Product Introduction
# TABLE OF CONTENTS

INTRODUCTION .................................................................................................................. 3

EXECUTIVE SUMMARY ...................................................................................................... 4

CURRENT WATER TREATMENT ALTERNATIVES ............................................................... 5

PRODUCT: THE PURIFAAYA ............................................................................................... 6
   The SPOUTS Advantage .................................................................................................. 6
   Product Specifications ..................................................................................................... 7

MARKETING MATERIALS ..................................................................................................... 9

NEXT STEPS ........................................................................................................................ 10

CASE STUDIES .................................................................................................................... 11
   Filters for Schools ......................................................................................................... 11
   Refugee Camps in South Sudan ....................................................................................... 11
   Besania SACCO, Mbarara ............................................................................................. 12
   Checkers Supermarket, Kololo ...................................................................................... 12

APPENDIX ............................................................................................................................ 13
   A: Analysis of Drawbacks of Alternative Water Treatment Methods ............................... 13
   B: Test Results and Certification ..................................................................................... 14
   C: Purifaaya Use and Maintenance Instructions ............................................................. 18
   D: Purifaaya Production Process ................................................................................... 19
   E: Product Recommendations ......................................................................................... 20
   F: Previous Success Stories From Around the World ....................................................... 21
   G: References (Annotated) .............................................................................................. 23
   H: Literature - CWFs for Water Treatment .................................................................... 25
INTRODUCTION

Dear Friends and Colleagues of SPOUTS,

We are delighted to introduce Purifaaya, an effective and affordable ceramic water filter to supply drinking water to East Africa. The lack of access to consistent clean drinking water has been a pressing issue in the region, and we are here to provide a solution. SPOUTS of Water, a US-based non-profit with business operations in Uganda, has been on the ground since 2012, making positive changes in the WASH sector.

We are working with various organizations on the ground today to:

1. Develop and implement WASH programs that utilize Purifaaya with partner development organizations
2. Provide sustainable micro-financing options to end users to purchase Purifaaya through SACCOs, VSLAs, and micro finance institutions
3. Utilize small scale entrepreneurs to distribute Purifaaya to end users in hard-to-reach areas
4. Develop comprehensive wholesale Purifaaya distribution networks with distributors
5. Install Purifaaya in public spaces such as refugee camps, clinics, schools, and prisons
6. Partner with various employers to directly provide Purifaaya with financing options to employees

SPOUTS hopes to continue forming sustainable distribution networks throughout East Africa to maximize the beneficiaries of Purifaaya. Ceramic water filter technology has been around for decades, and whether it is for household use or for larger institutions, Purifaaya is an invaluable addition to what has been a very limited array of WASH products on the market.

Please continue reading ahead to read more about our product.

Here to serve your clean water needs,
John Kye and Kathy Ku
Co-Founders
SPOUTS of Water
EXECUTIVE SUMMARY

Addressing the Need for Lasting Water Treatment: Purifaaya is an effective, sustainable, long-term approach to addressing bacterial diseases through the supply of clean drinking water. UNICEF has found that “locally produced ceramic pot-style filters have the advantages of being lightweight, portable, relatively inexpensive, chemical-free, low-maintenance, effective, and easy to use” (1).

“A clear negative association in diarrheal disease prevalence was observed in filter households compared to control households, indicating a strong protective effect of the intervention” - UNICEF (1)
## CURRENT WATER TREATMENT ALTERNATIVES

<table>
<thead>
<tr>
<th>Class</th>
<th>Treatment Alternatives</th>
<th>Drawbacks</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Point of Use</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Boiling</td>
<td></td>
<td>High cost of carbon-based fuel source with concurrent deforestation risk and opportunity cost of collecting fuel; Potential incomplete water treatment if users do not properly boil (2)</td>
</tr>
<tr>
<td>Flocculant / Disinfection Powders</td>
<td></td>
<td>Higher relative cost of water; Multiple steps required for use; Instruction necessary; Requires two buckets, a cloth, and stirring device (2)</td>
</tr>
<tr>
<td>Chlorination Tablets</td>
<td></td>
<td>Lower disinfection effectiveness in turbid waters; Potential user taste and odor objections; Necessity of ensuring quality control of solution; Misunderstanding of chlorination byproducts (3)</td>
</tr>
<tr>
<td>Biosand Filters</td>
<td></td>
<td>Biological layer takes 20 to 30 days to develop to maturity; Filter must be used on a regular basis; Very heavy to transport; High turbidity (&gt;50 NTU) will cause filter to clog and requires more maintenance (4)</td>
</tr>
<tr>
<td><strong>Communal</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Boreholes</td>
<td></td>
<td>High levels of faecal contamination due to proximity to latrines and domestic or grazing animals; High bacteria rates; High lead levels (5); Even if borehole water is clean, transportation and storage in dirty plastic jerry cans can cause water to become nearly 2.5 times dirtier than water drawn from a contaminated well (6)</td>
</tr>
</tbody>
</table>

