of social enterprises are certainly applicable to the WATASOL projects in Nepal. As WaterGuard and Piyush have shown, the market is not an easy one in which to become financially independent and sustainable. Furthermore, the idea behind the WATASOL approach is that members of a community, who are more proactive and

have networks through which to influence other community members, will do so in selling their safe water product. Indeed, women who purchased chlorine from Mr. Gopal in eastern Nepal admitted to doing so because they a) believed and trusted Gopal and b) had seen all their neighbors buy it and so were convinced to try it themselves.

Finally, let us not forget that the added value of a social enterprise over a normal business venture is that at its best it is supposed to create a paradigm shift. That is the ultimate large-scale impact it can have. According to Elkington, what begins as a mind-set, changes to behavior. Social entrepreneurs are good at influencing such a transformation in their immediate surroundings. Few however scale beyond that to achieve true systemic change. In order to do that, efforts must be devoted to creating *clusters of activity* (Elkington 2010; see Figure 7) – essentially networks that work together to push for widespread change on all levels (as Dees also notes). In the safe-water sector in Nepal such clusters already exist, with WaterGuard, Piyush and a host of organizations working together to raise awareness. Given that the WATA devices address a technological gap left by other products on the market, the WATASOL is perfectly poised to work with other agents in this field to penetrate into rural networks and achieve scale in the long run. Unfortunately but realistically, one cannot overlook that this all takes *time,* sometimes decades (Elkington 2010).

The question remains as to what the best method is to reach networks and to scale out in order to have the greatest impact. One option is through the model of microfranchising.

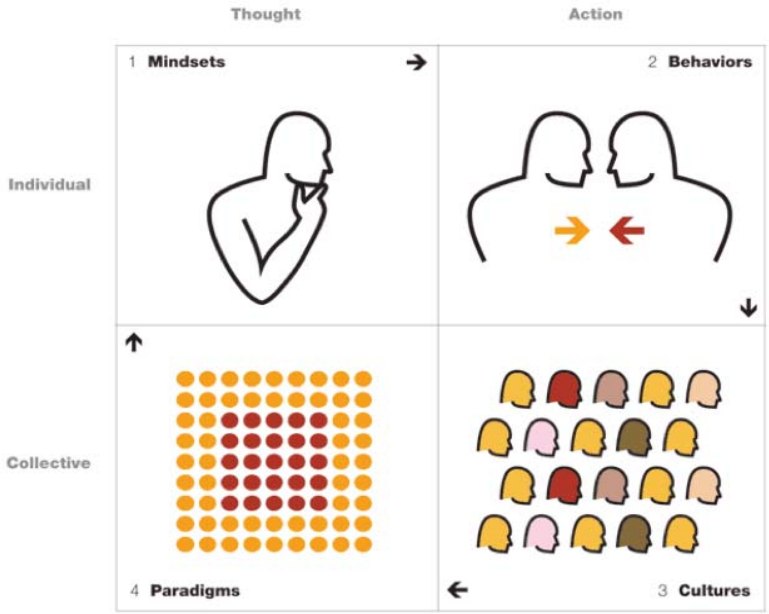

Figure 7: Cultural revolution in four steps – Change starts with individual beliefs and behavior, then spreads to the wider community (Source: Elkington 2010).

4.2. Microfranchising: A model for marketing the ATG WATASOL in the future?

As a result of the rapprochement between the private and the non-profit sector, hybrid business models that straddle both have begun to emerge. These include ventures of local entrepreneurs, partnerships between NGOs and MNCs and microfinance businesses – to highlight just a few. Fairbourne (2007) argues the next significant evolutionary stage in targeting the BoP is microfranchising. The traditional franchise model is one that serves as a means to replicate successful businesses and increase profits for the franchisor. Microfranchising takes this further and gives the opportunity of creating a business to the world's poorest people (Lehr 2008, 3). In light of the potential yielded by the analysis of the WATASOL technology in the previous section, microfranchising is one way to approach the challenge of scaling up projects and more importantly, establishing networks for the sale of chlorine. This part of the paper will apply one of the NGO microfranchising models Fairbourne outlines to the case of the WATASOL projects in Nepal, and analyze whether setting up such a model is feasible and what it would entail.

4.2.1. Social Microfranchising

"It takes an ecosystem to solve a social problem." (Dees 2010)

Microfranchising is relatively new in the BoP landscape and the precise definition of its scope is still somewhat fluid (Magleby 2007). At its most basic it involves a replication to scale of grass-roots, bottom-up poverty alleviation initiatives that have proven to be successful (Fairbourne 2007). This focus on poverty alleviation activities is the major difference between microfranchsing and traditional franchising. A further distinction is that rather than simply existing as an independent business in a community, the best examples of successful microfranchises operate "with a strong community feedback loop where experimentation, continual learning, and adaptation can take place" (Villani 2009). Thus far, there have been several very successful cases that suggest the potential of microfranchising.[23]

Fairbourne (2007, 10) breaks microfranchising down into three different models, each with a slightly different aim:

[23] These include: the Scojo Foundation selling reading glasses in El Salvador, India and Guatemala; Grameen Village Phones in Bangladesh; public transport operators cooperative in Rwanda or a solid waste collection in Dar Es Salaam (Henriques and Herr 2007, Appendix).

1) *Social microfranchising* has as its prime objective the provision of goods and services at affordable prices and as a secondary motive, the creation of jobs at the BoP. This model, therefore, does not operate on the bases of financial sustainability and allows for subsidized products, in order to achieve its goal.
2) *Sustainable microfranchising* seeks to create enough surplus profit to sustain the microfranchisor and thus has a more business-like approach.
3) *For-profit microfranchising* goes a step further in that it seeks to create enough profit to return some to the initial investors (this is generally more relevant to ventures launched by MNCs, rather than NGO-supported projects).

The first step in considering if the WATASOL technology would lend itself to being microfranchised is to decide what the main aim of the model would be: provision of affordable products and job creation or making a profit.

While the goal of generating profit for those at the BoP is certainly one that is voiced by partners, as the analysis has shown, none of the pilots in Nepal has yet proven that a WATASOL device can become financially sustainable, although the potential seems to be there. Although VSBK has found a willingness to pay, they have not yet found a way to use the WATA device without heavy subsidy, both for the device (lending it to the operator) as well as the storage tank and the salary of the water vendor. Similarly in ECCA's case, while some schools have purchased their Mini-WATA, none of the schools has yet made enough off of the sale of chlorine that would imply they have regained the cost of the initial investment. Further, they were able to do so at half the usual cost, thanks to a grant that ECCA received from the World Bank Development Market Place award, to be used expressly on this project. Even the pilots that have higher sales, such as the Water Users Committee in Jante, or the independent entrepreneur Gopal, have not proven financial sustainability. While the former were able to purchase a Standard WATA with funds they had as the VDC, at the time of research, they had only just begun selling water. They seem the most likely to regain their investment in the future given their steady sales stream and sales model. In the case of Gopal the WATA device still belongs to the school and he only receives a minimal cut from each bottle he sells. Despite this inconclusive financial data the pilots and interviews with the stakeholders suggest that with more time, returns will grow.

