



## Hygiene Improvement Project's Household Water Treatment and Storage E-Conference May 12-22, 2006

### Overview of the Conference

USAID's Hygiene Improvement Project (HIP) held an e-conference on household water treatment and storage from May 12-22, 2006. Household water treatment and safe storage (HWTS), together with the provision of improved water supply, adequate sanitation, and hand washing promotion, are highly effective interventions receiving the increased attention of donors and implementers. As those active in this field work to improve quality and access to safe water, a number of challenges arise. The e-conference discussed two HWTS themes simultaneously on parallel tracks. Theme 1 focused on: Household Water Treatment and Safe Storage: What can the poor afford? Theme 2 focused on: How do programs promote water treatment and ensure that the government continues to supply improved drinking water sources? Two position papers framed the two thematic discussions and posed provocative questions to stimulate dialogue among participants. Susan Murcott from the Massachusetts Institute of Technology (MIT) wrote the conference's background paper: "Status of Implementation, Critical Factors and Challenges to Scale up of Household Water Treatment and Safe Storage Technologies."

This document synthesizes the e-conference discussions around the two themes. All of the messages posted during the conference are available in their entirety in one combined document. In addition, the resources mentioned during the conference were compiled and categorized and published as a separate document. All e-conference related documents are available on the HIP website at [www.hip.watsan.net](http://www.hip.watsan.net).

More than 550 people were invited to join e-conference. Although the conference was scheduled for May 12-22, participants got a jumpstart—sending messages from May 10 and continuing over the allotted time—through May 25. In total, over 50 participants posted 144 messages. Between 5 and 10 percent of invitees asked to be removed from the e-conference list and approximately 10 percent of those remaining participated actively by posting messages—a relatively high statistic. HIP estimates that many others were actively engaged by reading contributions but did not post messages. Participants were from a wide array of geographic locations and organizational affiliations representing 23 countries and a range of government, commercial, NGO, and network institutions. Those who actively participated represented a mix of technical experts and practitioners with a wealth of experiences working directly with communities and consumers/beneficiaries.

Beyond the statistics, the discussions evolved from sharing information to conversations among contributors that were lively and rich to embracing networking opportunities. Following the conference, over 30 individuals asked to have their names added to HIP's networking list. A wide range of topics were discussed but broadly fall into the following categories: technology, marketing, improving practices, networking/information sharing,

new products, and subjects needing more discussion. Participants indicated that the conference was a useful exchange that challenged people's assumptions and enabled them to share valuable experiences and knowledge, and that discussions conveyed the passion of a wide range of professionals dedicated to improving the quality of drinking water around the world. The thoughts of Bob Hildreth (Project Las Americas), paraphrased here, can be seen as a call to action: This conference shows that the vast knowledge and resources of people—working together as a team on this issue—should produce synergies and results that far surpass what we have achieved to date. The time is now to synchronize and combine our efforts to effect real change.

### **Synthesis of Theme 1: What can the poor afford?**

The bulk of the contributions were entered under Theme 1, though many contributions addressed multiple issues across the two different themes.

The organizers posed a series of questions to help focus the discussions on Theme 1:

1. What strategies exist that promote household water treatment and storage?
2. What value do people see in treating and storing water safely so that they sustain the practice over the long term?
3. How can we magnify the savings from treating and storing water safely so that the investment seems worth the cost and effort to households?
4. What schemes exist that encourage small business investment into water treatment and storage?
5. What different payment methods might make these products more affordable or desirable to customers?

Although a few contributors addressed these questions, most elaborated on a wide range of topics. What follows are highlights from the e-conference messages. The focus of initial postings was on sharing **Technology**, particularly on solar disinfection. Other relevant topics discussed under this theme have been organized into the following headings: **Marketing, Improving Practices, Networking/Information Sharing, New Products**, and **New Topics** that require further discussion.

### **Technology**

#### ***SODIS***

Solar disinfection (SODIS) proponents shared their experiences and tips in implementing this household water treatment method.

- Foort Bustraan (Development Alternatives, Inc.-DAI) and Alan Spybey (KickStart) discussed how to increase the temperature within the bottles by painting one side black and placing the black side next to the roof.
- Martin Wegelin (Swiss Federal Institute for Aquatic Science & Technology-EAWAG/SANDEC) noted that the UVA light is most important in inactivating pathogens that cause diarrhea and that water temperature becomes effective only at temperatures above 45 degrees Celsius. He said that EAWAG/SANDEC has stopped recommending the practice of painting bottles ½ black. Water disinfected

through UVA that is stored in the bottle and consumed either from the bottle or a clean glass is less likely to be recontaminated.