Please view Appendix A for an in-depth breakdown of these various interventions.
PRODUCT: PURIFAAYA

The SPOUTS Advantage

Purifaaya utilizes a combination of physical filtration and chemical disinfection.

1. Physical Filtration: microscopic pores created from the combustion of sawdust within the clay pots filters contaminated water by only allowing water molecules to pass through. Bacteria, dirt, and other pathogens are too large to penetrate the micropores and cannot pass through to the water below.

2. Chemical Disinfection: a thin layer of silver nitrate is infused into the ceramic filter to enhance bacterial removal.
## PRODUCT SPECIFICATIONS

**Capacity**
- 20 L container: 10 L clay filter above, 10 L safe water storage below
- Flow rate of 2L per hour (5)
- Guaranteed life span of 2 years
- Can serve an entire household (5)
- 430 mm tall, 335 mm wide, boxed
- 3 kilos, empty

**Health Benefits**
- Removal of water borne pathogens
- Greater than 99.99% E. coli reduction (Appendix B)
- Greater than 94% turbidity reduction (Appendix B)
- 60-70% reduction in diarrheal disease (7)

**Affordability**
- 650,000 UGX in savings compared to 2 years of boiling (15)
- Significantly cheaper than bottled water
- Reduction in health costs associated with diarrheal disease

**Sustainability**
- All raw materials sourced in Uganda
- 21+ Ugandans employed at production facility
- Reduces deforestation
- Culturally accepted taste
- Long life span
- Economic stimulus through various distribution methods

*Purifaaya* has been approved by the Ministry of Water and Environment. For the test results and certification of approval, please see Appendix B.
DISTRIBUTION AND PARTNERS

SPOUTS of Water works with a variety of organizations throughout East Africa to distribute Purifaaya. The figure below depicts our various distribution channels.

SPOUTS partners and supporters include but are not limited to:

- Tuskys Supermarkets
- Uganda Prison Services
- Uganda Ministry of Water and Environment
- VisionFund Uganda
- PRIDE International Uganda Ltd.
- Living Goods
- POPOW
- JESE Joint Effort to Save the Environment
- Besania Sacco
- SURGE for Water
- SIMBA telecom
- Clinton Health Access Initiative
- Plan International
- Save the Children
- ACM Ministries
- OXFAM GB South Sudan
- PAH Polish Humanitarian Action
- Embassy of the Republic of Korea in Uganda
- KOICA
- Uganda Healthcare Federation
MARKETING MATERIALS

SPOUTS produces a variety of marketing materials to support the distribution of Purifaaya. Some of the materials include fliers, banners, and t-shirts. In addition, SPOUTS can work with partners to develop appropriate materials for the target audience. Some of our marketing materials are displayed below.

<table>
<thead>
<tr>
<th>Marketing Materials</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Fliers</td>
</tr>
<tr>
<td>• Posters</td>
</tr>
<tr>
<td>• X-Banners</td>
</tr>
<tr>
<td>• Tear-Drop Banners</td>
</tr>
<tr>
<td>• Demo Stands</td>
</tr>
<tr>
<td>• Brochures</td>
</tr>
<tr>
<td>• T-shirts</td>
</tr>
</tbody>
</table>

Poster

T-shirt

Demo Stand

Brochure
NEXT STEPS

Development of a High-end Product

SPOUTS is currently developing a high-end model of Purifaaya for better-off customers. Purifaaya Deluxe disinfects water through the same physical filtration and chemical disinfection, but has a sleeker, more attractive body. Purifaaya Deluxe will have a higher price than the original Purifaaya because of costs associated with the production of the plastic body. This Purifaaya model will be ready for sale around mid 2016.

