Safe Water at the Base of the Pyramid

How to involve private initiatives in safe water solutions

This study was prepared by:
Christian A. Vousvouras and Urs Heierli

August 2010

Published by the 300in6 Initiative: www.300in6.org

The 300in6 Initiative is jointly supported by Aqua for All, Connect International, Safe Water International and the Swiss Agency for Development and Cooperation

Schweizerische Eidgenossenschaft
Confédération suisse
Confederazione Svizzera
Confederaziun svizra

Swiss Agency for Development and Cooperation SDC

The Challenge

An incredible number of people all over the world – 884 million – still have no access to an 'improved water source'. In consequence, they drink water with a high concentration of viruses, bacteria, protozoa or even chemical contaminants (UNICEF & WHO, 2005). Many others, despite their access to improved water sources have not guarantee of safe water. The term 'improved', which features in the Millennium Development Goal (MDG) Number 7, relates only to the quality of water at its source and not to the safety of water once it reaches the user – water contaminates during transport and in storage. In addition to the 884 million people without improved water sources, another 3 billion people still lack permanent access to safe water due to failing water supply systems in a scenario which seems to have been forgotten when the MDGs were formulated.

Every day, across the globe, about 5,000 people die from diarrhea (Clasen & Haller, 2008, p. II). The lack of both safe water and sound sanitation is estimated to be responsible for annual health treatment costs of US$ 7.5 billion (Prüss-Üstün, Bos, Gore & Bartram, 2008, p. 21). Through the treatment of water at the point-of-use, an estimated 30–40% of all diarrheal diseases could be prevented (Fewtrell, Kaufmann, Kay, Enanoria, Haller & Coldford, 2005, p. 48).

Traditionally, government policies in developing countries have focused on the extension of centralized water networks to the excluded parts of the population. Results have often been disappointing: in rural areas many millions still lack a reliable source of water and rely on open ponds (cf. Picture 1). Hampered by corruption and lack of financial resources, infrastructure has not kept up with enormous population increases and the rural exodus towards cities. The key problem in the developing world is the poor quality of piped water. Water might be treated at source by operators but it contaminates during transport due to leaks in the piping system and frequent interruptions of service.

In recent years, as in the energy sector, private market actors have come up with such promising solutions as filters, chlorine and water kiosks for low-income customers, as a demand-driven alternative to the rigid government approach (cp. Netherlands Water Partnership, 2010). These bottom-up business models do not replace the need to extend water networks. They do, all the same, but shift the focus from the issue of quantity to the quality of water for the four billion, low-income, consumers living at the 'Base of the Pyramid' (BoP).

The task of delivering affordable solutions to these people requires the joint effort of governments, multilateral organizations, NGOs and private initiatives – how to include the latter is a particular aspect of this booklet.

The Water Market

The world currently consumes 4,500 km³ of water every year. This is expected to rise to approximately 5,500 km³ by 2025 (German Federal Environment Agency, 2009). Of this, 90% of the water goes, mostly free-of-charge, to the industrial/agricultural sector (Brabeck, 2010). The remaining 10% are split for private uses between top- and base of the pyramid customers. The former benefit from subsidies on piped supply and the latter receive water from an unsecured source or, at multiple times the cost of piped water, from inefficient water vendors (Kariuki & Schwartz, 2005, pp. 25–27; cf. Figure 1).

PICTURE 1

Congo, DR: Business at the Base of the Pyramid

Women collecting contaminated water from the Great Lakes

Micro-entrepreneur disinfecting jerry cans at the lakefront

Types of Water Contaminants

The WHO (2002) mainly separates microbial from chemical contaminants in water.

Microbial contaminants mainly derive from faeces and fall into three categories:

- Viruses (such as hepatitis / 20–200 nanometres)
- Bacteria (including E. coli / 0.5–3 micrometres)
- Protozoa (such as ryptosporidium parvum / 3–30 micrometres / high resistance to chlorine)

Chemicals naturally occur in water and usually pose only a risk when released in excess and over a longer time into a fresh water source. Water experts usually distinguish the source of chemical constituents.

- Naturally occurring chemicals (including arsenic and fluoride)
- Chemicals from industrial sources and human dwelling (of the likes of cyanide or cadmium)
- Chemicals from agricultural activities (such as nitrate)

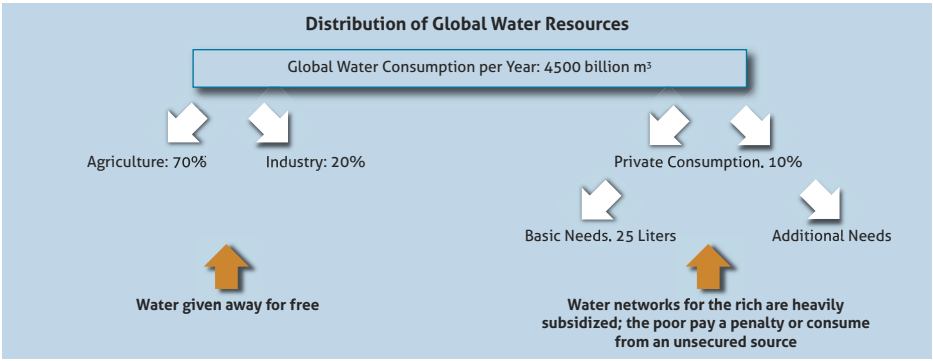
The price penalty paid by BoP customers is reflected in the sales figures of water markets in the developing world (cf. Figure 2). Low-income customers, with incomes below US$ 3,000/year, account on average for 45–60% of the total revenues of the water markets in Asia, Africa, Latin America and Eastern Europe. Together they constitute a worldwide sales volume of US$ 20.1 billion. These data indicate that there is a business opportunity at the BoP for those suppliers who succeed in overcoming existing inefficiencies in the water sector.

The Right to Water

Should the poor pay for water? In order to find an educated answer to this question, it helps to take a look at the status quo. In most countries, water for industry and agriculture is essentially a free good (Brabeck, 2010). Water for individual use, piped through existing water networks, has to be paid for on the whole but is also heavily subsidized. It is only the one billion people at the BoP, without access to any such network, who must pay either a penalty on expensive drinking water from water vendors or they collect water from an unsecured source and pay on fuel costs for boiling (Todaro & Smith, 2006, pp. 493–494).

