lessons learned

Ceramic Water Filters

Red Cross Red Crescent experiences and lessons in Asia

Simple, low-cost and effective access to safe drinking water for households

Globally, the world is expected to exceed the Millennium Development Goal target of halving the proportion of people without access to safe drinking water by 2015[1] – although uncertainties remain regarding the definition of "improved", sustainability of access and the quality of data.

Despite this statistic, more than 477 million people in communities across Asia[2] still lack access to safe drinking water, leaving them vulnerable to diseases such as diarrhoea, typhoid and hepatitis. When people fall sick, local economies are affected and children stay home from school.

Household water treatment and safe storage can dramatically improve drinking water quality, positively impacting the lives of those who rely on water from polluted rivers or lakes, or from unsafe wells or piped water supplies.

Ceramic water filters are a low-cost, effective, simple and easily maintained method for water treatment at a household level (or "point of use") – enabling families' to access safe drinking water, free from disease-causing pathogens. Their use across the region, particularly in South-East Asian countries, is already widespread and continues to grow in popularity.

Before commencing any programme, a thorough assessment should be undertaken to ensure that ceramic water filters are the most suitable household water treatment option for that particular country context.

Training before distribution and monitoring of use

"The ceramic filter programme in Sri Lanka (Sri Lanka Red Cross Society production facility set up following in depth analysis after the 2004 Indian Ocean tsunami – in 2 years over 12,000 filters were distributed) includes an obligatory training with audio visual materials, lectures and practical exercises. The film talks about proper hygiene practices related to water and sanitation and disease transmission. The practical training shows the future beneficiaries how to correctly clean the ceramic water filter element. This is followed by a household visit to a selected number of households after a week to confirm proper use of the filters. After one month a follow up visit is made and presence/absence tests whereby the biological water quality is measured. Those testing positive are targeted after three months with a third household visit and additional training and information is provided and possible re-testing."

Page 8, Literature review – Ceramic Water Filters, Bolieurs, M. for American Red Cross, May 2008.

1 *Progress on Sanitation and Drinking Water: 2010 Update, WHO/UNICEF Joint Monitoring Programme for Water Supply and Sanitation, Page 9.*

2 *Progress on Sanitation and Drinking Water: 2010 Update, WHO/UNICEF Joint Monitoring Programme for Water Supply and Sanitation, Page 7.*

Why this document?

This document captures key experiences from National Red Cross and Red Crescent Societies in Asia who have implemented programmes with ceramic water filters. It includes lessons learned and recommendations for National Societies in the Asia Pacific zone (along with partner National Societies and the IFRC Secretariat), who may be looking to implement similar programmes in the future.

Technical information on ceramic water filters (including the production process) is well documented and therefore is not discussed in detail (see page 5 for links to additional information and resources).

Ceramic water filters and the Red Cross/ Red Crescent context

Ceramic water filters are promoted under the IFRC's Global Water and Sanitation Initiative (GWSI) as a low-cost and appropriate technology for providing access to safe drinking water[3]. The IFRC standard Water and Sanitation Disaster Response Kit 2[4] can include 400 ceramic water filters as an alternative to chemical household water treatment options (for example chlorine tablets and flocculation/disinfection sachets) as a pre-positioned emergency response tool for up to 2,000 people (400 families).

In the Asia Pacific zone, various National Societies have experience with the production of ceramic water filters, their use in emergencies and/or in the distribution of ceramic water filters as part of ongoing community based development programmes (usually with the support of partner National Societies). Key lessons and recommendations for ceramic water filter distribution and programming outlined below are relevant for both emergency and longer term development contexts.

The Cambodian Red Cross has been producing ceramic water filters since 2003, and the Sri Lanka Red Cross Society began producing, distributing and subsequently selling ceramic water filters in collaboration with the American Red Cross following the 2004 Indian Ocean tsunami.

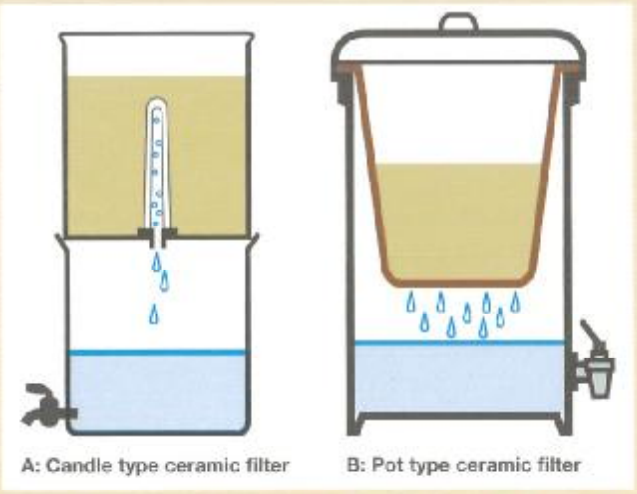
The Cambodian Red Cross, Myanmar Red Cross Society and Vietnam Red Cross have worked in partnership with the French Red Cross to distribute ceramic water filters in both emergency response and as part of community based water and sanitation programmes – with a total of 21,809 ceramic water filters distributed across the three countries to date.