That being so, none of the pilots have factored in the cost of any promotional materials into the costs of operating a WATA device. Promotion, education and advertising campaigns are paramount in raising awareness and creating continued demand for the product, as the

USAID and ENPHO projects found. This forces the conclusion that while in an ideal world a WATASOL device is used to establish a *sustainable microfranchise*, in reality, at least at this point in time, it can only be scaled out through a *social microfranchise* model (that seeks to provide goods and services at affordable prices and create jobs at the BoP).

The main reason for this is because of the heavy subsidy required for the device itself and the social marketing that must accompany any implementation. In creating jobs at the BoP the franchise model's aim does include financial profit and sustainability for the individual franchisees; financial self-sustainability simply doesn't cover all the costs of the microfranchisor, which include the social marketing component. As we have seen in the case of Nepal, extensive social marketing is a must in creating the required ecosystem. While the WATASOL chlorine may piggyback off of the campaigns to raise awareness launched by WaterGuard and Piyush, it is dangerous to assume the other organizations will always be the ones investing in these activities. Furthermore, in the more remote areas where the WATASOL technology seeks to penetrate, there might have been very little ground cleared by the competitor's products. In this case, extensive education and social marketing will need to accompany the set-up of any new enterprise or microfranchise branch.

Many of the business models that the Monitor Group reviewed, in fact, relied on so called soft funding[24] (Karamchandani, Kubzansky, and Frandano 2009). They argue, however, that

> this should not be seen as a shortcoming but rather as a reflection of the immaturity of the pioneering business models, as well as recognition of two important facts. First, most market-based approaches are aiming to fulfill a public function in a self-sustaining capacity, and certain solutions […] may prove to be far more efficient uses of government, donor, or philanthropic funds than traditional models of engagement or of government provision. And second, most of the enterprises in this space are operating in environments in which the full ecosystem needs to be developed end-to-end. (Karamchandani, Kubzansky, and Frandano 2009, 121)

Not surprisingly, these words sound a lot like the structure that Hart and Simanis' BoP Protocol called for, namely the phases, of *opening up*, *building an ecosystem* and *creating an enterprise* (Simanis and Hart 2008).

Magleby argues that franchises that aim to provide the greatest possible social good to the largest number of people, such as those in the fields of education, health care or the arts,

[24] Donations, subsidies, grants.

rarely become fully profitable (2007, 147). Ultimately, social franchising should be seen more as a "tool that might help bring an underlying business model to scale" (Karamchandani, Kubzansky, and Frandano 2009) rather than as a model in and of itself. The question then is what would the underlying business model look like that a social microfranchise would scale up? "For social franchisors the challenge is to hit on a commercially viable business model that provides a high-quality, socially beneficial product or service the poor truly and will pay for" (Karamchandani, Kubzansky, and Frandano 2009, 53). How to find this product and underlying business model is discussed in subsequent sections.

4.2.2. The BOOT Model of Microfranchising

We have identified that the two main hurdles (i.e. the components requiring the most significant financial input) for an entrepreneur using the ATG WATA devices are the device itself and the social marketing. The previous section addressed social marketing, this section will examine the financial side and will simplify an existing microfranchise model to suit the context of Nepal.

Gibson (2007) identifies NGOs as being one of three types of franchisors, namely as a *business creator*, as an *investor* in an already-operating microenterprise, or as a *BOOT Model franchisor*. Although it is possible to imagine that in a different context ATG might work with a local NGO that will invest in already operating microenterprises, this is not applicable to the context of Nepal. Thus, for our purposes we merely consider the option that involves creating a business from scratch, since that is what ECCA and VSBK in Nepal are seeking to do.

The BOOT model proposed by Gibson consists of an NGO *building, owning, operating* and then *transferring* ownership of a microfranchise to an entrepreneur who has been selected and trained (2007, 29).

> Under this model, the NGO/franchisor has substantial upfront responsibility and assumes the costs for the establishment of the microfranchise. The NGO/franchisor finds the location, builds the outlet, buys the inventory, and hires an operator who has potential to learn and operate the business. The franchisor and operator enter into a unique sweat-equity agreement that facilitates the eventual and gradual transfer of ownership from the franchisor to the franchisee. Simply put, the more time and energy the operator invests in the business and the more profits the operator generates for the franchising organization, the greater the share of the business the operator can purchase. The goal is for the

> ownership to actually be transferred to the operator who purchases the business with his or her portion of the profits. (Gibson 2007, 29)

The key step in this model involves a 6-12 month waiting period during which the franchisor mentors the franchisee and pays him a salary. As a result, "the strength of this model is that it can take poor, untrained people and transform them into profitable microfranchise operators and eventually owners" (Gibson 2007, 31).

There is much about this model that makes sense for the case of the WATA devices. Firstly, the fact that it allows for a period of monitoring and evaluation of the potential operator to ensure that an appropriate candidate has been selected is vital. Even among the poor there are those who can be innovative entrepreneurs and good leaders, and there are those who, no matter how dire their situation, are simply not suited to the task (Hatch 2007, 105). Several schools that ECCA had approached with the Mini-WATA and who purchased a device (or at least partially purchased it) ended up not using it regularly. Reasons varied but often the case was that the person selected was simply not the most suitable. Sometimes it was the individual who decided he was not cut out for the job:

> this is not our business profession. My profession is teaching. I am thinking about how far I can produce and sell to the student but this is not my profession. First I prefer to use in our school. Only after that do I sell it to the community. […] It is an extra job for me and it is difficult with only me doing it. […] I don't know how to divert *[tasks]* to others how to divert my jobs to others. (Nirmala - schoolteacher, interview with author, Lalitpur, 12 May 2009.)

Other times it was simply a reflection of the wider school sentiment that there was not enough interest on the part of the school. In such cases, the best option is to take the device back and find some better more useful placement for it. The BOOT model, in establishing from the beginning that there is a trial period, takes this into account.

Secondly, the model of gradually transferring ownership to the entrepreneur is one way to overcome the high initial investment cost for a WATA device. A lease system allows the operator to gradually purchase the device as he sells products.

The profit-sharing component of this model, however, is likely to present some problems in Nepal. A significant concern voiced by ECCA is that it is difficult to monitor the exact sales volume of operators in remote rural areas. The only guarantee of sales volume is what the operator and seller choose to record. This argument deserves serious attention, especially when recognizing that a microfranchise of a WATASOL model would operate in a largely

informal sector. Any training given to operators and eventual microfranchisees naturally will include certain elemental business skills such as record keeping. Simplifying the whole microfranchise model as much as possible, however, reduces the risk of inaccurate information and facilitates implementation. As the informal economy is characterized by weak legal procedures (Henriques and Herr 2007, 47), a more basic relationship between franchisee and franchisor is best. Furthermore, because of the weak infrastructure in Nepal in particular, regular follow-up monitoring and profit collection are difficult. Thus, the simpler the transactions can be made, the better.