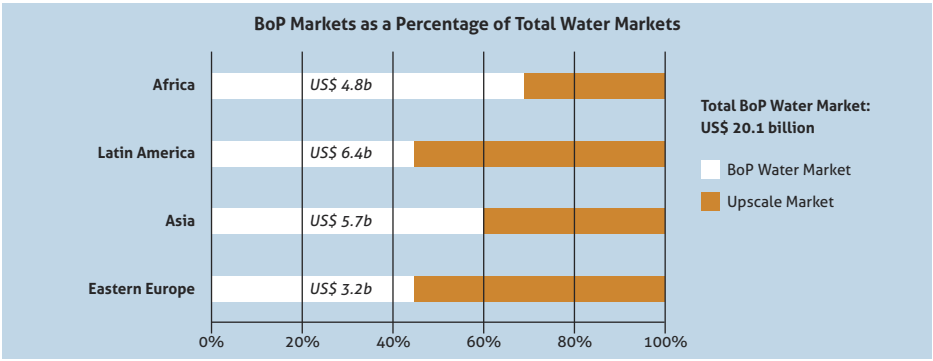
The fact that water has practically no price today has two key implications. Firstly, available fresh water resources are heavily overused, resulting in more rivers and lakes drying out (cf. Figure 3). The lack of groundwater resources forces rural people in particular to walk many kilometres to collect water. The implicit loss of time is estimated to reduce worldwide productivity by US$ 63 billion a year (Prüss-Üstün, Bos, Gore & Bartram, 2008, p. 21). Second, the provision of subsidies for existing water networks leads to fewer financial resources being available for network expansion to those parts of the population hitherto excluded. Hence wealthier people receive financial support at the expense of the poorest members of society. It is surely, therefore, an obligation to generally value water with the price it deserves – cf. preal in Figure 3 – in order to keep the water circle sustainable for future generations.

FIGURE 1



Source: Brabeck (2010) and Todaro & Smith (2006, pp. 493–494)

FIGURE 2



Source: Hammond et al., 2007, p. 9; pp. 52–59

Water is an absolute necessity. It constitutes the existence of every human being. People with no access to safe water have no lasting chance of survival and are deprived of any dignity.

On July 28, 2010 the UN General Assembly approved the resolution on the human right to "safe and clean drinking water and sanitation". Similarly, Article 11 of the International Covenant on Economic, Social and Cultural Rights (UN-Pact I) – ratified by 160 states as of January 2010 – recognizes "the right of everyone to an adequate standard of living". In 2002, the Committee on Economic, Social and Cultural Rights which monitors the implementation of the Covenant issued a General Comment 15 on "the right to water". It stated that "The right to water clearly falls within the category of guarantees essential for securing an adequate standard of living [as above-mentioned –Ed.], particularly since it is one of the most fundamental conditions for survival." Further, the comment stated that "the human right to water entitles everyone to equal, affordable, and physical access to sufficient, safe and acceptable water for personal and domestic use".

In the opinion of 300in6, the term 'affordable' means that every person should cover the basic needs for water according to his or her financial possibilities. Where a person cannot afford the price for 25 litres of water per day to nourish his family, he should receive it for free. Where affordability is no problem, by contrast, water should be sold for a price.

The Political Consequences of Wrong Pricing

We face two big issues. The present pricing structure is not only highly inefficient for a rational use of the scarce water resources, it is also extremely unfair. Subsidies do exist, but primarily for the rich, whilst there are strong penalties for the poor, who pay more for a very unreliable service.

It should therefore be a top priority on the political agenda to change this unjust system and to set the right incentives. Contrary to the claims of many NGO activists, this does not mean keeping the private sector out, but to make private initiative a strong driver in the delivery of safe water, especially to the poor. Instead of closing their eyes in a situation where poor people pay a high price to water vendors for an unreliable product, these vendors should be made more effective and reliable in providing water at an affordable price. Rather than keeping them in the informal sector, performing an illegal activity, they should be delivering branded products and ensuring that their water is safe.

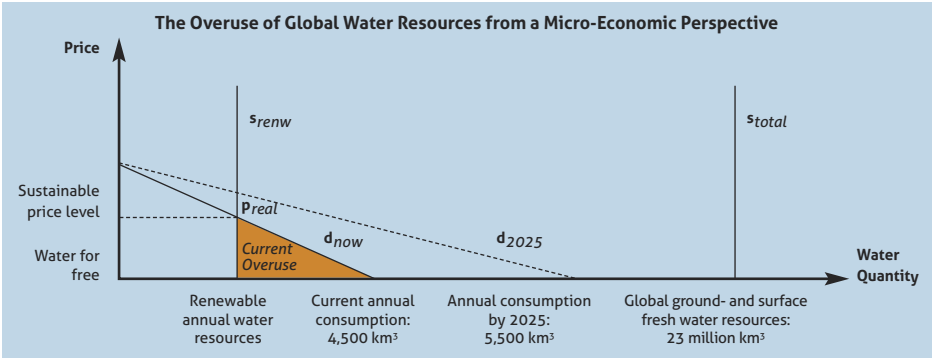
The other key issue is the neglect of safe water on the political agenda. The water sector has focused too long on the quantity of water delivery and not on the quality. It is high time it shifted priorities to include a focus on safe water; time too to tackle the scaling-up issue. It is unacceptable that the WHO Network for Household Water Treatment and Safe Storage should only run with a minuscule secretariat. Equally unacceptable is that global conferences, such as the World Water Forum 5 in Istanbul, featured not a single session on safe water neither in the main programme, nor within side events.

Affordable Water Treatment Technologies Exist – They need to be Scaled Up

The dissemination of water treatment products through private market suppliers assumes that marketable treatment technologies already exist. The following four treatment methods have attracted most attention:

- **Boiling** is probably the best known water disinfection practice worldwide. However, the wood or other fuels used imply high costs, time, and harmful emissions to the environment.

FIGURE 3



Source: UNEP (2002) and German Federal Environment Agency (2009)

PICTURE 2

Nepal: Consumer's Choice

Different water treatment options

- **Filtration** refers to the process of physically separating pathogens from the water by means of a barrier such as sand, active carbon or pottery. Viruses (20–100 nanometres) are the smallest waterborne microbes and hence the most difficult to filter.

Reverse Osmosis is a special form of filtration. It involves the movement of water through a semi-permeable membrane by applying pressure against the natural molecular diffusion process of water and pathogens. The process requires about 2–17 bar pressure for the treatment of fresh water and 40–70 bar for sea water. The method is highly inefficient, considering that only a minor part of water entering the system is eventually recovered. (Bergsrud, Seelig & Derickson, 1992).

- **Chemical disinfectants**, usually chlorine in liquid or tablet form, have proven to be effective in inactivating more than 99.99% of all bacterial and viral pathogens (WHO, 2007, p. 25). The main disadvantages concern its ineffectiveness against protozoa and the artificial taste of chlorine water.

