

This is part of a series of project briefs discussing the activities, research findings, and field experiences of PATH's Safe Water Project.

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## Commercial Approaches to Providing Safe Water in India: A Literature Review

### PATH's Safe Water Project

Contaminated drinking water is a leading cause of disease in developing countries, especially among young children. Improving the quality of water can prevent waterborne disease, and interventions at the household level have proven more effective than interventions at the water's source.<sup>1</sup> A project launched by PATH in 2006 will examine whether commercial market forces can help reduce the incidence of waterborne disease by delivering practical and affordable household water treatment and storage (HWTS) systems to poor families.<sup>2</sup>

PATH's Safe Water Project—one in a series of eight learning grants on water, sanitation, and hygiene



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awarded by the Bill & Melinda Gates Foundation in 2006—will initially focus on catalyzing the commercial market for a family of safe and effective HWTS products in India. One-fifth of disease in India is related to unsafe water, and there is a robust consumer economy and established industrial base that can facilitate commercial solutions to health problems.<sup>3</sup> Lessons learned will be used to refine strategies that PATH and other public- and private-sector players can use to improve

*Water hand-pumps are one of the most common sources of water in India. Women usually first wash the water vessels (with ash or even mud) and then fill them with drinking water.*

commercialization of HWTS systems around the world.

This project brief summarizes key findings on how to commercialize HWTS products from a literature review conducted for the safe water project.<sup>20</sup> This review, which was conducted in the first quarter of 2007, collected and synthesized both published and unpublished research and reference materials. The focus was on India, although many sources were global in nature.

### Taking a commercial approach

In recent years the private sector has turned its attention to markets at the “base of the pyramid” (BOP). The BOP includes 4 billion people worldwide, who reportedly earn less than \$2,000 a year and make up 65 percent of the population.<sup>4</sup> Companies have succeeded in manufacturing, marketing, and distributing an array of affordable consumer products to these low-income households. Their experience has demonstrated that many BOP households have some money to spend on discretionary items and that they aspire to have the same goods and choices as better-off households.<sup>4</sup>

Taken individually, BOP households spend little. Because of their sheer number, however, low-income consumers have considerable buying power in the aggregate. This means that businesses can and do earn a

profit in BOP markets by selling large volumes of products at low margins.<sup>4</sup> Low prices are essential to this strategy, so businesses in India and elsewhere have moved to:

- **Cut production and distribution costs, for example, by making simpler products and using cheaper materials.** In India, Nirma captured the BOP market for detergents in the 1980s with a product that lacked some essential cleansing agents but cost one-third as much as its rival.<sup>5</sup>
- **Sell goods in smaller quantities.** The introduction of single-use sachets of shampoo priced under US\$0.05 has increased the proportion of India’s population that buys shampoo from 18 percent to 45 percent over 10 years—even though the unit price of these shampoos remains expensive.<sup>6</sup>
- **Increase the buying power of BOP consumers by offering flexible payment plans.** Consumer financing, which may take the form of micro-loans, rent-to-own, leasing, and installment plans, is helping drive the expansion of the consumer durables industry in India.<sup>7</sup>

All of these strategies can be applied to HWTS products.

### Scaling up HWTS initiatives

Current HWTS initiatives are only reaching 7 to 8 million people

worldwide.<sup>8</sup> Most projects have failed to scale up beyond a limited geographic coverage, to bring about long-term changes in household water management behavior, or to achieve financial sustainability.<sup>8,9</sup>