Factory Expansion and Re-location

As SPOUTS as scaled up, we have realized the need to expand our factory production. This is being carried out in two ways. 1) Maximize Purifaaya production at our current facilities to 1000 filters per month. 2) Relocate our production to a larger, more efficient facility. Our team of engineers is currently designing the new production facility. Relocation is planned for October 2016. Once relocated, the current production facility will be discontinued.
CASE STUDIES

Filters for Schools

SPOUTS of Water participates in an outreach program to provide clean drinking water for students called Filters for Schools. SPOUTS’ Filters for Schools Program has been installing filters in schools since June of 2015, and has now provided clean water access to over 4,500 students in over 15 schools throughout Uganda. In addition to providing clean water access, this program is educating schools on proper Water, Sanitation, and Hygiene practices and how to avoid getting sick through proper practices and water purification. This program has allowed schools to focus more on educating their students and less on dealing with water-borne diseases and the hassle of boiling.

For the educational component, SPOUTS uses the Clean Water Curriculum and Activity Book designed by a group of high school students from the Denver School of Science and Technology under the supervision of Jeremy Wickenheiser, which was piloted and edited by SPOUTS staff. This curriculum discusses germs, germ transmission, and has engaging activities for students to learn about keeping clean and preventing the spread of germs.

SPOUTS has also been working with IDEAS for Uganda, a volunteer-based organization promoting solutions to environmental problems, to lead the curriculum and implement the program in schools.

In November of 2015, SPOUTS of Water partnered with Save the Children to lead a training for their volunteers that work with schools in Kasese district in the Western region of Uganda. Save the Children has procured over 300 filters to install in schools and will implement this program throughout the Western region, significantly expanding the range and influence of the program. SPOUTS hopes to continue working with Save the Children and to create partnerships with other organizations that can similarly create large-scale impact on clean water access in schools.

IDP Camps in South Sudan

Many internally displaced persons in South Sudan lack access to safe drinking water. Many IDPs rely on unsafe water sources such as the Nile River. Furthermore, IDPs struggle to maintain the quality of safe drinking water when it is available; mainly, the water gets contaminated during storage. To address this issue, SPOUTS has partnered with the Polish Humanitarian Action (PAH) to distribute Purifaayas among IDPs.
The Purifaaya offers a simple household level solution to treating unsafe water sources and ensuring the safe storage of drinking water up to the point of use. Thus far 1500 IDP households have been targeted by this partnership. Community Hygiene Promoters (CHPs) were trained on the use and maintenance of the Purifaayas. The CHPs then relayed this information to the IDP communities as filters were distributed.

**Besania SACCO, Mbarara**

Besania SACCO is one of SPOUTS strongest partners within the distribution network of SACCOs and Coops. Besania has sold over 120 Purifaayas in Mbarara. SPOUTS provides Purifaayas to Besania at a wholesale price which Besania then sales at a retail price. The Purifaaya is prominently displayed at the front of the Besania SACCO office so members are exposed to the product. This display includes disposal cups so members can taste the clean water dispensed by the Purifaaya. The office manager and other employees are trained on the specifications of the Purifaaya and can answer any questions a client may have. Besania distributes Purifaayas by both one time cash payments and payment by installment for SACCO members. Besania uses member fees and some sale profits to pay for promotional materials and operational costs.

**Checkers Supermarket, Kololo**

SPOUTS has been partnering with several supermarkets to distribute the Purifaaya. One of our most successful partnerships of this kind has been with Checkers Supermarket in Kisemente. SPOUTS provides the Purifaaya to Checkers at a wholesale price. Checkers in turn distributes the Purifaayas at a retail price to their customers. To promote sales, SPOUTS has supported Checkers with a variety of marketing materials including a display, fliers, and banners. In addition, SPOUTS has provided Checkers with salesperson to promote the Purifaaya on busier business days.
**APPENDIX**

**A: Analysis of Drawbacks of Alternative Water Treatment Methods**

(a) **Point of Use: Boiling**
Boiling water uses resources like firewood which are scarce in many areas of East Africa (13). The WHO estimates that 1 kilogram of wood is needed to boil 1 liter of water (14). A ceramic water filter manufacturer in Cambodia claims that “[b]y eliminating the need to burn firewood to boil water, each filter in circulation saves about 2 tons of firewood each year, according to conservative estimates” (2). Boiling this water takes time from other productive activities, often for women (6). Another potential issue related to boiling water occurs if the water is not brought to the full boiling temperature, in which case the harmful bacteria would remain alive (15). Even when bacteria in the water have been boiled, the suspended material in the water remains and is unappealing to the user (6).