- **Solar- and UV disinfection**: Two decades ago, the Swiss EAWAG institute proved that the thermal impact of boiling on contaminants is increased by exposure of water in transparent PET bottles to UV light for at least six hours under sunny conditions or for two days under very cloudy conditions. However, the method requires steady discipline and patience as the bottles must be filled and exposed every morning. For use in cloudy and rainy regions, UV lamps imitate the effect of the sunrays.

Towards Business Models with a Potential for Scaling-Up

With a range of right water treatment technologies now developed, the challenge is to reach the millions of customers that have not benefited from government intervention and free delivery systems. Public sector support, from both governments and such multilateral organizations as WHO and UNICEF, is still needed. Major progress can only be achieved by unleashing the energy of the private sector across broad swathes, ranging from the village water vendor or intermediate seller in a water kiosk to the large players in both the corporate sector, such as Tata and Unilever and the non-profit of the likes of PSI) (cf. Heierli, 2008). Four business models can be distinguished (cf. Figure 4):

- **Centralized Water Network:** Traditionally, water supply has been regarded as a public infrastructure issue. In it, a public or semi-public supplier builds a treatment plant and a corresponding water supply network. In developing countries, public water supply

Safe or Safer Water?

Among water specialists "logs" are used to measure and compare the efficacy of different water treatment technologies. "The term "log" as in log removal or inactivation (reduction) refers to an order of magnitude of change. For example, if a given volume of water containing 1,000,000 (one million) organisms is treated so that it now only contains 1,000 organisms, this is a 3-log reduction. If the one million were reduced to 10 (ten), this would be a 5-log reduction. And if it's treated so that only one remains, this is 6-log reduction. If the original water only contains 100 organisms, and is treated to the point where it contains only one, this is 2-log reduction. Another way to state this is: 90% = 1 log 99% = 2 log 99.9 % = 3 log..." (Water Conditioning and Purification Magazine, 2001).

The standards for the approval of specific treatment products are set by the World Health Organization and national health authorities. In the US, for instance, the Environmental Protection Agency (EPA) requires that treatment products have a minimum efficacy of log 4 against viruses (WHO, 2002, p. 30). The Pureit filters of Unilever, as an example, align with the standards set by the US Environmental Protection Agency (EPA) and are advertised as being "as safe as boiling".

Should treatment products that do not achieve such international quality standards a priori be dropped? We suggest not. Not in all cases – if a local water source was only lightly contaminated with viruses, a log 3 technology would already serve the users under such circumstances. Here, perfectionism can be the enemy of a significant improvement. Experts should therefore not only measure the effectiveness of certain products but also the environment and the water for which they are intended. People do not need access to absolutely safe but rather to safer water products which correspond to local needs. From a marketing perspective, however, it seems clear that only the apparently unequivocal term 'safe' can be used to successfully promote a product.

usually only reaches the urban, upper-income segments. Rural infrastructure development has long been disregarded and city infrastructures often cannot keep up with the fast pace of population growth. At the same time, existing water network users benefit from subsidies on the price of the water. This creates the bizarre scenario whereby a nation's wealthy members receive assistance at the expense of the underserved poor (Todaro & Smith, 2006, pp. 493–494). However, even if a public water supplier reaches a peri-urban city slum, this access will not guarantee water quality. The water in developing countries is treated at source and often contaminates on its way to the end-users' taps, because of leaking pipes and if not permanently pressurized, contaminated water can enter the network during interruptions. In order to drink water, users are therefore forced to boil tap water or to apply another treatment option.

- **Decentralized Community Water Treatment:** In some under-served areas, various coalitions of communities, micro-entrepreneurs and external organizations have seized the opportunity to establish decentralized water treatment plants, often in form of water kiosks. In India, for instance, decentralized water treatment plants have grown tremendously over the past two years (2008–2009) with investments from regional governments, the International Finance Corporation, Dow Chemical and the Naandi Foundation (Intellecap, 2010, p. 7). The business model requires an upfront investment in a treatment technology such as reverse osmosis, UV disinfection or chlorination. This investment can range from below US$ 5,000 for a cost-efficient chlorination plant to US$ 50,000 for the use of expensive UV-ray technology. Even solar pasteurizer units are being field-tested to be set up in water kiosks. The required investment makes the business model attractive for the finance sector and micro-franchising networks. The decentralized community water treatment model can only grow when the sector succeeds in gaining access to substantial investment funds and becomes truly profitable.

- **Permanent Home Water Treatment:** Options that require a one-off, upfront investment in a treatment device on behalf of a household can be subsumed under the category 'permanent home water treatment'. Typical examples are water filters, but PET bottles can also serve as a tool to purify water. Being a permanent solution, usually no further investments are required in the medium term. However, sometimes the breakage of the device or the renewal of a filter/battery can lead to substantial follow-up costs.

  The upfront costs of filters create an issue of affordability. Unilever in India, for example, has successfully introduced its prestigious 'Pureit' filter, selling for around US$ 35 and providing a very attractive option for the lower middle class. At that price, however, is beyond the reach of the lower BoP customers, unless micro-finance facilities are available – PATH recently tested sales of Pureit filters on credit in India. Even cheap filters require an upfront investment. The Tulip filter, for instance, is a siphon filter that can be sold at less than US$ 10 and the famous India-based multinational Tata has introduced, under the name of Swach, a filter for less than US$ 20. In July 2010, Tata rolled out an even simpler version for 499 Indian Rupees (approximately US$ 11).

- **Provisional Home Water Treatment:** This category includes all treatment tools that allow for the treatment of water over a short period of time. Most commonly it refers to chlorine products such as bottled sodium hypochlorite or sodium dichloroisocyanurate [NaDCC] tablets. The bottled chlorine usually serves for some weeks whereas tablets can be bought on day-by-day basis. The fact that no upfront investment is required by households makes this option attractive for the very bottom of the pyramid. Chlorination is – besides SODIS – the cheapest form of water purification and can be purchased in small doses and thus by very poor customers. However, there is a risk that users tend to dismiss the importance of the chlorine once the family has ran out of stock. The provisional character of this business model requires steady discipline by users.