- Kevin McGuigan (RCSI) outlined the ideal conditions for SODIS but stressed the importance of keeping the protocol simple, citing a 10% reduction in diarrhea in children in Kenya even when conditions were not ideal.
- Matthias Saladin (SODIS Foundation) talked about the wide acceptability of SODIS because of its low cost, taste and attractiveness of the method.
- Renuka Bery (Hygiene Improvement Project-HIP) mentioned a recent HIP study in Nepal that found respondents considered SODIS to be an easy method to use; they did not like the warm temperature or its dependency on the weather. However, cost was not a factor in this study.
- Matthias Saladin (SODIS Foundation) responded by suggesting that in most places weather is not an issue and that schemes to make bottles available may be necessary where bottles are scarce.
- Mindy Weimer (USAID) raised some technical issues about her SODIS experiments in Indonesia. She found that after six hours when the water was 59.4 degrees C, fecal coliform levels dropped to zero, but after 48 hours the water harbored some fecal contamination.
- Kevin McGuigan (Royal College of Surgeon in Ireland-RCSI) and Regula Meierhofer (EAWAG) suggested that sampling instruments may be recontaminating the water, citing his experience with agar coated dip sticks that flaked off, gathered at the neck of the bottle, and encouraged bacterial growth.
- Regula and Kevin also cited studies that showed plastic compounds (phtalates) do not leach into water when exposed in direct sunlight for varying times over many days. The levels of plasticizers detected were no different than from water stored in glass containers.

### *Silver*

A series of postings revolved around coating ceramic and pottery filters and/or water storage containers with silver.

- Reid Harvey (Silver Ceramic Systems) talked about two processes. In the first, one paints silver nitrate directly onto the interior surface of a pottery storage container and then paints salt water onto that surface. An ion exchange results in insoluble silver chloride. The second process is trickier as it requires painting the silver nitrate directly onto a pottery pot that has not been fired or fired only once and not applying too much silver nitrate solution. Then once the silver nitrate is applied, firing the pot again. This approach requires more study. He also described some easy to use, inexpensive tests to assess the presence of bacteria: PetriFilm Plates made by 3M Company that cost (\$1-2/test) and one by Hanna Instruments (\$0.60/test) when purchased in bulk. He also estimated that the cost for silver treatment to be approximately \$0.10/10 L pot and \$1.00/125L pot.
- Klaas van der Ven (Basic Water Needs Foundation) is currently testing silver impregnation of ceramic filters in India and will have results in July.
- Henk Holtslag (Practica Foundation) mentioned using powered colloidal silver to impregnate ceramic pot filters available from ARGONOL in Spain.

- Mickey Sampson (Resource Development International, RDI-Cambodia) noted a non-harmful condition called Argyria that causes white skin to turn blue when high concentrations of silver are ingested and suggested from his experience that silver impregnated vessels have a limited life span.

### ***Water Storage Containers***

- Reid Harvey (Silver Ceramic Systems) introduced the idea of bypassing water treatment in favor of safe storage in areas where water is pure at the source (e.g. deep wells).
- Mohammed Kamfut (UNICEF) described how earthenware pots are used in Nigeria to store water. To limit contamination, the pots are carefully fixed with a plastic tap at the base that is sealed with cementing material to prevent leakage.
- Reid Harvey (Silver Ceramic Systems) appreciated the description of the taps as a method to prevent recontamination. Pricing of pottery water containers and treatment systems varies. In Nepal an 8-liter 2-bucket water purifier system costs approximately \$5 and a 12-liter system \$7. In Kenya he estimates that a single-bucket system will cost \$4. In Cameroon a water storage container costs approximately \$2.

### ***Water Testing***

- Henk Holslag (Practica Foundation) talked about using Pathoscreen P/A pillows, a Hach Company product, to test water quality.
- Mickey Sampson (RDI Cambodia) recommended a product called easy-gel Coliscan produced by Micrology Labs, which is a simple, inexpensive (\$1.35/test) test that shows presence of different bacteria through different colors.
- Several others described ways that bacteria might be made visible to people.

### ***Candle Filter Testing***

- Henk Holslag (Practica Foundation) mentioned conducting homemade bubble tests to check whether candle filters are functional. To do this, attach a hose to the nipple, immerse the candle in water, and blow through the tube. If a big bubble comes out, the candle is not useable.