What needs simplification is the mechanism through which a franchisor (as ECCA or VSBK would be, for example) can recover some or all of its costs (of purchasing the device and offering training). To eliminate the complicated step of monitoring the exact sales figures and making sure the franchising NGO is receiving the correct cut, a possible solution is to increase the initial lease value to include the costs incurred by the franchising NGO. Such costs include training, start-up number of bottles and basic promotional materials (flyers, t-shirt, cap, etc.). The profit of the microfranchisor/NGO is consequently not made proportionally to sales volume, but is a fixed margin on top of the cost of the WATA device and microfranchising kit. Of course this means eventually, once the lease is paid off, the microfranchisor no longer receives payments. Since we have accepted the *social microfranchise* model, this is not necessarily negative. Moreover, by simply establishing a fixed amount that an operator pays per month, the onus is on the operator to sell enough in order to be able to pay his monthly installments. The messy step involving checking books, calculating margins and wondering if the microfranchisee is being honest are eliminated. Once the lease is paid off over time, the microfranchising NGO is guaranteed coverage of its initial costs.

The BOOT model's aim is that eventually an operator can accrue extra funds with which to purchase ownership of the franchise (Gibson 2007, 29). Reaching the stage where sales volume is enough for an entrepreneur to be making a significant income requires time. Thus, time must be built into the model at the beginning to allow the microfranchisor to establish himself. To motivate an entrepreneur at the beginning, the initial time period is covered with a salary provided by the franchisor (taken as 5 months in the example in Figure 8). This salary is only temporary and this income is eventually replaced with profit from increasing sales volume.

The model for operating a WATASOL microfranchise in Nepal therefore would look something like this:

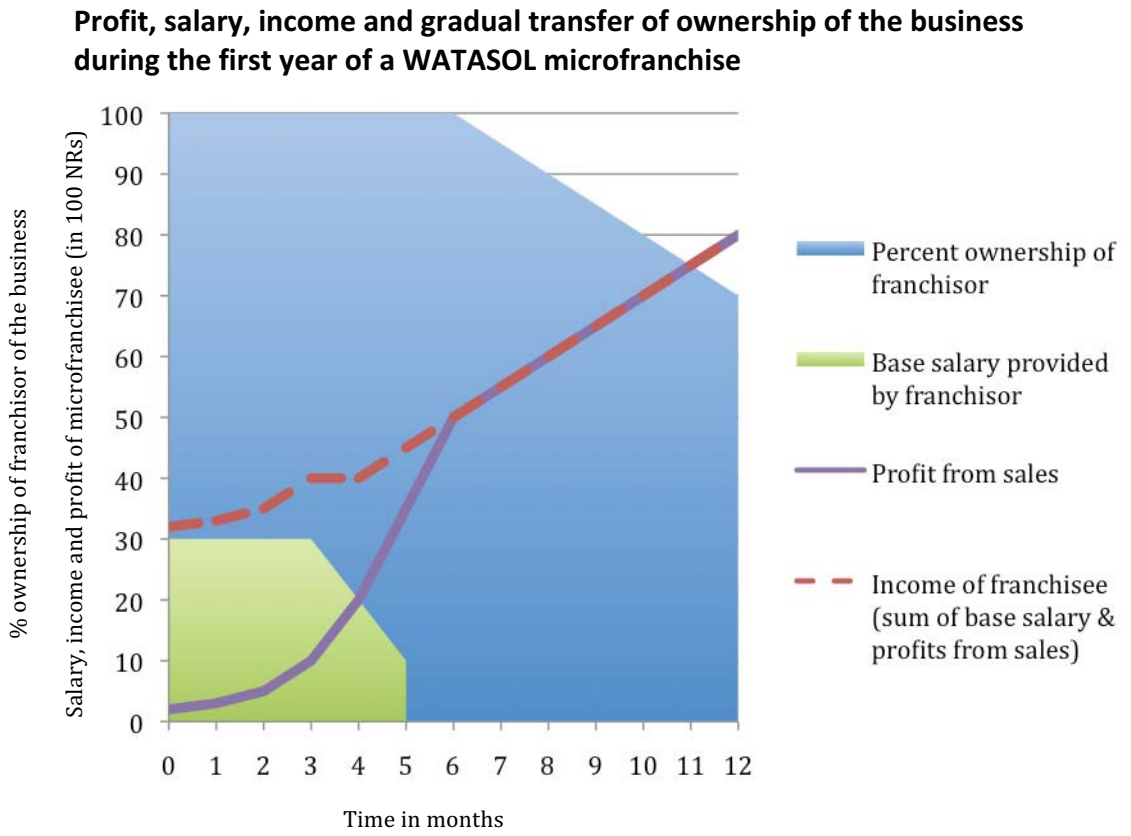

Figure 8: Graph showing initial base salary of microfranchisor, which decreases after the first three months as profit increases. From month 6 onward the operator's income consists solely of his profit and he can start repaying his lease, thereby beginning the gradual purchase and transfer of ownership of the business. (Source: author's depiction).

For the first block of time (taken as 3 months in the Figure 8) the franchisor pays the operator a minimum salary. The operator is given time to begin to set up his business. Because he knows he will not always get a salary, he has incentive to use this time well to establish himself. During the second block of time (another 3 months), the operator receives gradually less of a salary, as he is expected to be generating an income at this time. From the sixth month onwards (beginning of the third period), the operator is expected to be making enough so he can begin to repay the lease of the device while still earning enough to equal (or surpass) the initial salary he had been paid. If for some reason, his business is not running as well as he had hoped, he is given a 3-month grace period during which he can defer lease payment. After this time (a total of 9 months from the very beginning of the project) if it is clear that he cannot pay the installments, he must return the WATA device and all materials to the franchisor. The risk the franchising NGO/microfranchisor takes is reaching this stage. While they regain the device, their investment in training and travel expenses are sunk.