(b) **Point of Use: Chlorination Tablets**
Chlorine tablets are problematic as they need to be handled carefully or else risk skin and respiratory irritation (3). As a consumable, they incur ongoing costs, the concentration of tablets may deteriorate over time, and the dosage depends on water quality (6). Users often complain of the taste and odor of chlorine in their drinking water.

(c) **Point of Use: Flocculant/Disinfection Powders**
Flocculant/disinfection powders like P&G PuR Packets have drawbacks of being a multi-step process for removing the material that has dropped to the bottom of the container and they are more expensive per liter of water treated than ceramic water filters.

(d) **Point of Use: Biosand Filters**
Biosand filters are designed to remove pathogens found in water which can take 20 to 30 days to fully develop to produce clean water. Regular use of the filter is required to maintain the biofilm layer. The systems weight makes it difficult to transport. Water with high turbidity will clog the filter (4).

(e) **Communal Solution: Boreholes**
Boreholes can serve as a source of water but this water can be contaminated from faecal matter from humans and animals (5). Even if the water in the borehole is initially clean, studies have shown that transportation and storage of water in dirty containers can substantially degrade the quality of the water (8).
B: Test Results and Certification

Uganda Ministry of Water and Environment

NATIONAL WATER QUALITY REFERENCE LABORATORY

PERFORMANCE ASSESSMENT OF THE CERAMIC WATER FILTER

1.0 Introduction

This report provides test results for performance assessment of the Ceramic water filter No. 2 delivered to the National Water Quality Reference Laboratory (NWQL) by staff from Spouts of Water Limited located in Busiro Block 376, Plot 895 Wakiso.

The ceramic water filter is intended to provide household low cost water treatment that removes up to 99.9% germs to provide safe and clean water. The treatment unit comprises of two components; the ceramic pot and the bucket fitted with a drain tap. Raw Water is poured on to the ceramic pot which is then filtered at a rate of 1.8L/hr and collected in the reservoir (the bucket). The filtered water can then be collected for drinking through the tap. The assessment of the performance of the ceramic water filter to remove unwanted contaminants in water to produce acceptable clean water that meets the drinking water standards at the rate of 1.8L/hr has been conducted.

2.0 Methodology

The filtrate was collected through the tap and tested for bacteriological, physical and chemical constituents for good drinking water requirements as shown in the table 1. The raw water was also tested for similar drinking water constituents. The final volumes of water filtered were measured and the filtration rate determined. The percentage removal rates of the problematic constituents were then calculated. And finally the sustainability of the filtered water measured against the drinking water standards.

3.0 Drinking water requirements

Good drinking water must have acceptable physical appearance and organoleptic characteristics. The drinking water must also be free of disease causing organisms and chemicals that have potential health risks must be within the safe levels. Acceptability of drinking in terms of physical and chemical aspects is measured against the National Standards for drinking water.
NATIONAL WATER QUALITY REFERENCE LABORATORY

PERFORMANCE ASSESSMENT OF THE CERAMIC WATER FILTER

4.0 Laboratory results and discussions

<table>
<thead>
<tr>
<th>Parameters</th>
<th>% removal</th>
<th>Test Results</th>
<th>US 2011:2008 Drinking water Standard class 1</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Coliforms (CFU/100mls)</td>
<td>99.99</td>
<td>&lt;1</td>
<td>Not Detected</td>
</tr>
<tr>
<td>E.coli (CFU/100mls)</td>
<td>99.99</td>
<td>&lt;1</td>
<td>Not Detected</td>
</tr>
<tr>
<td>Turbidity (NTU)</td>
<td>46.30</td>
<td>1.96</td>
<td>5</td>
</tr>
<tr>
<td>pH (Units)</td>
<td>6.9</td>
<td>7.6</td>
<td>5.5-8.5</td>
</tr>
<tr>
<td>Colour (PtCo)</td>
<td>88.00</td>
<td>3.00</td>
<td>15</td>
</tr>
<tr>
<td>Conductivity (μS/cm)</td>
<td>39</td>
<td>208</td>
<td>1500</td>
</tr>
<tr>
<td>Flow rate (L/hr)</td>
<td></td>
<td>1.8</td>
<td>NS</td>
</tr>
</tbody>
</table>