### ***Filters***

- Klaas van der Ven (Basic Water Needs Foundation) described a variety of new ceramic filters (CSF and CSF-HD) being tested in India that will cost about \$2.50 and will treat 5 liters of water an hour. Replacement filters will cost about \$1.10. Once the tests are complete, the product will be piloted and then rolled out for a more extensive pilot in 2007.
- Mickey Sampson (RDI Cambodia) described ceramic filters in Cambodia that sell for \$7 with replacement ceramic inserts costing \$2.50. These are being sold at a small profit that is being used to subsidize units for poor families. The Basic Water Needs Foundation has also developed a small-scale water purification unit (DSW) for villages that will cost about \$750 to construct.
- Reid Harvey (Silver Ceramic Systems) shared some of his knowledge about colloidal silver filters to shed some light on why the CS filters in the HIP Nepal

study may still have had some contamination. He noted that if high flow rate candles were used in this type of filter, they do not effectively eliminate all bacterial contamination. But he suggested learning more about the efficacy of these filters from IDE, the organization introducing them into Nepal.

- Daniele Lantagne and Rob Quick (Centers for Disease Control and Prevention-CDC) stressed the need for adequate product testing before implementation to answer some deeper questions that might be related to manufacture failure or simply maintenance problems.

### ***Chlorine***

- Dan Campbell (Environmental Health at USAID project) summarized an article on the efficacy of Safe Water System for use in households affected by HIV and AIDS.
- Klaas van der Ven (Basic Water Needs Foundation) suggested adding activated carbon to the Safe Water System as a way to reduce the taste of chlorine and improve acceptability. He suggests that people can purchase a sealed refillable bag of activated carbon that is impregnated with silver.

### ***Moringa Oleifera***

- Joachim Ezeji (Rural Africa Water Development Project, Nigeria-RAWDP) introduced a household water treatment using existing indigenous resources. Moringa oleifera is an old, tested, and proven water treatment option and the Rural African Water Development Project has designed a filter using Moringa called the Mor-sand filter.
- Michael Lea (Jal Mandir Technology Clearinghouse) enriched the discussion by sharing the other ways in which Moringa contributes to human health: the leaves and seed powder contains high levels of vitamins A and C, potassium and calcium; Moringa oil on a water tank will help kill mosquito larvae; Moringa seeds are 40% oil and can be used for lamps, soap and skin infections; seed press cake left over from crushing the seeds can be used as a fertilizer, fuel, and to clarify dirty water.

### ***Water Source vs. HWTS***

- Joachim Ezeji (RAWDP) emphasized the need to focus on safe drinking water and that even improved water sources are often not safe. He also highlighted the problems of mineral encrustations, groundwater contamination and other contaminants associated with drilling wells.
- Rochelle Rainey (USAID) supported this concept and mentioned a forthcoming study by Tom Clasen that indicates household water treatment is twice as effective in reducing diarrhea as improvements at the source.

### **Marketing**

#### ***Different Financing Schemes***

- Michael Lea (Jal Mandir) highlighted the importance of supporting HWTS interventions with microcredit and microfinancing schemes, particularly women-oriented credit.

- Larry Siegal (Safe Water International) suggested that more expensive schemes may be viable if appropriate financing mechanisms are available. He mentioned that in Bolivia a public water supply system has user rates that help to finance household rainwater storage tanks.
- Mike Commeh (Technology Consultancy Centre) also mentioned that in Ghana water suppliers receive some tax exemptions.
- Hem Pokharel (Solutions Benefiting Life) has had a silvered-coated ceramic disk filter produced and promoted locally in India and Nepal using a small business model. Local program managers promote the filter through women's cooperatives, schools and clubs. The model currently subsidizes the cost but stresses the need to pay something. Users in turn become vocal critics enabling Solutions Benefiting Life to continue to improve the product.
- Renuka Bery (HIP) described a voucher program used for bed nets, which might be applicable for HWTS.
- Rochelle Rainey (USAID) questioned the program administration costs of implementing voucher programs, which may be higher than providing the product for free.
- As mentioned in Susan Murcott's e-conference background paper, subsidies for HWTS have not been adequately studied. However, as Michael Lea (Jal Mandir) pointed out, arguments against subsidies are strong and he equated subsidies to community oppression as the products provided may not be appropriate or valued because they are free.
- Matthias Saladin (SODIS Foundation) gave an example from Latin America where communities were given chlorine for free, and while it may have been appropriate during the cholera outbreak, it became an entitlement so people were not willing to pay for it (although it was inexpensive) and did not treat water if stocks were not available for free.
- Mike Commeh (Technology Consultancy Centre) suggested that national health insurance schemes could help people in Ghana purchase a filter system. He is working on this angle. In Ghana there are currently are credit schemes in place that allow people to purchase a HWTS system in installments. This is especially true for university campuses.
- Amreeta Regmi (USAID) stressed that to ensure sustainability, a technology/product must be priced to achieve full cost recovery. Then a mixed marketing strategy can be developed to ensure that those who cannot afford the technology/product will have access in other ways.