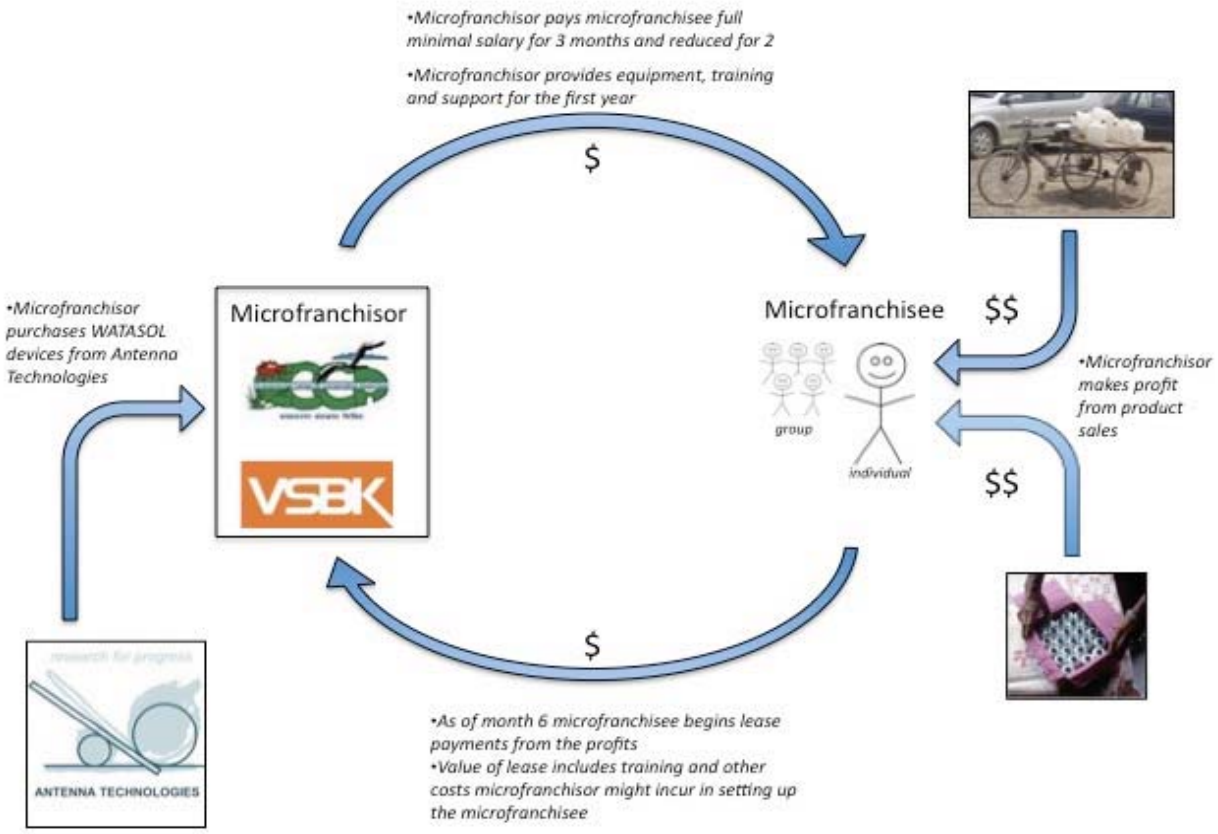

Figure 9: Modified BOOT microfranchising model (Source: author's depiction).

Costs, such as more bottles, more chemicals for testing or more promotional materials (posters, flyers, t-shirts, bicycles, water quality tests for educating communities, etc.) could be purchased by the microfranchisee from the microfranchisor at additional cost (and profit for the microfranchisor).

Hesitancy was noted by both ECCA and VSBK about simply allowing operators to take the WATASOL devices home with them without collateral. The solution both organizations have come up with involves placing the device in a supervised place (such as in ECCA's Letang field office, or in the home of one of the trusted VSBK social mobilizers) and allowing the operator to produce the chlorine there. In that way, the safety of the device is at least minimally guaranteed. While ECCA does not have an office in most places where a WATASOL microfranchise could be set up, the idea of a safe space in order to store the device it is worth keeping in mind.

4.2.3. Product versus Business Microfranchising

Magleby splits microfranchises differently, namely into *product* and *business* microfranchises.

> In general, product franchises focus on "what" while business format franchises are more concerned with "how." Product franchises offer autonomy and measure sales results. Business format franchises control processes in an effort to produce predictable sales results. (Magleby 2007, 136)

It is helpful to examine the WATASOL project from this perspective as well, because the technology presents possibilities for either approach: there is operating the WATASOL device as a business and the selling chlorine or purified water as the product.

As previously noted, the context of Nepal, especially remote rural areas, is one dominated by the informal sector. As such, a microfranchising model that will work best is likely one that does *not* have strict standards for sales site selection, pricing, sales territories, or any of the other details that a franchisor might attempt to regulate, i.e. the *how*. This is best left for the operator to determine. As Magleby (2007) notes, more informal business models allow "a franchisor to grow large without the overhead investment and compliance mechanisms that more tightly controlled networks require" (142). This suggests that the *product* microfranchising approach is more suited to the distribution of the WATA devices.

However, the product itself is a flexible component of WATASOL approach – it can be the chlorine concentration or purified water in flexible quantities – which suggests that a better microfranchising model is one that focuses on the business aspect, i.e. including training and guidance on distribution mechanisms, sales techniques and promotional materials. Indeed, many of the pilot implementations have clearly lacked more guidance in the *how*. Not only have teachers struggled to integrate regular production and sustained sales into their daily activities, but even in initial pitches made to potential new operators by ECCA, there is a distinct lack in supporting evidence on how to sustainably run a WATA device. This suggests the need for a *business* franchise. Elements of the *how* might include guidance on pricing schemes through a system of customer cards. As an example, if a customer buys 5 refills of chlorine within 5 months (one roughly every months) then the customer gets a bottle free (thus pricing strategy can be used to promote regular usage).

Consequently it seems that an organization acting as the main franchisor in Nepal should pursue two strategies (see Figure 10), one focused on franchising a product, the other focused on franchising a business model, depending on the entity/individual acting as the

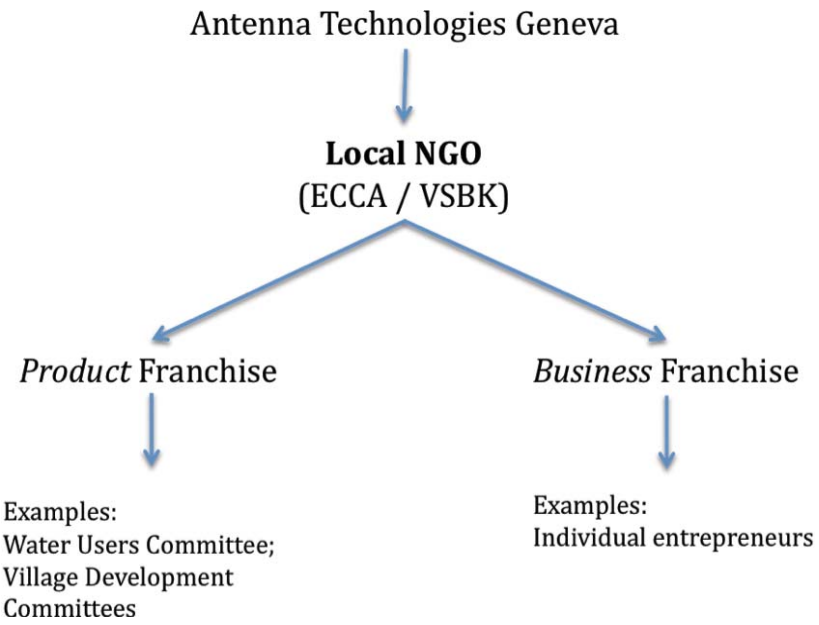

Figure 10: Two-model franchise (Source: author's depiction).

microfranchisee. These two models require different amounts of support, meaning the lease for the device in each case would be adjusted to cover the extra cost in training, travel, monitoring, support, etc.