FIGURE 4

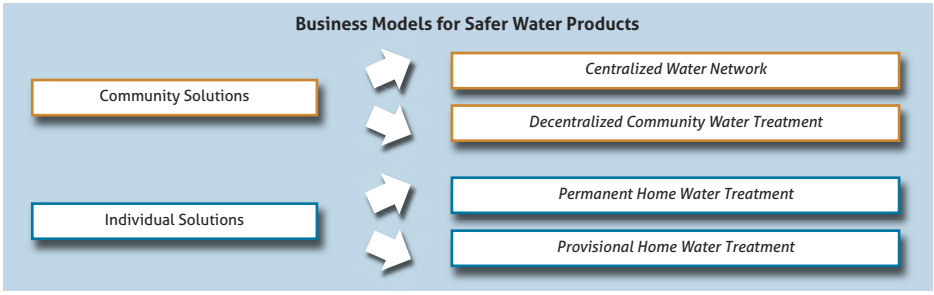


TABLE 1

	Business Model	Upfront Investment	(Micro)-Credit	Treatment	Need Satisfaction	Cases
Centralized Water Network	Selling water	Provider	For provider	Provider	Tap water is often not potable	SEDAPAL (Lima)
Decentralized Community Water Treatment	Selling purified water	Provider	For provider	Provider	Covers daily/ weekly needs	Water kiosks (Naandi) Chlorination plants (Aquasure)
Permanent Home Water Treatment	Selling a home water treatment tool	User	For user	User	Covers permanent needs	Pureit (Uni) SODIS CWP (IDE)
Provisional Home Water Treatment	Selling a home water treatment tool	No	No	User	Covers daily/ weekly needs	PUR (P&G) Watasol (AT) PSI

The Cases and the Criteria

This study identifies business models for the delivery of safe water and assesses whether they are ready for scaling-up. Ten business case studies from backgrounds in Asia, Africa and Latin America have been evaluated with the goal of identifying key strengths, present obstacles, the overall potential and possible ways forward. The progress achieved so far will be presented along four criteria:

- **Consumer Acceptance:** Does the population accept the product? Do target consumers like the product (such as the taste of the treated water)?
- **Affordability:** Are the products financially and logistically accessible for BoP customers? Is the supplier able to serve the very bottom of the pyramid?
- **Viability:** Is the business model financially self-sustaining and what would happen after a withdrawal of the organization?
- **Scale:** Is the business model replicable in other contexts – in which context?

PICTURE 3

Congo, DR: Marketing Specialists

Sales promoters of bottled chlorine

Case Studies

Centralized Water Network:
- No case has been selected as centralized networks in developing countries do not usually provide 'safe water' at the point-of-use.

Decentralized Community Water Treatment:
- Naandi water kiosks (India)
- Aquasure chlorination plants (Madagascar/ Senegal)

Permanent Home Water Treatment:
- Unilever Pureit filters (India)
- IDE ceramic filters (Cambodia)
- Tulip filters (worldwide)
- SODIS (Latin America)

Provisional Home Water Treatment:
- Medentech Aquatabs (Worldwide)
- P&G Pur (Pakistan)
- Antenna Watasol (Guinea)
- PSI (Africa)

Footstep Assessment

One Footstep: Some initial steps have been taken, but substantial bottle necks persist.

Two Footsteps: Some progress has been achieved but also some serious problems have occurred. It is still not clear whether the case will take a step back or forward.

Three Footsteps: Substantial success has been achieved. Bright prospects!

Naandi Foundation – Reverse osmosis water kiosks — India

The Naandi Foundation has set up almost 400 community-run water kiosks in rural India, currently serving about 100,000 households (250 households per plant). At their full potential, these kiosks, costing US$ 20,000 each, could serve up to 1,000 households or 5,000 people per day at a price of US$ 0.045 for 20 litres of water. This service enjoys high consumer acceptance and thanks to the cooperation of such strong partners as Tata and Global Water Challenge, Naandi is in a position to add 400 kiosks every year. However, the high costs of the plant require that the kiosks run partly on subsidies.

Key advantages

- Convenience
- Embedding of safe water provision into local community structures → High acceptance
- The quality of water can be more easily assured than at household level.
- The high-tech appearance of the kiosks makes the product very prestigious and thus acceptable and desirable.

Problems

- High investment costs (US$ 20,000) for water kiosks → too high for implementation in low-population contexts
- Complexity of delivery increases in highly-dispersed areas.
- Problematic technology (reverse osmosis) → Less than 20% of the water inflow is ultimately treated

Potential

The number of 400 additional kiosks per year for 100,000 households or 500,000 people is promising. The high upfront costs make the business model more attractive for medium- to large-size villages rather than small ones.

Next steps forward

- Focus on the larger villages.
- Switch to a more cost-efficient and environmentally-sustainable technology.
- Use the existing infrastructure to expand the service range of the kiosks from water services to include grocery items, mobile phone services and newspapers.
- Embed the treatment technology into existing, local structures. The Naandi treatment system could be franchised by local supermarkets or pharmacies.

Progress

CONSUMER ACCEPTANCE	*AFFORDABILITY*	*VIABILITY*	*SCALABILITY*

More information: http://www.naandi.org

Aquasure - Chlorination plants — Senegal / Madagascar

The French NGO Aquasure relies, as does Naandi (Case 1) on decentralized community water treatment, with the difference that the chlorination/coagulation plants are cheaper to build, at US$ 7,000. Again, customers appreciate the local character of the plant and the model can break even in two years with 230 families as regular customers. 20 litres of water are sold in jerry cans for about US$ 0.13. This price include a margin of 43% for the vendor. Given the income situation of a typical family in the target markets of Senegal and Madagascar (US$ 1-2 per day), the affordability of the water can at least be questioned.

Key advantage

- Convenience
- Embedding of safe water provision into local community structures → High acceptance
- Cheaper than competitive treatment plants, such as Naandi
- The quality of water can be more easily assured than at household level.

Problems

- Relatively high price for a jerry can of 20 litres of water (US$ 0.13) due to high vendor margin. The model becomes profitable in two years with 230 regular daily customers. However, for a substantial part of the population, 13 cents per day might be too much to afford.
- Complexity of delivery increases in highly-dispersed areas.
- Lack of an efficient credit market in Africa. Who can provide a loan of US$ 7,000 for the treatment plant?

Potential

The Aquasure chlorination/coagulation treatment plants are comparatively cost-efficient. The model has still to find ways to become both profitable and affordable for the BoP. Furthermore, the model is challenged by the lack of strong credit markets in sub-Saharan Africa.

Next steps forward

- Reduce the vendor margin and provide them other opportunities of income. → The plant could be managed by a person who already runs a business in the community and who sees the plant as an additional source of income.
- Look for reliable credit providers in Africa
- Look for cost-efficient (maybe existing) delivery channels to serve customers in dispersed areas.
- The operational costs could be reduced by the use of chlorine only instead of chorine/coagulation tabs; at least in areas where turbid water does not pose a problem.