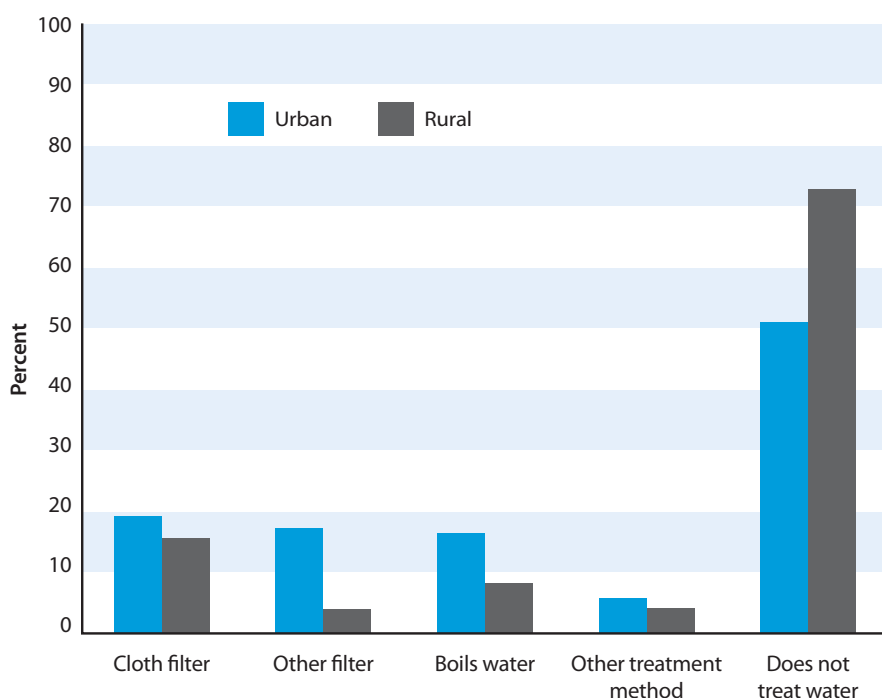
A commercial approach may be able to help overcome some of these challenges. Unlike nonprofit programs, which rely on external grants and subsidies, commercial ventures sell goods at prices that cover all of their costs—making the approach inherently more sustainable. The potential for profits also creates an incentive for more companies to enter the HWTS market. These companies may compete for market share by reducing prices, improving the quality of their products, developing innovative technologies, and heavily promoting their products. All of these strategies will tend to heighten public interest in and sales of HWTS products.<sup>10</sup> With more companies manufacturing HWTS products, it may also be easier to scale up production and distribution, reach different geographic areas, and serve diverse market segments.

Critics, however, point out that the people who need HWTS systems the most are often the ones who can least afford it—making it unrealistic for HWTS programs to go to scale without substantial external support.<sup>11</sup> This raises a fundamental question for

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*“...businesses can and do earn a profit in BOP markets by selling large volumes of products at low margins.”*

**FIGURE 1.** Percentage\* of urban and rural households that purify water, by method (2005-06 India National Family Health Survey)



\* Total percentages may add to more than 100.0 because multiple answers are allowed.

commercial safe water initiatives: what portion of the population can they realistically hope to serve? Further analysis of the BOP market suggests that commercial firms can reach a “submerged market” of 2.8 billion people worldwide, who have incomes between \$1 and \$5 a day and already buy consumer goods on a regular basis, but who do so in highly inefficient markets.<sup>12</sup> The remaining 1.2 billion people, who live in deep poverty on less than \$1 a day, must look to nonprofits and the public sector for free or subsidized HWTS products.

### Prospects for a commercial HWTS market in India

The scarcity and poor quality of water in India have made bottled water and water purification devices a growth industry.<sup>13</sup> More

and more companies—including international, domestic, and regional firms—are entering the market, and competition is heating up between various high-tech devices, such as ultraviolet (UV) and reverse osmosis purifiers.<sup>14</sup> Headlines about commercial water wars in India, however, focus on markets at the top of the economic pyramid rather than the poor.

The reality is that most households in India—especially poor and rural households—do not currently purify their water or store it safely (Figure 1).<sup>15,16</sup> However, about 125 million households have annual incomes between \$360 and \$3,000, which theoretically means they could afford to pay for low-cost HWTS systems.<sup>17</sup> Notably 70 percent of consumer durables in India, such as refrigerators, color

televisions, washing machines, and microwave ovens, are purchased by households with annual incomes between \$350 and \$4,500. Households at the lower end of this income range rely on installment plans to finance their purchases.<sup>18</sup>

Low-income households in India have repeatedly demonstrated their willingness to spend money on larger and more reliable supplies of water.<sup>19</sup> It is less clear that they are willing to spend money on purifying that water. While water is a necessity, treatment is not considered so. HWTS products compete against and may lose out to other household purchases, from food to soap to cigarettes. Certainly HWTS consumers tend to be highly price elastic, that is, demand drops quickly as prices rise.<sup>9</sup> Thus low prices—and good marketing—are essential.

## Product Development

### Selecting appropriate technologies

A wide range of HWTS products—including chemical disinfectants, solar and UV devices, ceramic and slow sand filters, and high-tech appliances—are already on the market, and new technologies are also under development.<sup>21,22</sup> Hence businesses deciding what product to manufacture are faced with a difficult choice, as are families deciding what treatment system to buy. Effectiveness against the pathogens and other contaminants present in local water sources is a minimum requirement (Figure 2), but other considerations also come into play.