The examples of functioning WATA devices in Nepal are predominantly reflections of early stages of product microfranchising. The Water User's Committee in Jante was told of the possibility of selling chlorine in bottles and this is what they are doing. How to go about it was left up to them. This was similarly the case for schools and for Gopal – they were explained the product and were left to innovate the distribution. While this has certainly yielded some interesting innovations (such as the discovery of Gopal), none of the models have become financially sustainable.

In the end, one must remember that microfranchising is not the end in and of itself. Instead, it is to be viewed as a tool to fill a need that the government is too corrupt and incapable of meeting for its citizens (Hatch 2007, 107). As argued previously, this is the reason social entrepreneurs are required: to address these unmet needs.

4.2.4. Microfranchising is not Social Enterprising

Thus far the models of both social enterprises and microfranchises have been applied to the WATASOL program. However, careful note should be taken not to confuse the two distinct phases of social enterprise creation and that of microfranchisig. Fairbourne argues, "a true

entrepreneur would not be a good candidate as a microfranchisee" (2007, 9). Conversely, those who could be the best microfranchisees might not be entrepreneurial, because they are good at following procedures but not at generating new business ideas (Lehr 2008, 10). Microfranchising provides less entrepreneurial individuals with "a business blueprint that, if followed, will lead to greater individual economic success" (Fairbourne 2007, 9). Social entrepreneurs, on the other hand, "are trying to change the world, not capture a market" (Drayton 2010). While the step of being creative and innovating to *change the world* is certainly vital in the development of any solution – indeed, this is the *deep listening* and co-creation with local entities that BoP theory for MNCs belabor – one must make a clear distinction between that phase and the phase of scaling up (microfranchising). The models that have been piloted by ECCA and VSBK thus far have focused on freedom and innovation, with little structure, partly with the aim of allowing for experimentation. The idea has been to let potential entrepreneurs figure out on their own what the best solution is for an approach in their community. Because of this, the success of the WATASOL technology at the current phase is highly dependent upon the character of the individual entrepreneur/operator or committee.

While one might be inclined to scale up by simply distributing more WATA devices and seeing how they evolve in the hands of more entrepreneurs, without proper follow-up and follow through, chances of establishing successful approaches with meaningful impact remain questionable. As Drayton (2010) notes, "the entrepreneur's job is not to take an idea and then implement it. That is what franchisees do. The entrepreneur is building something that is entirely new—by constantly creating and testing and recreating and then testing and recreating again " (n.p.). This is the phase that ECCA and VSBK still find themselves in. Gopal, as the example as the most innovative of the pilot operators, thinks outside of the box: "when one makes the chlorine there is that 'smoke' that comes off and I realized that there were never any mosquitoes around. So I tell people that if their chlorine has expired they should put the rest on a cloth and hang it up against mosquitoes" (Gopal Dhakal, interview with author, Letang, 17 May 2009). In order to try and cover the smell and taste of chlorine, he also tried adding mint leaves to the chlorine (he quickly realized this was not a good idea). Another teacher used the following analogy: "you put sugar in your tea; if you put too much, more than you're supposed to, it tastes bad; so you make sure not to put too much; same with the chlorine" (teacher, interview with author, Letang, 11 April 2009). Such examples show how those who work with the WATA devices are still testing how best to convince their

communities of the need and to sell the idea to them. It does not as of yet offer a standardized blueprint anyone can follow.

This need not be a negative fact, however. Returning to the point raised previously about not needing to scale up an organization to achieve impact, "social entrepreneurs may have important roles to play in their ecosystems, as innovators, catalysts, leaders, coalition builders, visionaries, and the like. But they should not bear the sole responsibility for the success or failure of their innovations to create large-scale change" (Dees 2010). Thus, the point to remember is that while social entrepreneurs are vital to the success of the WATASOL program, for the creativity and innovation they contribute, establishing a microfranchise from this stage is a separate step entirely. Before this can be attempted, the entrepreneurship business model has to have been tested and proven successful. This brings us to my final point on considering microfranchising: the necessity for impact evaluation.

4.2.5. The need for impact assessment

At the time of this research (June 2009), the WATASOL pilot projects with the partner organizations ECCA and VSBK in Nepal still found themselves in their infancy. While initial feedback is promising, none of the pilots had become financially sustainable. Even with subsidies factored in, as they would be in the *social franchising* model, it had not proven that significant financial profit had been made. The capacity to turn a profit must be evident before any large-scale push to scale up (through microfranchising or some other model) happens. There was also little comprehensive data on household consumption of chlorine, although anecdotal evidence was plenty. Gopal spoke with enthusiasm about how his longstanding stomach problems stopped and his appetite returned once he started drinking chlorinated water (Gopal Dhakal, personal communication, Letang 11 April, 2009). Other villagers expressed similar sentiments as reasons for continuing to purchase chlorine. As the analysis in section 3 has shown, initial feedback strongly suggests that the pilots have the potential to evolve positively both on the financial and the consumption side.

This predicament about relying on evidence that is heavily anecdotal is not uncommon in the world of BoP ventures. Since the emergence of BoP 2.0 examples of activities targeting the BoP, both among MNCs as well as smaller entities (NGOs, social enterprises) have grown exponentially and success stories of individual entrepreneurs and local organizations are numerous. Most of this evidence across the board, however, is anecdotal and lacking robust impact measurement systems (London 2010, 1). Rather, MNCs and other BoP poverty

alleviation examples “judge their success at alleviating poverty on the basis of tasks completed and milestones achieved – amount of money invested, quantity of products distributed, number of interventions initiated, and so on – rather than on how well their activities translate into changes on the ground” (London 2010, 2). Because social entrepreneurs are trying to provoke social change, “the standard measures of organizational size and growth are inappropriate” (Drayton 2010).

Given the nature of BoP business, it is impossible to evaluate impact purely on a financial or even statistical bottom line, although this is certainly a necessity as well. In the development sector, evaluations are used to extract information about why things are happening, so as to facilitate learning and improve decision-making for future program strategy (Church and Mark M. Rogers 2006). This type of information is key when assessing the success or failure of BoP projects. To rectify this evaluation gap, London has developed a framework to allow for a more holistic assessment of the impact of BoP ventures. The framework includes an assessment of three main components: the economic situation, the constituents’ capabilities and their relationships (London 2010, 1). In demanding a more informed assessment of BoP impact and changes as this framework does, BoP targeted activities that started in a strictly business dimension and were evaluated on that basis (demanding a financial bottom line), are now being reviewed on a more holistic level (through comprehensive evaluations characteristic of the development sector).