## **Improving Practices**

### ***Essential Conditions***

- Arinita Shrestha (Environmental and Public Health Organization, Nepal-ENPHO) mentioned that before promoting HWTS several conditions must be in place:
  1. Do people really understand what safe water is? And do they have access to affordable water testing kits?
  2. Do people have adequate knowledge about the types of options available?

3. Are the options available appropriate for the communities they aim to reach in terms of physical and socioeconomic aspects?
- Understanding the cultural context as well as the beliefs and practices of the target population is crucial. Robert Ainslie (USAID/JHUCCP) mentioned the need to understand barriers to changes in practice. For example, most people do not associate diarrhea with contaminated drinking water. Then, even when a family treats the water, if the children drink untreated water outside the home, will families ever see reductions in diarrhea? Other times, trying to change a practice, for example, from boiling to chlorination, is very difficult. He also mentioned the need to change cultural norms at a community level rather than a household level to achieve sustained change.
  - Julia Rosenbaum (HIP) described an approach that HIP is using to negotiate behavior change that promotes improved practices instead of ideal behaviors. In this approach home visitors become agents of change rather than educators or water treatment distributors.
  - Camille Dow Baker (Center for Affordable Water and Sanitation Technology-CAWST) wrote that HWTS is a process or a series of practices that must be addressed incrementally.

### ***Interpersonal Communication***

Several postings highlighted the importance of interpersonal communication in encouraging the uptake of new practices.

- While Xanat Flores (MIT) mentioned that this may not be the most “efficient” approach from a marketing perspective, it is very effective to use trusted leaders to introduce new technologies and encourage practices that can be adapted to current daily routines, culture, social structures, etc.
- Amreeta Regmi (USAID) shared experiences from Indonesia and discussed a two-pronged approach that targets both household and institutional levels and creates opportunities to link the technology horizontally and vertically.

### ***Options***

Numerous contributors stressed the need to provide HWTS options.

- Arinita Shrestha (ENPHO) suggested having a minimum of two or three options from which people could choose and to show advantages and disadvantages of all options available so people can choose the best option for their circumstance.
- Bruce Gordon (WHO) also reminded the e-conference that, “it is incumbent on us to ensure that consumers have choices, but also clear information to make an informed decision.”
- This idea was reinforced by Reid Harvey (Silver Ceramic Systems) who called for developing useful and simple ways to compare technologies.
- Merri Weinger (USAID) requested more information on promoting multiple options simultaneously.
- Matthias Saladin (SODIS Foundation) said, “The fact that you can give options to families increases the probability that they will choose any of them, and also the time they will keep using them....Many families use a mix of technologies

depending on circumstances.” He also mentioned a specific methodology that the SODIS Foundation has developed to promote multiple technologies.

### ***Consumer Preferences***

Understanding consumer preferences is critical to uptake of new practices.

- Laurent (last name not available) highlighted the chasm that sometimes exists between project implementer passion for a technology that may not resonate or work for local populations. Many factors influence the uptake of HWTS. Cost is definitely a consideration, but water attributes such as taste, smell, ease of use, and temperature and consumer perceptions of these are also important.
- Renuka Bery (HIP) described a recent study of consumer preferences conducted in Nepal by HIP and Julia Rosenbaum identified a new tool to assess preferences that is now available from HIP.
- Robert Ainslie (USAID/JHUCCP) reminded participants on how bottled water is promoted—it’s “fresh” or “pure”...from a “mountain stream.” Will these messages resonate more with consumers than the reasons often given (saves money and is practical)? Interesting food for thought.
- Larry Siegal (Safe Water International) stressed the importance of dependability and convenience as perhaps more important factors than cost. He also emphasized contract ownership where communities manage a drinking water system and are responsible for promoting use and maintaining the system properly or financial ownership where a family, cooperative, or community invests in a scheme such as water bottling business to provide families with safe drinking water.
- Michael Lea (Jal Mandir) talked about the importance of local commitment both in identifying cultural practices that may limit viability of options (e.g. Moringa tree being considered bad luck) and in building a network of community members to promote new practices within the community.
- Xanat Flores (MIT) emphasized that engaging the community early to identify and/or develop technology and then to promote using the technology.
- Mickey Sampson (RDI Cambodia) shared a negative experience: When he introduced a UV water treatment system, he found that users preferred to use the car battery to power their TV and lights rather than treat their water, underscoring the need to address education and cultural issues.
- Mike Commeh (Technology Consultancy Centre) indicated that when users can see that they are visiting the doctor less often than before drinking treated water, they are convinced to continue using it.

### ***Seeing is Believing***

- Robert Ainslie (USAID/JHUCCP) suggested that treatment options that show something to the user can be more attractive. For example, seeing bubbles in boiling water.
- Michael Lea (Jal Mandir) suggested a simulation to demonstrate how germs travel: women put glitter/chalk/sticky rice or glow-in-the-dark powder on their hands and then go about their regular activities. Looking at where the glitter (or other substance) spreads can stimulate interesting conversations about bacteria migration.