People largely judge the quality and healthfulness of water based on its color, clarity, smell, taste, and temperature.<sup>23,24</sup> HWTS technologies that visibly improve these attributes are more desirable and more likely to turn a profit. In fact, if water does not obviously look, smell, or taste bad, HWTS promoters may need to demonstrate that it is contaminated—with a microscope or a water testing kit—in order to motivate people to treat it.<sup>25</sup> They may also need to show how water is contaminated in the home from contact with people's hands, unless it is stored in a container with a narrow opening, tightly fitting lid, and a spigot.<sup>26</sup>

Cost, ease of use, and convenience are also important for consumers. While poor households tend to focus on up-front costs, such as the initial

purchase price of a filter or storage vessel, operating costs and the longevity of the product also affect a system's long-term affordability.<sup>27</sup> Once households have invested in a system, they are more likely to keep using it, and to do so correctly and consistently, if it is relatively easy and convenient to operate, maintain, and repair.<sup>23</sup>


For manufacturers, production and distribution costs are important considerations. Production processes that require sophisticated or proprietary manufacturing techniques, skilled workers, or imported materials are more costly. Simple production processes using local materials are cheaper and can be decentralized, making distribution easier. Heavy or fragile products are more difficult and expensive to transport.


## Tailoring products to consumer needs and preferences


Tailoring products to the special needs and preferences of BOP consumers and to the local setting can increase demand. For example, new improved cookstoves were popular in China and Rwanda, where women had considerable input into their design, but were largely rejected in Kenya and Maharashtra, where women's preferences were ignored.<sup>28,29</sup> For HWTS products for the BOP, the challenge is designing an affordable, safe, reliable, durable device that can survive the rigors of distribution in rural India, that is simple to use and does not require electricity, and that is effective in local water conditions.<sup>9</sup> Products also must meet consumer preferences, for example, regarding design features, which may vary

FIGURE 2. "No Treatment Method is Ideal" (adapted from Reck & Hart, 2004)

	Contaminant					
	Turbidity	Heavy Metals	Viruses	Bacteria	Parasites	Pesticides
Boiling						
Filtering						
Chemical disinfection						
Combined chemical disinfection						
UV						
SODIS						

 Solution addresses contaminant well or consistently.

 Solution addresses contaminant moderately well and/or sometimes.

 Solution does not address contaminant well or at all.



by region.<sup>30</sup> Hence research on the challenges facing low-income households and what they want in a product is essential.<sup>31</sup>

In India, as in other developing countries, all household tasks related to water are considered women's work.<sup>32</sup> Since women and girls are the ones who actually fetch, treat, store, and dispense water in the home, HWTS products should be designed for and tested by women.<sup>33</sup>

## Marketing a family of products

There is no one perfect solution for purifying water in the home. Each HWTS system has advantages and disadvantages in terms of cost, effectiveness, flow rates, ease of use, maintenance requirements, impact on clarity and taste, and the like. When consumers can choose the technology that best fits their wallet and personal preferences, they may be more satisfied with and more likely to use a HWTS product.<sup>34</sup> This means developing a family of HWTS products (manufactured by one or many companies), each tailored to meet the needs and preferences of a different market segment. If consumers are to make a truly informed choice, however, they will need objective information about the pros and cons of the products available.<sup>9</sup>

## Production and Distribution

### Building a reliable supply chain

The supply chain encompasses the flow of goods and information from suppliers all the way to consumers.



*Collecting water from a turbid source.*

It ensures that affordable, good quality products are available when and where customers want to buy them.<sup>35</sup> Building a reliable supply chain poses a daunting challenge because so many firms are involved, including manufacturers, suppliers, importers, wholesalers, distributors, and retailers.

Experience with water and sanitation products in developing countries has revealed the importance of effective planning and management to mesh together the many members of a supply chain.<sup>35,36</sup> Only by conducting market and technology assessments can businesses fully understand the challenges facing their supply chain, for example, the difficulties of maintaining product quality or ensuring the availability of spare parts. It is also important to foster an effective flow of information on sales and inventory levels so retailers can place orders as needed and manufacturers can anticipate demand.