Although evaluation of financial capacity of the WATASOL project is key for microfranchising, it would be an injustice to judge the WATASOL’s impact purely on that one dimension. It can have far-reaching impacts on community health, education, even status and relationships within families (through an increase in family income, for example). Gathering this type of information is vital for a more holistic idea of the full potential and the results of the WATASOL project’s impact.

5. Conclusion

To conclude, the Antenna Technologies WATASOL approach to safe water through chlorination finds itself at the intersection of several significant trends both in the private and in the public sectors. These trends have converged to create a *fourth sector*, which has yet to settle into a more defined state, but in which the social enterprise safe water model being tested in Nepal fits. The pilot projects spearheaded by the two non-profit organizations ECCA and VSBK in Nepal have yielded valuable information on the social marketing aspect of chlorine produced by the WATA chlorinators. Initial results have also shown that the WATASOL chlorine reaches the BoP where there is a willingness to pay among consumers, and that the technology should lend itself well to the creation of a sustainable venture. While the option of creating a microfranchise system around the technology is appealing and promising, it is premature at this point in time in the case of Nepal, because the projects still find themselves in the trial-and-error phase of enterprise creation. One this phase has ended, and impacts have been evaluated, microfranchsing blueprints can be piloted. In the end, as a Nepalese saying has it: *pratikshya fal mitho hunccha* – fruit of patience is always good.

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Appendix A: The ATG WATASOL Technology

Antenna Technologies, 11/04/2008

Research for Progress
ANTENNA TECHNOLOGIES

Antenna-WATA : three designs to fight waterborne diseases

Antenna-WATA devices produce a concentrated solution of active chlorine (6 g/l) from salted water (25 g/l), through an electrolysis process.

Mini-WATA KIT**

Mini-WATA
(drinking water for 600 people*)

Produces up to 3 litres of active chlorine concentrate per day.

Height	30 cm
Weight	250 g
Power supply	5V / 1A (included)
Price	40 euros***

Designed in order to fit into the neck of a standard plastic bottle (soda-like; 1.5 litre or 2 litres).

Works with a 5W alimentation (included in the kit) to be plugged into the electric network, or through direct coupling with a 10W solar panel.

WATA KIT**

Autonomy: this handy device only requires a regular energy source (battery or equivalent), salt and clear water.

Output: working continuously, WATA can ensure the treatment of about 90'000 litres of drinking water per day (needs for 6'000 people).

Produces up to 24 litres of active chlorine concentrate per day.

Size (height)	13 cm (+ 17 cm electrode rods)
Weight	500 g
Power supply	12V / 4A (50W solar panel compatibility)
Price	200 euros***

WATA
(drinking water for 6'000 people*)

Maxi-WATA KIT**

Maxi-WATA
(drinking water for 80'000 people*)

Produces up to 300 litres of active chlorine concentrate per day.

Size (height)	25 cm (+ 35 cm electrode rods)
Weight	8 kg
Power supply	24V / 30 A (direct current)
Price	1700 euros***

Output: Aimed at large chlorine production facilities, Maxi-WATA can ensure the disinfection of 1'200'000 litres of drinking water per day (needs for 80'000 people).

*** based on WHO's recommended daily needs for drinking water: 15 litres per person per day**
**** the kit includes the WATA, 1 electric transformer, 1 syringe, 1 ATBlue reagent and 1 test tube.**
***** negotiable prices depending on the amount ordered**

For all additional information, please contact Antenna Technologies:
wata@antenna.ch – website: www.antenna.ch

Source: Antenna Technologies Geneva. Line of products. http://www.antenna.ch/en/drinking_water/wata-products.html.

Mini-WATA

Production of active chlorine

ANTENNA TECHNOLOGIES
wata@antenna.ch
www.antenna.ch

User guide

Mini-WATA KIT CONTENT

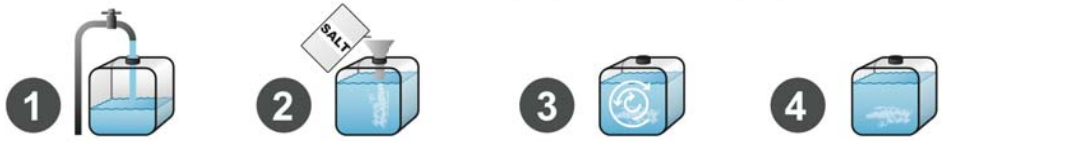
1 **Mini-WATA**
Height: 30 cm
Weight 150g

1 power supply 5V / 1A
2 syringes: 50 mL, 5 mL
1 WataBlue kit (residual chlorine measurement)

The **Mini-WATA** device produces concentrated solution of active chlorine from salt water, through an electrolysis process. It is designed in order to fit into the neck of a standard 1.5 litre plastic bottle (soda).
Its power supply accepts 110V or 220 V alternative current.

1. The device must only be used by adults. carefully read the user guide before using.
2. This model must only be connected to alternating current power sources.
3. the chlorine concentrate is not dangerous. rinse well with water in case of accidental contact with the solution. Do not inhale.
4. The concentrate should be stored in clearly labelled, clean, opaque, tightly-closed, glass/plastic containers, keep away from children.
5. Never use metallic containers in the procedure.

PREPARATION OF SATURATED BRINE



1 Fill a (non-metallic) container of any size with clear water.

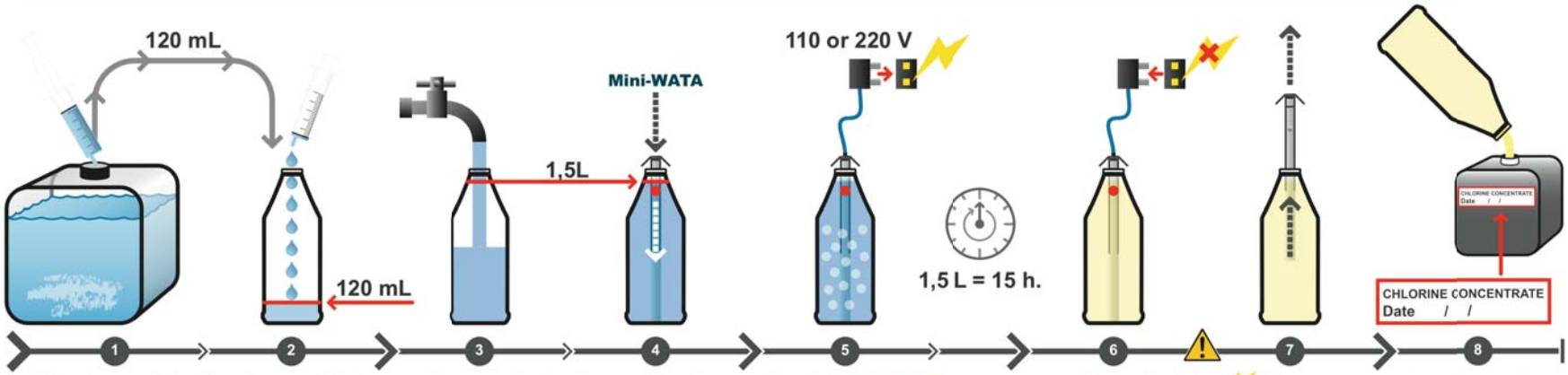
2 Add a large amount of salt **(about 400g of salt per litre of water)**.