*Table 1: Laboratory test results on average*

4.1 Physical characteristics

The physical characteristics refer to properties of water that may be determined by physical methods. Such properties include conductivity, pH and turbidity measurements.

Physical characteristics mainly have aesthetic affects such as taste, smell and appearance to water.

The physical characteristics of the filtered water showed in table 1 above show water that is within the recommended standards. The Ceramic filter can remove Turbidity, Colour on average of 89%. However, there was an observed increase of 39% in the mineralization of the filtered water.

4.2 Microbiological Characteristics

Microbiological characteristics refer to pollution in water by pathogens commonly determined inform of total Coliforms and E. coli. Total Coliforms is derived from the environment as a result of decomposing organic matter while E.coli is derived from faecal matter from warm blooded animal. Presence of E.coli indicates recent contamination.

Page 2 of 3
NATIONAL WATER QUALITY REFERENCE LABORATORY

PERFORMANCE ASSESSMENT OF THE CERAMIC WATER FILTER

The filtered water samples test results show microbiological characteristic that meet the required drinking water standard. The filter can effectively remove problematic constituents of microbiological nature in the water to up to 99.99% removal as shown in table 1.

5.0 Conclusion
The treated water from the ceramic water filter is efficient and effective to produce water that meets the recommended standard of water for human consumption.

6.0 Recommendations
- The company should think of increasing the size of the filtration unit for large communities such as schools etc.
- Regularly carry out cleaning and maintenance of the ceramic water filter to avoid clogging as instructed every after 14 days.

Issued by
Principal Water Analyst

[Stamp] 09 JUL 2015
<table>
<thead>
<tr>
<th>Parameter</th>
<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>pH</td>
<td>5</td>
</tr>
<tr>
<td>Turbidity (NTU)</td>
<td>1</td>
</tr>
<tr>
<td>E.coli (CFU/ml)</td>
<td>Not Detected</td>
</tr>
<tr>
<td>Total Coliforms (CFU/ml)</td>
<td>Not Detected</td>
</tr>
</tbody>
</table>

**Flowrate (L/h):** 1500

**Conductivity (µS/cm):** 15

**Colour (PtCo):** 15

**pH (Units):** 5

**Turbidity (NTU):** 1

**E.coli (CFU/ml):** Not Detected

**Total Coliforms (CFU/ml):** Not Detected
C: Purifaaya Use and Maintenance Instructions

The Purifaaya is simple to use and maintain. To use, simply pour untreated water into the ceramic filter. The water will slowly flow through the filter so only clean, safe drinking water collects below. Use the tap to access the clean water. It is suggested that basic maintenance is performed every two weeks. Use a clean cloth to wipe the inside of the ceramic filter. This will dislodged any dirt that has collected and restore the flow rate of water through the filter. Clean the bucket with soap and water, just as you would clean a dish. The use and maintenance instructions are displayed in the figure below.
D: *Purifaaya* Production Process

The *Purifaaya* is manufactured at the SPOUTS factory located off Entebbe Road in Katale Busaawuula. The production process is as follows:

1. The raw materials (black clay, yellow clay, sawdust, and grog) are ground and mixed together.
2. The mixture is pressed into the filter form and touched up.
3. Filters are fired in a wood-burning kiln at 900 degrees Celsius. The sawdust is combusted leaving micropores, the main form of physical filtration.
4. Filters are tested to ensure safe water quality.
5. Filters are painted with silver nitrate for chemical disinfection.
6. Filters are packaged and distributed to various partners.

Factory workers using the filter press.
Dr. Ian Clarke, the Mayor for Makindye Division of Kampala, has been a supporter of SPOUTS Of Water. He wrote for Sunday Vision on February 15, 2015 on the two directors of SPOUTS and suggests that the use of SPOUTS Filter can improve access to clean drinking water in Uganda.