### ***Promoting the Positive***

- Several contributors emphasized the need to focus on positive messages when promoting options, such as clarity, taste, affordability, ease of use and staying healthy rather than preventing disease. These were found to be better predictors of adopting and sustaining improved HWTS practices.

### ***Need for Technical and Behavior Solutions.***

- Several contributors stressed the need to focus both on appropriate technology, offering choices, and improving practices—all of which are necessary in creating a sustainable demand for HWTS.
- Daniele Lantagne and Rob Quick (CDC) stressed the importance of ensuring that a technology being promoted is efficacious and verified in addition to being socially acceptable. The reason being that sometimes new technologies have residual effects that could potentially harm users, such as the high iodine residuals from the LifeStraw technology. Daniele and Rob propose three minimum technical qualifications:
  1. The technology must not cause harm.
  2. The technology must meet some minimum standard of improving water quality.
  3. The technology must be used effectively.

### ***What Can the Poor Afford?***

- Joachim Ezeji (RAWDP) suggested that “the poor in absolute terms cannot afford anything.” And while this is true from people’s experiences, it is also relative.
- Mike Commeh (Technology Consultancy Centre) said that if people desire something enough, they will find a way to obtain it, even when outsiders consider it out of reach. Thus, the next step is to find creative ways to show people why they should desire HWTS and provide attractive and preferred options from which to choose.
- Joachim Ezeji (RAWDP) said that you must build on what already exists using local materials.
- Arinita Shrestha (ENPHO) stressed the importance of not targeting products for the poor because the product and even the practice become stigmatized.
- Mona Grieser (HIP) talked about people’s aspirations for better products, even when they are expensive.
- Susan Murcott (MIT) reinforced this concept and emphasized the need for innovative financing schemes to enable people to afford these important products.
- Reid Harvey (Silver Ceramic Systems) pointed out that a motivation to use HWTS comes when friends and relatives from urban areas present HWTS systems to their rural relatives—a symbol of modernization and increased social status.
- Michael Lea (Jal Mandir) mentioned the need to ensure individuals are empowered to adopt new practices; something that can happen through improved microenterprises and microcredit schemes to support economic and social self-sufficiency.

### ***Working at Scale***

- Heather Lukacs (Stanford University) asked whether participants had experiences with spontaneous uptake of HWTS.
- Matthias Saladin (SODIS Foundation) indicated that pilot HWTS experiences in Latin America have been very successful and governments are very interested in taking efforts to scale.
- Betman Bhandari (CAWST) suggested that programs must be designed to emphasize sustainability beyond the “project” period by strengthening institutions to support activities and programs.
- Bob Hildreth (Project Las Americas) took this one step further by emphasizing the need to create an environment for HWTS rather than focusing on organizations. He discussed creating alliances and opportunities in the Dominican Republic between NGOs and the private sector that have stimulated the uptake of HWTS by engaging a range of local community leaders. And he suggests starting in places where this is easy to do, so that success can build on success.
- Maria Elena Figueroa (JHUCCP) identified new opportunities for communication in contributing to scaling up, particularly interpersonal communication (door-to-door) approaches.

### **Networking/Information Sharing**

The e-conference highlighted contributions from many interested, knowledgeable people working for the same objective with passion and interest, many of whom were interesting in finding ways to continue sharing knowledge beyond this conference.

### ***Stimulating Knowledge Sharing***

In response to a question about what would stimulate knowledge sharing numerous contributors shared their ideas.

- Several participants suggest that knowledge is power that people are reluctant to relinquish and often even when people do share valuable information, recipients may not be listening or able to use the information.
- Xanat Flores (MIT) suggested that the lack of time and experience almost prevented her from participating, but the more she saw others sharing the more she wanted to share.
- Several people suggested that people didn’t know whether what they had to say would be useful.
- Others pointed out that sharing knowledge is a uniting and motivating force that should be encouraged and made easier, perhaps through a central clearinghouse.

### ***Clearinghouse***

- Michael Lea ([Jal Mandir](#)) shared an existing resource that is available to all: a clearinghouse operated by open source software (Tiddlywiki) that provides users assistance and information about research and innovative technologies associated with household water treatment. He also “offered” this resource to the HWTS community, proposing to share it with The International Network to Promote Household Water Treatment and Safe Storage and to run it jointly as a participatory project.

- Maria Elena Figueroa (JHUCCP) suggested that the HWTS community build a case to present to donors on the efficiencies of information sharing to attract funding for a centralized clearinghouse.