3 Shake/mix for **30 minutes** to dissolve as much salt as possible.

4 Make sure that there is salt remaining at the bottom of the container. Close it and label the container.
If no excess salt is visible, add more salt and proceed from step 2.

PRODUCTION OF CHLORINE CONCENTRATE

Keep in a dark place, away from light.



1 Using the large **(50 mL)** syringe, put 120 ml of saturated brine **(1)** into a 1.5L bottle **(2)**.

The volume of the brine must represent 1/13 of the total volume for electrolysis.

2 Top up the bottle with water **(3)** until full and immerse the **Mini-WATA** in the salt solution.
The liquid level must be above the lateral holes in the tube **(4)**.

3 Plug in the **Mini-WATA** power supply **(5)** **(110 or 220 V)**. Bubbles should immediately be seen forming in the bottle. Wait **15 hours to produce 1.5 L** of concentrated chlorine (6 g/litre or 6000 ppm)

4 Unplug the device **(6)**. take it out of water, rinse it with clear water and store it **(7)**.

5 Store the chlorine concentrate in a labelled opaque container

Source: Antenna Technologies Geneva. Method of production with Mini-WATA. http://www.antenna.ch/en/drinking_water/wata_guides.html.

Appendix B: Comparison of point-of-use household water treatment systems

METHOD	ADVANTAGES	DISADVANTAGES
Biosand filter	• High filtration rate and volume • Good to reduce turbidity • Easy use, high user acceptability • Long life span • One-time installation • Produced locally	• Not proven effective in removing all bacteria and viruses • Large size • High initial cost of filter • Local knowledge for production, installation and maintenance necessary • Not effective as a stand-alone water treatment • Lacks residual protection
Boiling	• Readily accessible and available • Often pre-existing knowledge • Easy use • Effective in reducing pathogens	• Cost of fuel can be high (both for time and monetarily) • Danger of scalding accidents • Environmentally unsustainable • Lacks residual protection
Ceramic filter	• Easy use • Low filtration costs (excluded acquisition costs) • Long life • Time saving (compared to methods boiling & SODIS) • Time savings (compared to boiling) • Proven reduction of bacteria	• High initial investment cost • High cost for replacement parts • Questionable durability • Slow filtration rate • Lacks residual protection
Chlorination	• Effective in reducing bacteria and most viruses • Residual protection against recontamination • Low cost • Location independent • Easy to use • Scalable	• Changes water taste and odor • Low protection against some parasites • Unsuited for water with organic and inorganic compounds • Dosing sometimes difficult • Low water turbidity necessary • Concern about long-term carcinogenic effects
Flocculants	• Removes even heavy particles from turbid water • Proven effective against bacteria, viruses, parasites and pesticides • Residual protection • Visual improvement of water • Scalable	• Multiple step process requires commitment from users • Relatively high cost per liter • Filtration required to remove sediment
SODIS	• No cost (after acquisition of bottle) • Proven effective in bacteria and virus reduction • Easy use • Unlikely recontamination	• Requires extensive time period of sunlight • Water cannot be turbid • Does not perform satisfactory during periods of continuous rainfall • Limited volume treated at a time

Table 4: (Source: author's depiction drawing from Lantagne, Robert Quick, and Mintz 2007 and WHO 2007).

Appendix C: Examples of household treatment implementers and implementation strategies

Implementer	Government- or donor-supported, with no charge or nominal charge to beneficiary	Subsidized distribution with partial cost recovery	Commercial sales with full cost recovery and profit
Public sector	Emergency and outbreak response by UNICEF, UN Office for the Coordination of Humanitarian Affairs and national governments	X	X
NGO	Promotion of solar water disinfection by Swiss Federal Institute for Environmental Sciences and Technology (EAWAG)/Department of Water and Sanitation in Developing Countries (SANDEC); distribution of sodium hypochlorite and flocculant-disinfectant sachets in emergency response by Samaritan's Purse, CARE, International Committee of the Red Cross, American Red Cross and others; distribution of ceramic filters by Oxfam	Promotion of ceramic filters by International Development Enterprises (IDE), Rural Development International (RDI) and Environment and Public Health Organization (ENPHO); promotion of biosand filters by Centre for Affordable Water and Sanitation Technology (CAWST) and BushProof	Promotion of ceramic filters in Kenya by Network for Water and Sanitation; sales of ceramic water filters in the Plurinational State of Bolivia by Sumaj Huasi; some sales of filters in Cambodia by IDE and RDI
Private sector	X	Promotion of flocculant-disinfectant sachets by manufacturer (corporate social responsibility strategy and cooperative donor funded)	Sales of sodium hypochlorite solution by Aman Tirta; sales of sodium dichloroisocyanurate (NaDCC) tablets by manufacturer; sales of ceramic water filters by manufacturer
Social marketer	Government purchase and distribution of sodium hypochlorite solution and flocculant-disinfectant sachets through PSI as part of acute watery diarrhoea response in Ethiopia	Promotion of sodium hypochlorite, flocculant-disinfectant sachets and NaDCC tablets by PSI; promotion of filters and disinfection products by Academy for Educational Development	Sales of sodium hypochlorite and NaDCC tablets in certain markets by PSI and Academy for Educational Development

X, unlikely/no example known

Table 5: (Source: Clasen, Thomas. 2009. Scaling Up Household Water Treatment Among Low-Income Populations. Geneva: WHO, 14).

Appendix D: Methodology of research

This thesis draws on a variety of disciplines. Authoritative sources including books, journal articles, working papers, seminar proceedings, presentations, and news articles addressing both the private and the non-profit sector position on safe water treatment models, BoP targeting, social entrepreneurship and Nepal, were consulted. Because the Antenna WATASOL technology is unique in its versatility among other point-of-use water treatment options, first-hand observation of the initial pilot stage in Nepal with ECCA and VSBK was conducted. This involved visiting over 12 schools in the Lalitpur area and the rural communities of Jante and Letang where WATASOL devices were being tested. Formal interviews were conducted with 14 stakeholders, including producers (the type of person this was varied) and others involved in the implementation process. Informal feedback was also gathered from customers and clients in the target communities. Not enough chlorine had been sold, nor had the selling been going on long enough for more quantitative data to be collected from many households. Interviews were also conducted with project coordinators of similar HWTS projects in Nepal.