Kathy Kit and John Kye are both 23 years old, born in Korea, brought up in the US where they studied at Harvard University, Kathy to study engineering and John, economics. While they were undergraduates, they undertook a project in which they travelled to Uganda and worked in Pader researching clean water systems. They found that Uganda was the only country in the region which did not have local production capacity for water filters - all the water filters in Uganda are imported, so they decided to investigate the possibility of setting up a plant in Uganda to manufacture water filtration systems using local technology. They also wanted to sell their system at a price point suitable for domestic households. Clean water is a basic necessity for life, but many Ugandans obtain their water from contaminated rivers and springs, which causes diarrhoea diseases.

Boiling is one way to ensure clean water, but it is also possible to filter water to remove bacteria and impurities. This is cheaper, more environmentally friendly and more practical. They raised finance for the venture through entering their business plan in various competitions (which they won) and when they graduated, they came back to implement the project. If this work was being carried out by a large USAID-funded NGO it would be commendable, but the fact that two 23-year-old graduates are behind such a venture is simply amazing. The principle of their filter is to use clay which has microscopic holes which trap the bacteria. Uganda has an infinite supply of clay, so the raw material is cheap, but there are many steps involved in transforming raw clay into a usable water filter. They first tented some disused chicken houses in Kajjansi (where there are ample supplies of clay), and after they had disinfect them from an infestation of fleas, they set about transforming the chicken houses into a water filter factory. The process is as follows: after drying the clay, they use an adapted maze mill to grind the clay into fine particles. They also grind up sawdust into a very fine powder which is mixed with the clay and water in a machine producing the appropriate mixture, out of which they can press the filters. The clay flower pots which one buys along the roads are turned by hand, but since they needed a uniform size of filter, they had to design a press which would shape their filters without small variations in size. This presented a significant engineering challenge since no such press exists in Uganda. However, Kathy designed the specifications for the press and found a local engineering works which was able to produce most of the parts. She was not able to obtain the hydraulic arm locally, so she bought it in the US and brought it back in her luggage.

“...They were prepared to make the necessary sacrifices…”

“We can live on sh290,000 per month,” she informed me, which was not difficult to believe when I saw their basic accommodation. These two young people developed a project at university and after graduation applied what they had learned. They believed in their own concept so much that they were prepared to commit themselves and make the necessary sacrifices. They developed appropriate technology using local materials and now provide employment for 17 people. They did their research which showed there was a business case, they designed the product, developed a business plan, raised the money, and implemented the project from scratch. They now produce 800 filters per day and are at the phase of marketing. Oh, and they are still only 23 years of age.

Facebook: @DrIanClarke
Twitter: @DrIanClarke
One family said that since they started taking [SPOUTS] filtered water their family has not had diarrhea and they are very happy and grateful. Another one said they had like the clean water and it even comes out cooler and they are all doing fine now.

Aurora Castillo, Director (ACM)

70,000 UGX is the best price point I have heard. The other water products in the area go way above 100,000 UGX and seem unreasonable to even middle class Ugandans.

Ted Pantone, Director (Mango Fund)

The [1000] students here get sick all the time from drinking dirty water. But the water from the pots is very excellent. The parents traveled far just to see them and want to take them even home.

Charles M., Headmaster (Nyero Primary School)
As long-term solutions in relief settings
- Flooding in Dominican Republic: 16 months after ceramic water filter distribution, 48.7% of households visited reported having a working filter. (9)
- Tsunami in Sri Lanka: 2 years after ceramic water filter distribution, 71% of households self-reported filter use that day or the day before. (9)

As emergency response products
Ceramic water filters have also been used in relief responses by organizations such as USAID, UNICEF, Oxfam, Action Against Hunger, and the Red Cross.
- Sri Lanka Indian Ocean Tsunami 2004: 12,000 Filters (10)
- Ghana Flooding 2007: 1,000 filters (11)
- Myanmar Nargis Cyclone 2008: 115,000 filters (12)

In addition to their use in relief and emergency settings, ceramic water filters have been utilized as a tool to increase the access to clean drinking water sustainably in many developing countries by various international development organizations including but not limited to:
- UNICEF
- FAO
- Oxfam
- World Vison / Vision Fund
- Save the Children
- Plan International
- Red Cross
- Care International
- PCI
- ACF International
SPOUTS OF WATER

G: References (Annotated)

   The filter's demonstrated effectiveness in improving water quality and health, over a wide range of conditions, makes it an attractive option for household water treatment in Cambodia. Results suggest more work is needed in order to ensure the intervention's continued effectiveness and sustained use in households. Filters maintain effectiveness when used properly. Where possible, filters should be integrated into a comprehensive WSH intervention program. More research is needed on the health impacts of the CWPs.