Progress

CONSUMER ACCEPTANCE	*AFFORDABILITY*	*VIABILITY*	*SCALABILITY*

More information: http://www.aquasure.fr

Unilever Pureit filter: Targeting India's urban BoP — India

In 2005, Unilever Hindustan launched a classy-looking water purifier for the aspiring, upper segments of India's BoP. The Pureit device consists of four parts: a microfibre mesh (which filters dirt), a carbon trap (removes parasites), a chlorine tablet (kills viruses and bacteria) and a polisher (improves taste). It can be purchased in 14,500 outlets or through one of many door-to-door retailers. Thus far, it has already attracted three million households, mainly in India's mega- or middle-sized cities. The relatively high entry-level of US$ 35, however, makes the filter unattainable for the millions of Indians who live on less than a dollar per day. All the same, in the future the company might move continuously downwards as markets at the 'upper crust' of the BoP become saturated.

Key advantages

- Trendy, prestigious design and superior technology → "As safe as boiling"
- Access to an existing Unilever distribution network
- Over the past decade, Unilever has shown strong interest in low-spending customers. Some 10 years ago, it established the 'Shakti' (empowerment) programme, training women in rural India to become retailers of Unilever products. By 2006, Unilever had trained 30,000 women. The Shakti women could be a point of entry for the promotion of the Pureit filter among rural customers.

Problems

- Only urban, upper-crust segments within the BoP can afford US$ 35 for the filter device and the additional US$ 8 four times per year for the replacement kit.

Potential

At present, Pureit filters are a good option for India's urban lower middle class, the upper crust of the BoP. Unilever has started the marketing to those segments, to first harvest the low-hanging fruit. Recently, around the time of the launch of the Swach filter by competitor Tata for only Rs. 499-749 (US$ 11-16), Unilever has also introduced a light-version (lower capacity) of its Pureit filter for only Rs. 1,000 (US$ 20). Furthermore, some initial steps have been taken by such NGOs as PATH to allow for more flexible payment options through credit. However, in regions where credit markets do not work, such as in many regions in sub-Saharan Africa, it may be difficult to profitably disseminate the filters.

Next steps forward

- Trickle down to the 'real' Bottom of the Pyramid → For example, develop different types of filters, considering the difference in both buying power and preferences among rural and urban customers.
- Look for more flexible financing schemes in cooperation with partners from the credit sector in order to extend the customer base towards the bottom.
- Involve existing structures, such as the Shakti network in cooperation with micro-finance initiatives, for delivery of the filter to rural areas.

Progress

CONSUMER ACCEPTANCE *AFFORDABILITY* *VIABILITY* *SCALABILITY*

More information: http://www.pureitwater.com

IDE ceramic filters - Private retail channels vs. NGOs — Cambodia

Building upon a Potter for Peace technology, in the period of 2002-2004 the NGO International Development Enterprises (IDE) began selling pot-style, ceramic filters to the BoP in Cambodia. The user feedback for the 'rabbit filters' was initially highly positive, resulting in the dissemination of 200,000 filters through sales to private retailers and NGOs. Despite this success, it became clear that the price of US$ 8 (US$ 6.25 production and delivery costs – 20% sales margin) was too high for the very bottom BoP, namely those without access to credit. Thousands of filters were therefore purchased by NGOs and distributed at a highly-subsidized rate to the poor. Unfortunately, these campaigns cannibalized the image of the rabbit filter, rendering it as a symbol for poverty. IDE plans now to launch a 'luxury' version of the rabbit filter for upper segments of the BoP.

Key advantages

- Permanent safe water solution
- Convenience
- Cheap compared to other filters such as those of Unilever or Tata

Problems

- The free-of-cost distribution by some NGOs has turned the filter into a symbol of poverty.
- Upfront costs too high for the very bottom population
- The traditional design as a ceramic pot filter makes the device clumsy and prone to breakage; it needs steady maintenance and must be replaced after some years.
- The flow rate of the filter might be too slow for some users.

Potential

IDE has recognized the image problem with the rabbit filter. It is about to set up a new profit-oriented company, labeled Hydrologic, which is also developing a new upper-scale version of the rabbit filter. The highest potential can be found at the moment among upper-scale customers and in areas where a working credit market could provide flexible payment schemes for the filter device.

Next steps forward

- Introduction of different brands and filter products for upper and lower BoP customers.
- Establish relationship to a reliable and fair credit provider.
- Avoid free-of-cost distribution wherever affordability is no problem.
- Integrate siphon technology in order to increase the flow rate of the filter.

Progress

CONSUMER ACCEPTANCE	*AFFORDABILITY*	*VIABILITY*	*SCALABILITY*



More information: http://www.ide-cambodia.org

The Tulip Siphon Filter – Introducing technological innovation — Worldwide

In 2002, the Dutch businessman Klaas van der Ven started to experiment in India with traditional sand- and ceramic filters. The products he encountered were usually very heavy, slow and the opposite of user-friendly. One day in a remote village, he found community members using a siphon to pump water. This is where the idea grew to develop a convenient and fast-working siphon ceramic filter. Under the aegis of his company Basic Water Needs, van der Ven established a production facility in India and started selling the filters in 2007. To develop the filter further, Basic Water Needs has decided to stay low-profile for the time being. All the same it expects to break even in 2010 already, with current sales of 20,000 Tulip filters to NGOs every month, or 240,000 on an annual basis.

Key advantages

- High flow rate due to siphon technology
- Light design and low price (factory price approx. US$ 5; retail price approx. US$ 10) because, unlike other devices, the Tulip filter does not have a reservoir for water storage.
- Easy to maintain thanks to pre-filtration and backwashing technology

Problems

- Bureaucratic hurdles: van der Ven, founder of Tulip filters, claims to spend most of his time in obtaining government permits for the production and distribution process. The filters are produced in India and usually face high duties when imported by other developing countries.
- The Tulip filter has been warmly welcomed by experts in the field. However, most projects to resell the filters to the end-customer are at their very beginning. Commercial success has still to be proved.
- A survey on consumer acceptance in Mozambique showed that users are generally satisfied with the quality and the performance of the device. However, when asked if the household would invest money in a new ceramic filter element for €2 each time the old element had to be replaced, two-thirds of the households answered they would probably not.
- Has not yet removed any viruses.

Potential

Basic Water Needs currently sells about 20,000 units to NGOs every month, without having actively promoted the filter so far. Its high potential lies in its innovative technology. The filter is faster, more convenient and cheaper than competitive filters on the market.

Next steps forward

- Identify the most promising, commercial end-user distribution model among NGO customers.
- Find answers to explain the gap between high customer acceptance and a low willingness-to-pay in Mozambique.
- Start marketing activities to become high-profile before competitors copy the technological features of the Tulip filter.
- Cooperate with micro-finance partners to stimulate sales among the bottom BoP.