### ***Networking***

A high degree of networking took place during the e-conference.

- Several contributors exchanged email addresses to continue discussions off-conference and requested more information from each other and pictures of various technologies.
- Reid Harvey (Silver Ceramic Systems) canvassed the forum for those participants working at a relatively large scale interested in collaborating on grant proposals.

### ***Learning from Failures and Success***

- Bruce Gordon (WHO) started a conversation about the need to share and learn from honest program appraisals—looking at negative experiences as well as successes. Many people agreed and shared some of their challenging experiences and failures. But while appropriate, as others mentioned, this can be difficult when programs are funded by donors who want to see success.

### **New Products**

- Responding directly to a request for more information on new technologies, Giovanni del Signore (Aquaclor System) indicated he had just received a report from Indonesia on Aquaclor Solar units. He also shared information on solar-powered electrolytic hypochlorite generators: on-site chlorinators using only table salt that can produce 50mg of equivalent chlorine after being in the sun for one hour—enough to treat 20-50 liters of water. He also has one suitable for a community that can produce 15g with six hours of sun—enough to treat 12,000 liters of water a day.
- Michael Lea (Jal Mandir) described a peanut sheller made of concrete as an idea that the concrete molding process used might be appropriate for the Biosand filter.
- Larry Siegal (Safe Water International) described several products Safe Water international is piloting in Mexico and Bolivia. One village will use a sand filter and UV lamp, the second a multistage paper filter and the third a solar pasteurizer. In Bolivia work is underway using the new LifeStraw and manufacturing commercially a SODIS-like device that can disinfect seven liters of water at a time.

### **New Topics**

#### ***Monitoring and evaluation***

- Orlando Hernandez (HIP) raised the issue of measuring behavior and asked the group how they have measured water treatment.
- Camille Dow Baker (CAWST) said that the most objective measure is the water quality difference between source and household storage container. She stressed that while technology is important, household water treatment is a series of practices that users need to adopt and therefore the measures are different. The Center for Affordable Water and Sanitation Technology measures the number of

people with better water, the number of organizations implementing HWTS and the number of organizations using CAWST training material.

- Susan Murcott (MIT) stressed the need for the HWST community to agree on some common measurements for determining long-term sustainability of HWTS implementation. She offered rate of adoption and rate of sustained use as measurements and provided some references to others.
- Tommy Ngai (Univ. of Cambridge) asked how do you turn monitoring and evaluation data into program practice? Is the highest long-term acceptance rate more important? And how does one balance long-term acceptance with issues such as cost-effectiveness, water quality and other measures?
- Daniele Lantagne and Rob Quick (CDC) also raise related questions: What should the minimum technical qualifications for household water treatment be before being tested for social acceptability? Is it ethical to recommend a water treatment approach even though we don't know how effective it is? All of these are important questions that require further debate.
- Michael Lea (Jal Mandir) encouraged looking at HWTS from a broader perspective—using health indicators. Yet these measures depend on other factors beyond HWTS, complicating the picture.

### ***Donors Need Information Too***

It is incumbent on the community to verify and validate the technology and to disseminate this information. Yet donors too must recognize the need for sustainable mechanisms to monitor and report progress and failures—so that the same mistakes are not made.

- Rochelle Rainey (USAID) said that donors are wondering how they can provide an option for better health when the people who need it most can least afford it.
- Michael Lea (Jal Mandir) suggested engaging the Base of the Pyramid Learning Lab located at the University of Michigan Business School to consider the questions of microfinancing schemes in HWTS.
- Amreeta Regmi (USAID) identified some questions raised from experiences in Indonesia that could be further deliberated:
  1. Can an HWTS intervention bridge gaps in municipal service providers and link the domestic and institutional sectors in promoting safe water to consumers? Can HWTS combine effective messaging/strategies to stimulate institutional changes and thinking in targeting consumers?
  2. How can we leverage the different institutions responsible for providing safe water and standardizing water quality to promote HWTS?

### **Synthesis of Theme 2: How do programs promote HWTS and ensure that the government continues to supply improved drinking water sources?**

Within this theme, three questions were posed to the conference participants:

1. Does promoting household water treatment and safe storage allow the government to shift its responsibility to individuals to finance their own safe water?

2. How can implementers promote water treatment and safe storage without reflecting negatively on existing water sources, which may or may not be safe to drink?
3. Can organizations working to improve access to water also promote HWTS without sending a confusing and conflicting message to their communities?

In addition to responses to the above questions, several participants shared information on water treatment technologies and experiences. These responses are listed in the **Technology** category. Another series of participant responses provided feedback about the conference and sharing experiences as a learning tool. These responses can be found in the **Knowledge Sharing** category.