In recent years, business has come to recognize that competition takes

place between supply chains, not individual companies. Building collaborative relationships between members of a supply chain helps leverage their individual skills and knowledge and gives the entire chain a competitive advantage.<sup>37,38</sup> Close working partnerships between suppliers, manufacturers, and retailers can reduce costs, improve product quality, make delivery more dependable, and promote product innovation.<sup>39</sup>

### Reaching the rural poor

It is easier to build a supply chain in urban and periurban slums and shantytowns, where population densities are high, retail outlets are plentiful, the distances between suppliers and retailers are short, and there are many wholesalers, distributors, and stockists. It is far more challenging to keep shelves stocked in rural areas, where villages are widely dispersed, roads are poor, and stores—if they exist—only want small amounts of a product delivered at a time.<sup>40</sup>

Commercial HWTS initiatives cannot ignore rural populations in India, however, since they make up most of the potential market. Nearly three-quarters of India's more than 1 billion people live in rural areas. They are scattered across some 600,000 villages, only about 15,000 of which have more than 5,000 inhabitants.<sup>41</sup> While incomes are lower in rural than urban areas, the rural market now accounts for 53 percent of all fast-moving consumer goods and 59 percent of all consumer durables.<sup>42</sup>

Indian companies have created a variety of innovative distribution systems to reach the rural poor. Retailing in India is dominated by small, family-run kirana shops, whose owners have a close relationship with customers. Their decisions about what products to stock and their recommendations to customers are highly influential.<sup>42</sup> The challenge is to persuade shop owners that carrying HWTS products will create a new revenue stream.<sup>40</sup> If they agree, the next step is to build a distribution network that can profitably deliver small orders. For example, Coca-Cola has devised a hub-and-spoke system that can deliver less than a case of soda at a time to rural kirana shops via rickshaw, bicycle, or cart.<sup>43</sup> This system helped Coca-Cola increase its rural penetration in India from 13 percent in 2001 to 25 percent in mid-2003.

For even greater penetration in rural areas of India, companies like Mahindra Tractors and Castrol Engine Oils send sales teams to market their goods at haats (traditional weekly village markets where rural families make routine purchases) and melas (annual fairs

held in conjunction with a festival or holy place).<sup>17,42</sup>

Other companies have turned to personal selling, which is interactive and allows sales people to customize messages to individual customers.<sup>40</sup> For example, Hindustan Unilever Limited (HUL) has trained thousands of women living in small villages to become self-employed, direct distributors of its personal and household products.<sup>44</sup> These Project Shakti dealers are well positioned to educate women about new product categories: they can explain health and hygiene benefits, increase awareness, change attitudes, and drive the growth of the market.

### **Providing for maintenance and repair throughout a product's life cycle**

The supply chain does not end with the delivery of a product. Service and maintenance, including readily available replacement parts, are essential to retain customers and ensure a product's long-term viability.<sup>36</sup> Ceramic water filters provide a good example. In Cambodia, lack of replacement parts for fragile ceramic water purifiers contributed to a steady decline in their use: only 80 percent of households were still using the purifiers one year after adopting them, only 50 percent at two years, and less than 20 percent at three years.<sup>45</sup>

Manufacturers should consider the entire life cycle of any product they launch. With forethought, products can be designed for a long life of easy maintenance and repair. This not only keeps costs down for BOP customers, but also helps build a product's image and company's reputation.<sup>46</sup> Depending

on the nature of the product, manufacturers may need to build a reliable and convenient supply chain for consumables (such as chlorine disinfectant), replacement parts (such as candles for ceramic filters), or technicians (such as repairmen for slow sand filters).

### **Quality assurance**

It can be difficult to deliver consistent quality products in developing countries like India where there is little regulation and most products go through nonstandardized sourcing, production, and delivery systems.<sup>40</sup> One way to ensure the quality of HWTS systems is for the government to set standards and make product testing mandatory.<sup>45</sup> Another approach uses market forces to pressure manufacturers to compete on quality: it gives consumers reliable information about the quality of HWTS products on the market so they can make informed purchasing decisions.<sup>47</sup> In response, manufacturers may raise their design and production standards or even seek outside endorsements or product certifications.