Progress

CONSUMER ACCEPTANCE	*AFFORDABILITY*	*VIABILITY*	*SCALABILITY*



More information:
http://www.basicwaterneeds.com

SODIS – Safe water through social behaviour change — Worldwide

When SODIS was introduced more than 20 years ago, the development community believed that the exposure of water in plastic bottles to the sun at zero cost would rapidly spread around the world. In some countries like Bolivia, intensive behavioural campaigns using such motivational tools as community workshops and street theatre have led to an acceptance rate of 5% among the nation's BoP. However, the total number of 3 million SODIS users worldwide still seems to be rather moderate and has a strong tendency to stagnate without constant promotion. For much of its lifetime, SODIS has been promoted solely as a matter of behavioural change linked closely to poverty and without any appeal to the private sector. Of late, the promoters of SODIS have started to develop products that finally involve private companies in its dissemination.

Key advantages

- Low cost treatment → Requires only a plastic bottle and a source of water

Problems

- No appeal to users → Symbol of poverty
- No supply chain exists that could provide an incentive to keep the application alive.
- Requires steady discipline and the cost of 'time investment' is far from being zero.
- Does not work with turbid water.
- Only attractive in relatively sunny regions.
- Up to now, SODIS campaigns have depended on subsidies.

Potential

SODIS can be an attractive option in impoverished, sunny regions. However, in order to release its potential, new ways of proliferation must be found that counter the continuous and unsustainable need for subsidies. The Fundación SODIS, which promotes solar disinfection in Latin America, is currently evaluating options for a SODIS business model.

Next steps forward

- Promote SODIS as an attractive product and not as a treatment method for the poor. For example, design and sell attractive plastic bottles which indicate to users when the water has attained sufficient quality.
- Look for alternative models of dissemination → SODIS as a technology for decentralized community treatment plants

Progress

CONSUMER ACCEPTANCE	*AFFORDABILITY*	*VIABILITY*	*SCALABILITY*

More information: http://www.sodis.ch

Medentech Aquatabs – From emergency to commercial sales — Worldwide

Medentech is an Irish producer of chlorine tablets for use as disinfectants. In cooperation with such key players in the water sector as PSI and USAID, it sells 10 million water purification tablets every day. Some 85% of the value created remains in the sales market. The product is a practical and cost-efficient alternative to coagulants, bottled chlorine and boiling. However, users perceive the tablets as being more a medicine rather than a convenience product. In fact Aquatabs have widely been distributed to NGOs and governments in such emergency situations as tsunami and earthquakes. In all, some 50% of the tablets are given away for free or at a subsidized rate. The Aquatabs could thus become seen as a solution of 'last resort' rather than an item for daily use.

Key advantages
- More convenient than liquid chlorine
- Can be used on a large scale for emergency situations

Problems
- Bridging the gap from emergency to commercial sales
- Image of a medicine ("Healthy people do not need to take any medicine")

Potential

In comparison with the P&G Pur product (next case), Aquatabs offer similar advantages (namely convenience, and purchasable in small amounts) at a cheaper price and are accessible for a broader public. Initially, the Medentech company relied to a considerable degree on sales to NGOs, particularly in emergency situations; recently it has started very promising efforts to build up grassroots supply chains, through bicycle vendors. To become a product of daily use, Medentech needs to transform the brand from a medicine into a convenience product.

Next steps forward
- Strengthen private retail channels and continue with innovative BoP marketing approaches.
- Reposition the Aquatabs as a tasty and healthy product of daily use and not as a medicine in emergency situations.
- Strengthen promotional campaigns in post-emergency situations.

Progress

CONSUMER ACCEPTANCE	*AFFORDABILITY*	*VIABILITY*	*SCALABILITY*


More information: http://www.medentech.com

PUR by Procter & Gamble - A promising product with start-up problems — Pakistan

In 2003, as part of a global initiative, the multinational Procter & Gamble started a project to promote sales of its water disinfectant PUR to low-income communities in the Pakistani province of Sindh. The PUR sachet contains a coagulant and chlorine to coagulate turbid water and then disinfect it with the chlorine. The company planned to use its already existing distribution network and to further boost sales of the PUR sachets through respected community promoters. Heavy marketing efforts were made, but it quickly became clear that sales were far below budgeted levels. From the outset, P&G encountered a seriously sceptical public. The product was perceived as something unnatural and inimically Western; many users could not adapt to the taste of chlorine in water. Moreover, its price of US$ 0.06 per sachet was up to six times higher than what people had spent on water until then. After 18 months. P&G decided to stop the project in Pakistan and to pursue the worldwide marketing of PUR only as a non-profit product and part of the corporate social responsibility [CSR] unit. There would be no margin added for P&G, but the supply chain was intended to become profitable by allowing retailers to make profits with the product. Large-scale dissemination is undertaken mostly in cooperation with NGOs – notably PSI – and emergency relief agencies.

Key advantages

- More convenient than liquid chlorine
- Works in turbid water (coagulant)
- Access to an existing Procter and Gamble distribution network

Problems

- Too expensive ($US0.13/day/household)
- Chlorine taste
- Bad image → Scepticism towards the tabs. Product considered as an inimical substance of the West to contaminate the Islamic world

Potential

PUR is a promising, convenient alternative to bottled chlorine, especially in regions with a high turbidity of water. It can be purchased according to the desired treatment volume in easy-to-handle sachets. However, to become more attractive for BoP customers, Procter & Gamble must find a way to cut the unit price of the sachets and to further improve both taste and image of the product.

Next steps forward

- Conduct an analysis to identify the most important cost drivers → How can the price of the tabs be cut?
- The population should feel the brand is theirs → Look for a local branding, involve national stars as well as Muslim and community leaders in promotional activities, contract local workforce
- Improve the taste of the product.

Progress

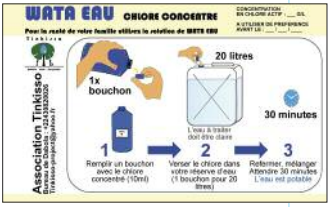
CONSUMER ACCEPTANCE	*AFFORDABILITY*	*VIABILITY*	*SCALABILITY*

More information: http://www.pghsi.com/pghsi/safewater/

Watasol – Local chlorine production and sales — Guinea

The Watasol method of the Geneva-based NGO Antenna Technologies – the name applies both to overall method and to the disinfectant solution – is to build up the 'local' aspects. It provides local enterprises with electro-chlorinators for the local production of chlorine.