**Question 1: Does promoting household water treatment and safe storage allow the government to shift its responsibility to individuals to finance their own safe water?**

- Matthias Saladin (SODIS Foundation) said that promoting HWTS should not imply a shift in responsibilities—in the long run, it still should be the task of the water distribution entities (government or private) to deliver safe water. He regards HWTS as a shift in public health policies (from curing to prevention), and not directly related to drinking water policies.
- Padmaja Shreshtha (Environment and Public Health Organization-Nepal) is in favor of a strong role for government in making sure the drinking water is safe. She said the government should maintain and enforce water quality standards as well as a role in HWTS awareness programs to educate about the safe storage of water.
- Julia Rosenbaum (HIP) described the HIP working at scale approach to hygiene improvement. Working at scale is different than scaling up; it begins at scale by engaging the widest range of sectors and stakeholders about common themes like hygiene improvement. Scale is reached when multiple stakeholders and interventions saturate the same targets with needed activities to adopt and sustain the key hygiene practices that reduce diarrheal disease among a large enough population to have health impact. Lasting change ultimately depends on a critical mass of people practicing improved behaviors. Change can be sustained when individuals encounter the same message at every key contact point in their lives. HIP brings key stakeholders together to develop a shared vision and action plan to improve hygiene with approaches that reach people where they live, work, worship, shop, study and play.
- Michael Commeh (Technology Consultancy Centre) wrote about how limited government funding is a challenge but that successful projects will receive funding. He described that funding was no problem when the government learned of the success of his organization's glass blowing/technology project.
- Joachim Ezeji (RWADP) wrote that the government sees water source development as a major priority over HWTS. HWTS is often seen by government agencies as an emergency response. Recognition for HWTS from WHO and other international agencies can play a role in educating governments about HWTS.

- Merri Weinger (USAID) shared an experience USAID has in Malawi where the government is interested in participating in hygiene improvement efforts but faces time and human resource limitations.

**Question 2 - How can implementers promote water treatment and safe storage without reflecting negatively on existing water sources, which may or may not be safe to drink?**

- Abednego Chigumbu (UNICEF) responded to this question with the comment that for project implementers, disinfecting water at the household level may be easier said than done for a number of reasons—financial, social, cultural, time constraints, knowledge and attitudes, etc. It was his view that methods that make existing sources safer through physical protection are more sustainable and produce better results. He described the benefits of upgrading family wells. Household ownership of the well ensures that breakdowns are attended to whenever they occur and with little or no external assistance. Communal sources, on the other hand, may be perceived as belonging to the implementing agency. He concluded saying that “the use of participatory health and hygiene education techniques in behavior change communication can never be over emphasized if safe household level use and storage of water is to be realized.”
- Matthias Saladin (SODIS Foundation) said that their approach is to empower people to test their water quality. While a distribution network may deliver poor quality water, some open sources may be actually of good quality—so anyway, you need to measure quality. And in any case, safe storage is needed, because that's actually where big part of the problem arises.
- Describing water testing, Larry Siegel (Safe Water International) wrote about a recent experience in Bolivia where water testing led to the use of HWTS.
- Roshan Shrestha (UNICEF Nepal) shared information on a campaign to promote POU water treatment in Nepal. He agreed that the key to effective promotion is "negotiating behavior change" through the frontline workers (community health volunteers, mobilizers etc.). He wrote that even before offering the available water treatment options to the target audience, we need to make them aware that the water they are currently drinking has microbial contamination. The most effective way to do this, he said, is through interpersonal communication supported by mass media. Regarding POU treatment options, one option UNICEF/Nepal promotes is the *Kanchan*<sup>TM</sup> Arsenic Filter developed by ENPHO in select Terai (Southern Nepal) districts. This filter is primarily designed for arsenic mitigation but can be used for reducing microbial contamination too.
- Sally Sutton (UNICEF) raised an important point on the difference between peri-urban and rural environments and the choice of water treatment and storage methods. Peri-urban areas tend to have higher faecal coliform counts in sources but also better access to supplies. In rural areas source and household contamination appears generally to be low in much of Africa compared with Asia and Latin America. Different strategies may be more effective in different environments, rural, urban, African, Latin American, and Asian.

- Sutton also mentioned the difficulty of sustaining HWTS in times of cholera when the government provides chlorine for free during epidemics. She agrees with a previous conference post that perhaps it is the financing systems which need more attention than the technology. She recommended enabling people to make their own choices. In general, water quality comes a lot further down their list than having a source nearer to the house, which they can then manage.