## **Marketing and Demand Generation**

### **Segmenting the market**

BOP markets are not homogeneous. Gender, income, education, and sociocultural variables can affect what people want and why. For example, women may be more likely than men to understand the implications of drinking unsafe



PATh (Glenn Austin)

*Various water containers are displayed by a cart vendor in India.*

water and to place higher priority on improving water quality and household hygiene because of their household responsibilities.<sup>48</sup> Thus mothers who participated in a trial of Aquatabs in Bangladesh were willing to pay for further supplies of the disinfectant, but fathers generally were not.<sup>49</sup> Even when women and men agree on the need for a product, they may have different motivations. In Benin and Vietnam, for example, women valued latrines for the convenience, privacy, dignity, and safety they offered, while men tended to focus on comfort, modernity, and social status.<sup>50,51</sup> Thus HWTS manufacturers, distributors, and marketers must identify different market segments, understand their motivations and product preferences,

and formulate different advertising messages in response.

### Positioning the product

Since most low-income households in India have no experience with treating water at home, companies must be prepared to build a market for a new product category—a process that may require sustained investment over a period of years.<sup>52</sup> This will require generic messages about the need for and benefits of safe water, in addition to product-specific advertising. Companies may also have to demystify HWTS products by explaining how they work and demonstrating their use.

Promoting the health benefits of clean water is often not sufficient to

persuade people to begin treating their water. Marketers should consider appealing to other factors that drive consumer behavior. HWTS products can be positioned based on:<sup>23</sup>

- **Aesthetics.** People prefer drinking water that tastes good, looks clear, and is cold.
- **Convenience.** People enjoy household appliances that make their lives easier.
- **Social aspirations.** Low-income families may associate HWTS products with modernization and higher social status, especially since wealthy, urban households in India routinely treat their drinking water.<sup>15</sup>



## Marketing HWTS Products to the Poor

In recent years, three initiatives have sought to introduce low-priced, commercial HWTS products in developing countries. Scientists at Procter & Gamble (P&G) began looking for new ways to purify drinking water in 1995. They reverse-engineered the municipal water treatment process to create PUR,<sup>8</sup> an inexpensive and effective combination of a flocculant and disinfectant that is packaged in single-use sachets. However, commercial sales proved lower than expected. In addition, P&G found that substantial upfront investments were required for awareness raising and health education, gaining government approvals and the trust of local nongovernmental organizations (NGOs) was a slow process, and the countries where the company had distribution infrastructure in place did not necessarily offer the most favorable market conditions for PUR.<sup>9</sup> P&G now provides PUR<sup>®</sup> at cost for emergency relief, social marketing, and other pro-bono programs, distributing more than 75 million packets<sup>54</sup> through these channels over a four-year period.

Engineers at Hindustan Unilever Limited (HUL) have developed a highly effective water purifier called Pureit, which operates on a different principle than other purifiers on the Indian market. To introduce and explain the product to consumers, HUL has gone outside normal sales and distribution channels. Interested urban consumers can see live demonstrations of the purifier at special sales outlets, and a direct sales force also goes door-to-door.<sup>55</sup> HUL's advertising emphasizes that Pureit produces water that is as safe as boiled water, but does so more conveniently and for less money. Despite a significant upfront outlay (currently Rs1800 for the appliance and Rs300 for replacement parts), lower-income consumers have shown interest in buying it, in part because of its good looks and social cachet.<sup>9</sup> Pureit was launched first in Chennai, where the water quality is highly variable, and other cities in Tamil Nadu. HUL



PATH (Glenn Austin)

*A boy fills a cup with water from a Pureit water purifier in India.*

hopes to reach a tipping point with Pureit based primarily on word of mouth and is expecting the business will break even in five years.<sup>56</sup>

With funding from the United States Agency for International Development, Aman Tirta, a public-private partnership in Indonesia, launched Air RahMat, a chlorine disinfectant, in 2006, and the private sector is scheduled to take over the venture within a few years. Because formative research found that boiling is an accepted norm in Indonesia, the disinfectant has been positioned as a simpler, quicker, and cheaper alternative to boiling.<sup>57</sup> Air RahMat's health benefits are receiving far less attention because they have less influence on behavior. Initial sales of Air RahMat in two provinces have been promising, with over 750 small stores and pharmacies distributing the disinfectant along with NGOs, women's groups, and other nontraditional retailers. The program is scaling up and opening new markets in the country. A flurry of media and community promotion is helping the project overcome some fundamental challenges, including the objectionable smell and taste of chlorine-treated water, retailers' reluctance to support a new product category, and the difficulty of competing in a cluttered media market.



- **Health benefits.** This argument is compelling only if people understand *both* that bad water causes ill health<sup>53</sup> *and* that their own water is contaminated.

For examples of how commercial ventures have positioned HWTS products, see the box on marketing HWTS products to the poor (page 8).