Its commercial aspects stand out because of its cost-efficiency. An Antenna electro-chlorinator, serving the needs of 2,400 persons, costs only €200. In the Dabola prefecture in the Faranah region of Guinea, the NGO Tinkisso acts as a local producer and sells one litre of chlorine – enough to meet the annual needs for safe water of a household – for just US$ 1. The product has been accepted by local people and proven to be operationally viable. However, in the complex and challenging environs of Dabola, Tinkisso has reported difficulties in maintaining regular supplies to its network of 16 water kiosks and 16 community workers. Poor infrastructure and limited transport is hindering the distribution process. A new strategy is being tested in four other prefectures in Faranah in cooperation with the local health authority, using the existing channels of health centres for providing chlorine and awareness-building. In addition, chlorine is also sold door-to-door by health education agents.



Key advantages
- Low-cost solution
- Independent, local production
- Refill system
- Chlorine can be use as a disinfectant → contribute to hygiene promotion

Problems
- Chlorine taste
- Delivery to dispersed areas with water kiosks has proven to be too costly and complex
- Quality assurance – monitoring is costly
- Source of electricity (generator and high cost of fuel)
- Finding the right application

Potential

Watasol is a very cost-efficient way to produce chlorine on site in a decentralized manner. A big advantage of the local chlorine production is that plastic flasks can easily be re-filled. In order to protect the brand Watasol, Antenna must find a reliable system of quality control. The distribution of the chlorine through 16 water kiosks has proven to be too costly and complicated without an adequate vehicle. New forms of dissemination are being tested by Antenna Technologies in South Asia and Africa.

Next steps forward
- Use existing communication and delivery channels to isolated areas, or bundle the bottled chlorine with other 'hot' products such as cell-phone cards or food, to raise revenues per delivery.
- Price differentiation → Higher price in isolated areas
- Using relatively cheap technologies such as bicycles to cover distances
- Improve the taste and design of the product

Progress

CONSUMER ACCEPTANCE	*AFFORDABILITY*	*VIABILITY*	*SCALABILITY*

More information: http://www.antenna.ch

PSI – A subsidized market model — Africa

PSI is a major provider of water treatment solutions. Approximately 10 million people worldwide, in particular in Madagascar and Zambia, use either PSI bottled sodium hypochlorite or Medentech Aquatabs (Case 1) as a water disinfectant.

With 10 years of experience in the water sector and 30 years in HIV prevention, PSI has become the global leader in social marketing. The 'Safe Water System' is a branded product with different names and stands out for its needs-oriented design and affordability. The bottled chlorine solution is produced nationally and distributed through existing retail channels. While the social marketing efforts have created a market for safe water products, in some countries – with added pressure from governments – part of the success has been achieved through price subsidies. It is not entirely clear if the figure of 10 million customers could still be met if the massive donor funds were to be removed.

Key advantages
- Low-cost solution (<US$ 0.01/day/household)
- Social marketing expert / Deep knowledge of BoP customers

Problems
- Pressure by donors for quick, unambiguous results → subsidies
- Expensive social marketing campaigns but also relatively conventional retail systems (pharmacies) that do not always reach the targeted BoP customers in remote areas
- Taste of chlorine
- Centralized production of chlorine ensures the quality but requires sales of flasks as one-way goods.

Potential
It is difficult to assess the potential viability of the PSI business model. The NGO does not aspire to become fully profitable, but only operationally. Social goals are prioritized over financial goals. It would be interesting to test the model with the ambition of establishing a profitable business.

Next steps forward
- Remove subsidies from the supply chain whenever possible.
- Cooperate with governments and competitors to share the costs of expensive social marketing campaigns.
- Ask donors to expect long-term instead of short-term success.

Progress

CONSUMER ACCEPTANCE	*AFFORDABILITY*	*VIABILITY*	*SCALABILITY*



More information: http://www.psi.org

Key Entrepreneurial Decisions

The suppliers of safe water solutions encounter different challenges depending on the chosen business model and the environment they are operating in. Some entrepreneurial issues are of particular importance at the Base of the Pyramid:

- **Ascending vs. Descending the Pyramid:** Should a supplier tackle the BoP market from the top, moving slightly downwards, or from the bottom, going later on up to the top? With its Pureit filter in India, the strategy of Unilever is first to tackle the urban, 'low-hanging fruits' of the BoP, who already practice some water treatment method. Antenna Technologies, by way of contrast, is seeking to implement its local chlorine production model at the very Bottom of the Pyramid in sub-Saharan Africa. The Unilever strategy is obviously less risky, with fewer income restrictions and more educated consumers, but also less effective in tackling the bottom. Antenna certainly has to invest more time in finding the 'right' model, but in the process it is gaining deeper market knowledge than Unilever.
- **Sharing distribution channels:** Margins at the BoP are very low. A promising way to reduce costs and extend the range of products on offer can be to share distribution channels with other products such as groceries or newspapers.
- **Financing options** are required on multiple levels. Firstly, micro-entrepreneurs such as kiosk owners need credit to establish their business (treatment equipment, bike for distribution, property and more). Second, consumers, especially with permanent home water treatment products, might only be able to afford the upfront cost for filters if they can access credit.
- **Selling a product vs. selling behavioural change:** The marketing of safe water to low-income customers has two dimensions. Social marketing creates a general awareness of the importance of hygienic water consumption; it must, therefore, be conducted jointly by the private sector and public actors. Product marketing links, as a secondary step, the identified problem to a specific product solution and should therefore be organized by private suppliers on their own.
- **Using existing structures:** In a long-standing Swiss tradition, every small village used to have its own post office. However, under privatization, many agencies disappeared and postal services were franchised to local community stores. The system works well and has reduced costs of delivery significantly. Why not transfer such a franchising system to developing countries, where almost every village has a small grocery where water products and services could be offered.
- **Building hybrid partnerships:** Small-scale suppliers rarely succeed in scaling up their business without the support of a strong ally. Large-scale producers, by contrast, often lack the intimacy and local know-how of small NGOs. Hybrid partnerships between large- and small-scale suppliers can therefore be complementary.
- **Decentralized vs. centralized production:** Supply chains that involve local communities are clearly more accepted among customers. Nonetheless, a centralized production facility still offers some advantages, such as economies of scale, lower fixed costs and more feasible quality control .
- **Attracting micro-entrepreneurs, end-users and investors:** Some supply chains require the development of several distinct marketing strategies. The Geneva-based Antenna Technologies, for instance, promotes the use of chlorinators as a business opportunity for micro-entrepreneurs. The entrepreneurs can only establish a flourishing business with the support of

PICTURE 4

India: Pre-pay for Water

Naandi Water Kiosk

2 Rupees per 20 liters

Pre-pay stamp card

investors who expect a return on investment and with consumer demand for chlorine.