Limitations

The on-site research in Nepal was limited in several fronts. First, the author's inability to speak / and or read Nepali meant that most of the interviews conducted with stakeholders were through a translator. This inevitably leads to a loss of detail and introduces the risk of inaccuracy. Those interviews conducted in English were often with people whose English was not fully fluent, thus also limiting the quality of the responses. Second, there was at least one case where several people were interviewed regarding the same project and the information given was blatantly contradictory. This highlights the danger of answers being given 'to save face' in front of a foreigner when a project might not be running well. Lastly, the author visited the projects in their early infancy and as such, there were no real quantitative results to be collected or significant impact (in terms of health or even financially) to be measured. Only initial reactions to the full proposed potential of the WATASOL devices could be collected. The ongoing political instability in Nepal meant that travel was restricted and follow-up visits to the field projects limited.

Interview questions for WATA operators / implementing partners

1. *How did you first hear about the chlorinator (WATA device)?*
2. *What were your initial thoughts/reactions about the chlorinator (WATA device)?*
3. *Why did you decide it was worth promoting/implementing the chlorinator?*
4. *Describe your chlorinator program. (How did you go about implementing it, operating it, bottling the chlorine, selling the chlorine, etc.)*
5. *Why did you decide to structure the program/implementation in that way?*
6. *What difficulties did you encounter in the implementation? Were they expected or unexpected?*
7. *What worked well in implementing the chlorinator?*

8. *What support materials did you have in this initial phase?*
9. *At the time, did you wish you had something (information/help) that you didn't?*
10. *Looking back on how it has gone so far, what would have been useful to have (but which you didn't have)?*
11. *What about the chlorinator do you like?*
12. *What about the chlorinator do you dislike?*
13. *How do you see the next step/future for your program with the chlorinator?*
14. *Is there anything you wish you had for these next phases?*
15. *What do you see as the main aim in your implementation of the chlorinator?*
16. *Where do most people get their drinking water from in this region?*
17. *Do you think people generally think their drinking water is safe?*
18. *Do people generally treat their drinking water? If yes, how?*
19. *Are people aware of the method of using chlorine to treat their drinking water?*
20. *Is WaterGuard or Piyush available in this region?*

For cases of successful implementation and sale of chlorine:

21. *How many bottles of chlorine did you fill?*
22. *How many bottles of chlorine did you sell?*
23. *Whom have you sold bottles to?*
24. *How many people have bought refills?*
25. *What were peoples' reactions to the idea of using chlorine?*

List of people interviewed

Date:	**Persons interviewed:**	**Location:**	**Project:**	**Translator:**
06/05/2009	Mr. Rajesh Adhikari, promotional manager	ENPHO offices, Kathmandu	ENPHO Piyush project	none
07/05/2009	Mr. Rajesh Pandey, science teacher and Mr. Ramesh, headmaster	Lalit Kalyan Lower School, Bholdhoka, Lalitpur	School implementation through ECCA Nature Club	directly in English with help from Bikash Maharjan, ECCA counselor
11/05/2009	Ms. Usha Maskey Manandhar, Social Coordinator	VSBK head office, Pulchowk	Implementation in various brick kilns	none
12/05/2009	Ms. Nirmala, teacher	Prabhat Higher Secondary, Lalitpur	School implementation through ECCA Nature Club	Sushil Anu, ECCA project coordinator
17/05/2009	Mr. Rajendra, teacher	Laxmi Secondary School, Phadari 7, Letang, Morang	School implementation through ECCA Nature Cub	Bikash Maharjan, ECCA counselor
17/05/2009	Mr. Gopal Dhakal, school caretaker	Shiksha Bikash Secondary School, Kheruwa 4, Letang, Morang	School implementation through ECCA Nature Club and school caretaker	Bikash Maharjan, ECCA counselor

17/05/2009	Ms. Dara, teacher	Shiksha Bikash Secondary School, Kheruwa 4, Letang, Morang	School implementation through ECCA Nature Club and caretaker	Bikash Maharjan, ECCA counselor
18/05/2009	Mr. Binodh Bhurtel, UNISON staff	Letang (project location is in Kavre)	School implementation through UNISON	Bikash Maharjan, ECCA counselor
19/05/2009	Mr. Yam, teacher	Mahabharat Secondary School, Guwa Bari 2, Letang, Morang	School implementation through ECCA Nature Club	Bikash Maharjan, ECCA counselor
20/05/2009	Mr. Nanda P. Khatiwada, chairman; Mr. Prem Bahdur Rai, secretary	Water Users Committee office, Jante, Ward 2	Water User's Committee implementation by ECCA	Bikash Maharjan, ECCA counselor
22/05/2009	Mr. Prem Bahadur Karki, teacher	Khuttidangi, Mechinagar 5, Jhapa	School implementation through ECCA Nature Club	Bikash Maharjan, ECCA counselor
28/05/2009	Ms. Sharda Nepali, social mobilizer	Ram Kaji kiln site, Imadol, Lalitpur, Patan	VSBK brick kiln implementation	Usha Maskey Manandhar, VSBK project coordinator
31/05/2009	Mr. Dhruba Amaty, accountant	Yashodhara Lower Secondary School, Lalitpur	School implementation through ECCA Nature Club	Bikash Maharjan, ECCA counselor
03/06/2009	Mr. Bijay Gurun	Aajad Higher Secondary School, Baluwa 5, Kavre	School implementation through UNISON	Sushil Anu, ECCA project coordinator
03/06/2009	Ms.Urmila Humagai, teacher; Mr. Parsu Ram Kadel, headmaster; 8 students	Bright Future, Balua 9, Kavre	School implementation through UNISON	Headmaster in English; Sushil, Anu, ECCA project coordinator
04/06/2009	Ms. Arinita Maseky Shrestha, HIP Nepal coordinator	Kathmandu, phone conversation	HIP USAID project	none
Multiple	Mr. Prachet Shrestha	Kathmandu	ECCA WATASOL project	none
Multiple	Mr. Sushil Anu, ECCA project coordiantor	Kathmandu	ECCA WATASOL project	none
Multiple	Mr. Jai Rajbhandari	Kathmandu	ECCA WATASOL project	none
Multiple	Mr. Yogendra Chitrakar	Kathmandu	ECCA WATASOL project	none

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Eigenständigkeitserklärung

Ich erkläre hiermit,

- dass ich die vorliegende Arbeit ohne fremde Hilfe und ohne Verwendung anderer als der angegebenen Hilfsmittel verfasst habe,

- dass ich sämtliche verwendeten Quellen erwähnt und gemäss den gängigen wissenschaftlichen Zitierregeln nach bestem Wissen und Gewissen korrekt zitiert habe.

Lilian Lehmann

Lissabon, 11. August 2010