(2) Daniele Lantagne, PE and Thomas Clasen, JD, PhD. Point of Use Water Treatment in Emergency Response. London School of Hygiene and Tropical Medicine. With support from USAID. London, UK. October 2009.
   Document recent experience in point of use water treatment in emergency response, identify lessons learned and develop a set of recommendations. A literature review and a survey were performed and the results were summarized.


(5) Brian Reed and Bob Reed. Technical Notes on Drinking-Water, Sanitation and Hygiene in Emergencies. WEDC for World Health Organization. 2011
   Technical notes prepared for WHO regarding how much water is needed in emergencies, 2.5 to 3 liters per day for survival (drinking and food).

   Preliminary results from a study performed in Uganda beginning in July 2011 regarding the effect of storing and transporting water from wells to the point of use. Found high levels of contamination from dirty containers despite original clean water sources.

   Overview of effectiveness, health impact, benefits, drawbacks, appropriateness, implementation examples, and economics and scalability for ceramic filters

   A study evaluating the social, economic, and environmental sustainability of ceramic filters impregnated with silver nanoparticles for point-of-use drinking water treatment in developing countries. LCA analysis against a centralized water treatment and distribution system over 10 years.
Results indicate that ceramic filters averted 0.083 DALYs per year for the general population and is cost effective at 84 USD/DALY averted when considering diarrheal diseases. It also performed better in 4 out of 5 environmental categories including energy usage, water usage, global warming potential, and PM10 generation than a centralized water distribution system.


Determining best practices for household water and treatment and safe storage in response to disasters such as the 2010 Haiti Earthquake. Suggests that interventions such as water trucks and chlorination tablets effective during acute phase of disaster but ceramic water filters may be appropriate for the recovery phase. Funded by UNICEF, Oxfam Great Britain, and Oxfam America.


Description of the Red Cross’s distribution of ceramic water filters in Sri Lanka in 2004. Proportion of reported continued users was high at 76% of the 452 households that had received filters. Mean flow rate was 1.12 liters per hour and filters were shown to continue to improve water quality, reducing Escherichia coli for households.


UNICEF study shows that after initial flushing of Myanmar-made filters, arsenic levels in effluent are at acceptable drinking water levels.


Doi:10.1371/journal.pone.0039337


A Canadian company that specializes in water purification solutions and support reviews waterborne disease, bacteria, viruses, and cysts and reviews common methods of water purification.

H: Literature - CWFs for Water Treatment

Evaluating the Sustainability of Ceramic Filters for Point-of-Use Drinking Water Treatment

Dianjun Ren, Lisa M. Colosi,* and James A. Smith

ABSTRACT: This study evaluates the social, economic, and environmental sustainability of ceramic filters impregnated with silver nanoparticles for point-of-use (POU) drinking water treatment in developing countries. The functional unit for this analysis was the amount of water consumed by a typical household over ten years (37,960 L), as delivered by either the POU technology or a centralized water treatment and distribution system. Results indicate that the ceramic filters are 3–6 times more cost-effective than the centralized water system for reduction of waterborne diarrheal illness among the general population and children under five. The ceramic filters also exhibit better environmental performance for four of five evaluated life cycle impacts: energy use, water use, global warming potential, and particulate matter emissions (PM10).

For smog formation potential, the centralized system is preferable to the ceramic filter POU technology. This convergence of social, economic, and environmental criteria offers clear indication that the ceramic filter POU technology is a more sustainable choice for drinking water treatment in developing countries than the centralized treatment systems that have been widely adopted in industrialized countries.

For more on this paper, please follow the link below.
http://pubs.acs.org/doi/abs/10.1021/es4026084