- **Is micro-franchising the future?** Probably the most effective way to get to BoP customers is through large numbers of micro-enterprises that are very close to their target population. In order to guarantee both scaling-up and quality, myriads of these micro-enterprises could be involved in profitable business models under a micro-franchising system that would allow disseminating branded products at a very low cost.

PICTURE 5

Senegal: Community Involvement

Aquasure Chlorination Treatment Plant

Conclusions

What is needed to attract the private sector to invest in the area of safe water and to meet the needs of the one billion people worldwide who drink contaminated water? Promising businesses ideas, among them community water kiosks, chlorination by micro-entrepreneurs, locally produced pot filters and industrially manufactured water filters, are on the brink of a breakthrough and could be scaled up globally. However, all cases described in this booklet still have to overcome some constraints, in terms of viability, scalability, consumer acceptance and ability to reach the poor.

A more thorough study is in preparation in cooperation with leading public and private institutions in the water sector. Based in part on extensive field visits, it will document the most promising business models and the most urgent bottle necks, and make recommendations on how the cases could be improved further. This study will be published early in 2011, as a contribution to the 300in6 Initiative – scaling up access to water for 300 million people in 6 years.

Literature

- Bergsrud, F., Seelig, B. & Derickson, R. (1992). *Treatment Systems for Household Water Supplies – Reverse Osmosis.* Downloaded May 28, 2010, from http://www.ag.ndsu.edu
- Brabeck, P. (2010). On *Big Think* [Interview]. Downloaded May 28, 2010, from http://bigthink.com
- Clasen, T.F. & Haller, L. (2008). *Water quality interventions to prevent diarrhoea: Cost and cost-effectiveness.* Geneva: WHO Press
- Fewtrell, L., Kaufmann, R., Kay, D., Enanoria, W., Haller, L. & Colford, J.M. (2005). Water, Sanitation, and Hygiene Interventions to reduce diarrhoea in less developed countries: A systematic review and meta-analysis. *Lancet Infectious Diseases,* 5, 42–52
- German Federal Envrionment Agency (2009). *Sustainable and rational use of water and energy – examples from Germany.* Downloaded May 28, 2010, from http://www.umweltbundesamt.de
- Hammond, A.L., Kramer, W.J., Katz, R.S., Tran, J.T. & Walker C. (2007). *The next 4 billion – market size and business strategy at the base of the pyramid.* Washington DC: World Resources Institute, International Finance Corporation
- Heierli, U. (2008). *Marketing Safe Water Systems – Why it is so hard to get safe water to the poor – and so profitable to sell it to the rich.* Bern: Swiss Agency for Development and Cooperation
- Intellecap (2010). *Filling up the Base of the Pyramid – Update Report 2008–09.* Hyderabad: Intellecap
- Kariuki, M. & Schwartz, J. (2005). *Small-Scale Private Service Providers of Water Supply and Electricity – A Review of Incidence, Structure, Pricing and Operating Characteristics,* World Bank Policy Research Working Paper 3727. Washington D.C.: World Bank
- Netherlands Water Partnership (2010). Smart Disinfection Solutions – Examples of small-scale disinfection products for safe drinking water. Amsterdam: KIT Publishers
- Prüss-Üstün, A., Bos, R., Gore, F. & Bartram, J. (2008). *Safe Water, better health – Costs, benefits and sustainability of interventions to protect and promote health.* Geneva: WHO Press
- Todaro, M.P. & Smith, S.C. (2006). *Economic Development* (9th ed.). Harlow: Pearson Education
- UNEP (2002). *Vital Water Graphics – Freshwater Resources.* Downloaded June 25, 2010, from http://www.unep.org
- Water Conditioning and Purification Magazine (2001). *Canada: UV & Log reduction.* Downloaded May 28, 2010, from http://www.wcponline.com
- WHO (2002). Guidelines for drinking-water quality (2nd ed.). Geneva: WHO Press
- WHO (2007). *Combating waterborne disease at the household level.* Geneva: WHO Press
- WHO & UNICEF (2005). *Water for life: Decade for action 2005–2015.* Geneva: WHO & UNICEF

The 300in6 Initiative

The 300in6 Initiative aims at 300 million more people having access to safe water in 6 years. The initiative was born at the World Water Forum 5 in 2009, out of frustration that the topic of safe water was discussed neither at the main meeting nor at any side-event. A small core group from the Netherlands, Switzerland and USA has launched this ambitious alliance of like-minded organizations, to place the topic firmly on the mainstream development agenda. The essence of 300in6 is to achieve a rapid and sustainable scaling-up of safe water access and thus reach at least 300 million people in 6 years. This will be mainly through innovative business approaches and efficient delivery models with a focus on water treatment options. 300in6 proposes a paradigm shift whereby the provision of access to safe water becomes a marketing challenge and business opportunity rather than the charity operation it so often was in the past. In reaching its objective, 300in6 is following these guiding principles:

- **Consumer Orientation:** To consider people as consumers, not as mere beneficiaries or recipients, and to give them the freedom to choose among different safe water solutions in a multi-product or multi-service approach.
- **Scalability:** To focus on products that have the potential to be scaled-up radically.
- **Treatment at Point-of-Use:** To concentrate on treatment at the point-of-use and thereby address an issue which was not included in MDG 7. This goal refers only to safe water at the source, and not at the point-of-use. Water can become recontaminated in transport between source and point-of-use, or in storage in the home.
- **No Gifts:** To recall that safe water solutions should not be given away, except as a temporary solution in emergency situations. Whilst safe water is now a human right, it should not necessarily be free-of-charge. Smart subsidies may be granted, but only if they stimulate markets and do not distort them.
- **Affordability:** To encourage the private sector to make high-quality products and services including options that are affordable to consumers at the Base of the Pyramid.
- **Public Sector and Civil Society:** To urge governments and NGOs to shift their role from direct delivery to market creation. Their emphasis is needed on regulation, social marketing and preventing any distortions of private initiatives.

Publication: Access to Safe Water at the Bottom of the Pyramid

As part of this initiative, a study on water treatment as a business is in preparation, in cooperation with leading private and public institutions. Based in part on field visits, it will present and assess the latest business options, market barriers, and recommendations to overcome present obstacles. The publication will stimulate private initiative as a vibrant element in the water sector. It will be launched early in 2011.

More Information available:
http://www.300in6.org

The 300in6 Initiative is jointly supported by Aqua for All, Connect International, Safe Water International and the Swiss Agency for Development and Cooperation

Connect International

Schweizerische Eidgenossenschaft
Confédération suisse
Confederazione Svizzera
Confederaziun svizra

Swiss Agency for Development and Cooperation SDC