### Competing with public-sector programs

Firms entering the commercial market for HWTS products in India may encounter public-sector programs to improve the quantity and quality of water available to poor households.<sup>58</sup> Manufacturers can benefit from these initiatives, which raise public awareness of water issues, and should lobby for publicly funded communication campaigns on water safety.<sup>59</sup>

Where public programs distribute free or subsidized HWTS products (such as Safewat chlorine disinfectant in India), manufacturers must segment the market and carefully develop, brand, and position their products to set them apart from public-sector commodities.<sup>60</sup> In Bangladesh, for example, the private sector jumped into the production of household latrines and handpumps after nongovernmental organizations and the government stimulated demand with social mobilization campaigns. Private manufacturers

now outcompete the public sector by offering simpler, cheaper, and more appropriate designs, flexible payment schemes, and convenient services.<sup>47</sup>

### Importance of interpersonal promotion

While mass media advertising can raise awareness of HWTS products, it has had little effect on behavior. Field trials have consistently found that community-based and face-to-face promotional activities are necessary to expand the use of HWTS products beyond a small core of early adopters.<sup>20</sup> Therefore companies marketing HWTS products should consider:

- Building a relationship with small shopkeepers, whose recommendations carry great weight with customers.
- Sponsoring community events, such as folk performances or talent competitions, to showcase product promotions.
- Sending salespeople door-to-door or to village markets and fairs to explain unfamiliar new technologies.
- Targeting sales to opinion leaders and building relationships with satisfied customers to generate positive word of mouth.
- Encouraging health care providers, community promoters, and teachers to spread water safety messages.

### Targeting receptive markets

When launching a new product, it makes sense to target areas where demand can most easily be stimulated and met. This strategy can accelerate the acceptance of a HWTS product and create momentum for its diffusion to other areas.<sup>9</sup> On the supply side, dense populations, functional roads, and existing retail outlets make it easier to build a supply chain. On the demand side, consumers are more likely to be receptive to HWTS products if they think their water is bad; if cholera epidemics, floods, earthquakes, or other disasters have raised awareness of water safety issues; or if government information campaigns have raised awareness of water safety problems like high arsenic levels. They are more likely to buy a technology that suits local conditions—for example, filters are good for turbid water, while solar disinfection only works where the climate is sunny. Stimulating demand for HWTS products is also easier where literacy rates and income levels are higher and there is greater mass media penetration.

### Conclusions

A commercial approach has the potential to meet part of the need for safe drinking water among low-income households—and to

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*“A commercial approach has the potential to meet part of the need for safe drinking water among low-income households.”*

do so in a sustainable, scaleable way. While it cannot replace subsidized public-sector programs, it can decrease demands on them and vastly increase the number of poor people who have the ability to purify their household supply of water. However, PATH's Safe Water Project faces two major challenges in implementing this vision: first, convincing commercial enterprises to enter the market for low-cost HWTS systems and, second, persuading low-income households to spend time and money on treating and safely storing their water.

To enlist commercial partners, the project will have to demonstrate that there is a large and potentially profitable market for low-priced

HWTS products among the BOP. This may be a hard sell, given that creating a market for this new product category is likely to require sustained investment over many years. Manufacturers may be reluctant to pay for generic safe water promotions that are essential to generating demand for HWTS products, but that will benefit their competitors as much as themselves. They may also be reluctant to join with competitors to offer a family of HWTS products.

Changing the spending priorities and household water management behaviors of low-income households may prove equally difficult. When resources are limited, people

may prefer the more immediate gratification offered by other consumer goods to the benefits of home water treatment. Face-to-face explanations and exhortations will certainly be needed.

On the other hand, business has a proven track record of marketing goods to the BOP. Manufacturers have been able to enter and expand markets for latrines, handpumps, and improved cookstoves that were created by pro-social initiatives. Companies in India have been able to educate low-income consumers about health and hygiene issues and create vast new markets for soaps, shampoos, detergents, and other products. Their strategies and experience provide a path to follow.

## Acknowledgement

PATH's Safe Water Project would like to acknowledge the research and innovation in household water treatment and storage (HWTS) technologies over the past two decades. Pioneers in this area are still hard at work blazing the trail to safer water at the household level and PATH's team owes a debt of gratitude to them. Any list of past and current work in HWTS will inevitably leave out important contributors, but a few that PATH is particularly grateful to are listed below:

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