**Question 3: Can organizations working to improve access to water also promote HWTS without sending a confusing and conflicting message to their communities?**

- Libertad Gonzalez (International Federation of Red Cross and Red Crescent Societies-IFRC) stated that IFRC promotes an integrated approach to water/sanitation projects. This approach basically contains two elements: hardware elements (construction / rehabilitation /upgrading of affordable water and sanitation facilities) and software elements (promotion of good hygiene practices at community and household level and community management system of the facilities). Carrying out activities at household level to promote water treatment and safe storage does not exclude implementing hardware activities at water source level.
- Matthias Saladin (SODIS Foundation) described a UNICEF Bolivia project that promotes a multi-technology HWTS approach (boiling, chlorination, SODIS) after the construction phase of their water supply systems. This is due to the fact that centralized water treatment systems (chlorinators) generally are non-operational in the rural communities, for a series of reasons.

**Technology**

***Disinfection***

- Henk Holtslag (Practica Foundation) shared information about the Plation method for water disinfection. It is a tube, containing a number of silver impregnated balls that float in the water container. Tests showed that, within three hours, the water in the container was free of bacteria. He recommended further study on developing low cost options to the Plation.

***Filtration***

- Joachim Ezeji (RWADP) provided details on the Mor-sand Filter designed by RAWDP Nigeria. He said that the “filter mainstreams effective coagulation as a crucial forerunner for efficient filtration, and as being more significant than filtration parameters such as filter media and filtration rate.”
- Mohammed Kamfut (UNICEF) gave a detailed description of a household sand filtration system used in UNICEF projects. It is designed for use by rural communities and farm settlements that depend on surface water sources. Depending on the capacity, a typical filter can provide up to sixty liters or more of potable water in a day. Water quality tests conducted on the filters have shown significant improvement in physical appearance, chemical content and bacteriological quality.
- Michael Commeh (Technology Consultancy Centre) provided a detailed summary of the Nnsupa ceramic water filter, which costs about \$1.50 for the candle and about \$20 for the overall system.

### ***Household Wastewater Treatment***

Laurent Stravato (Studio Galli Ingegneria) provided technical and cost information for wastewater treatment systems. Different studies demonstrate that duckweed microphytes or macrophytes systems can generate sufficient income for the maintenance and operating of treatment facilities. Once the treatment facilities are set up, the maintenance can be financed by means of urban agriculture and inland fisheries bringing important benefits for livelihoods.

### ***Hygiene Education***

- Klaas van der Ven (Basic Water Needs Foundation) asked for information to assist on a campaign in India. Many village women expressed a need to see bacteria that are present in contaminated water. This seems to be very important to them. His project is investigating techniques to do this and he requested information from others. Several participants responded to his information request.. (See “Seeing is Believing,” pg.8. above.)

### ***Storage***

- Michael Commeh (Technology Consultancy Centre) advocated the use of clay pots for water storage.

### **Knowledge Sharing**

Three questions about knowledge sharing were posed to participants at the end of conference:

1. Share one thing you have learned from this e-conference that will be useful to you in your work.
2. People talk about sharing knowledge, yet when the opportunity presents itself, much knowledge and information is not shared. Why? What can you suggest to stimulate sharing?
3. In your mind did this e-conference get to the heart of the HWTS issues posed?

Responses from e-conference participants included:

- Mohammed Kamfut (UNICEF) said the conference gave the opportunity to establish contact with professional colleagues working on different aspects of HWTS. A lot was learned from the experiences shared particularly on appropriate, inexpensive options of making household water storage safer.
- For Matthias Saladin (SODIS Foundation), the e-conference reinforced the importance of household visits and face-to-face as a key to behavior change.
- Henk Holtslag (Practica Foundation) had several interesting ideas. For knowledge transfer, he recommended the creation of Smart Technology Centers in countries and/or regions. He said “these should not be paper collection centers but effective practical knowledge centers where options can be seen, touched, and tried. Advisors that know the local context can select 2 to 5 options of each technology

that fit the local situation regarding wells, pumps, water storage, water treatment, etc.”

- Alan Spybey (KickStart) agreed that sharing negative experiences would be useful but since many organizations depend on donor funding, there is more pressure to share successes rather than failures.
- Larry Siegel (Safe Water International) wrote that the e-conference probed some issues, e.g. education, cost, and range of options, but perhaps more importantly, it drew out the current thinking of groups and individuals at work at the field level.
- Jaap Pels (IRC, Netherlands) reminded us that e-conferences do have limitations; a wealth of knowledge is not easy translatable into text and basic to knowledge sharing is 'trust,' which is not easy without face to face contact. The e-conference, he said contained contributions by the complete spectrum of professionals; from on the ground practitioners, networks of suppliers, producers and inventors as well as academics and decision makers. One question posed by Jaap was “how to convince donors, governments and the private sector to finance opportunities for knowledge sharing and what approaches would work better on top of this.”