Post-implementation monitoring

Post-implementation monitoring of ceramic water filter use in Sri Lanka and Myanmar, supported by the American Red Cross and French Red Cross, both concluded that the main reason for households no longer using the filter was breakage (generally either the tap or filter). Despite indicating a willingness to pay, the majority of respondents reported not knowing where to source a replacement filter or that spare parts were too expensive. A significant number of households continued to use the filters for everyday drinking purposes, including in Sri Lanka even after some households had been connected to a communal supply.

Overview of ceramic water filter technology

Pot type and candle type ceramic filters are the two most common.



A: Candle type ceramic filter B: Pot type ceramic filter

Generally, a porous ceramic filter sits on top of a plastic or metal receptacle, which is fitted with a tap. The ceramic filter material has tiny pores or microscopic holes specifically designed to trap small solid particles and pathogens, while letting water pass through slowly.

Untreated (or raw) water is filtered through the ceramic by gravity, a process which effectively traps any bacteria, protozoa, amoebas or parasites that are present in the water. Both the pot and candle type filters can be impregnated with colloidal silver, which inactivates any remaining bacteria as the water passes through.

3 *For further information on the IFRC's GWSI see: http://www.ifrc.org/Global/Publications/Health/water-and-sanitation/gwsi-brochure-en.pdf*

4 *For further information on the IFRC standard water and sanitation response tools see: http://www.ifrc.org/Global/Publications/disasters/ers-watsan.pdf. For a detailed content list of the water and sanitation disaster response kit 2 see: http://procurement.ifrc.org/catalogue/overview.aspx?volume=1&groupcode=114&familycode=114012*

Filtered water drops into the receptacle below where it is stored, ready for immediate consumption.

The trapped bacteria and contaminants remain behind on the surface of the filter. The filter can be used until it clogs up and the water filtration rate has significantly reduced – then it needs to be cleaned. The candle or the clay pot should be cleaned with a soft brush and then thoroughly rinsed with clean or boiled water. Soap can be used on the candle but not the clay pot filter, and the receptacle container (including tap) should be cleaned periodically with soap and hot water. The candle should also be boiled after cleaning to kill any remaining pathogens.

Key advantages and limitations of ceramic water filters are summarized below:

Advantages

- Effectively removes bacteria and protozoa from water (approximately 99%[5])
- Simple, easy to use method for treating water at household level
- Affordable, low-cost technology which can be locally produced
- No unpleasant chemical taste or colour in the water
- Simple and minimal maintenance which is easily done by households
- Filter and parts are replaceable if it breaks or wears out (general life span is one to three years)
- Households can save fuel, money and time if the alternative treatment method is to boil water (in particular, it can reduce the workload required for firewood collection which is often the responsibility of women)
- Environmental benefits if less wood/gas/energy is used for drinking water treatment (boiling)

Limitations

- Does not remove viruses, chemicals or pesticides that are present in water
- Yield of filter (generally 20 – 40 litres per day) can mean quantity of water produced is not sufficient for large families (two filters required per large family)
- In general, can provide enough safe water for drinking and sometimes cooking; but not for hygiene and washing of clothes/utensils
- Risk of re-contamination due to poor filter handling and poor hygiene practices (no residual protection for example as from chlorine)
- Relatively short lifespan due to breakage during cleaning, lack of household motivation/financial resources and availability of replacement parts
- Necessary to have an appropriate and accessible supply chain for spare and replacement parts
- Setting up a production facility is time-consuming and requires a high level of technical expertise

A Sri Lanka Red Cross Society volunteer conducting pre-distribution training on ceramic pot filter cleaning.

5 *Brown, J.M, 2007. Effectiveness of Ceramic Filtration for Drinking Water Treatment in Cambodia. Dissertation, (PhD.) University of North Carolina – Chapel Hill.*

Quality control of the ceramic water filter production process is critical to ensure that the filters actually remove contaminants as intended and that they do not break easily. Although various quality assurance processes do exist, there is no international standard for certification of ceramic water filters[6].

Quality control methods such as flow rate testing, visual inspection and measurement of E. coliform bacteria removal are used by both Cambodian Red Cross and Sri Lanka Red Cross Society during their ceramic pot filter production processes. Sri Lanka Red Cross Society has its production process certified by a national research institute.

Sustainable income generation in Sri Lanka

Investing funds to establish a ceramic water filter production factory can continue to be a long-term source of income beyond the project period. Early in the tsunami project, Sri Lanka Red Cross Society carried out an in-depth study on drinking water needs, the National Society's and local capacity to produce filters, retail and wholesale margins and feedback from potential consumers. It took over two years to overcome many technical, practical and regulatory challenges in order to set up the factory and begin production. This included consulting with government agencies on quality and certification requirements – Sri Lanka Red Cross Society has their production process certified by a national research institute. Sri Lanka Red Cross Society now sells ceramic water filters through commercial retailers and has developed a new more attractive receptacle which can compete with other commercially available designs. Since 2010, 27,000 ceramic water filters have been sold to other organizations for subsidized distribution.

Myanmar Red Cross volunteer explaining the use of ceramic water filters as an alternative to traditional household water treatment practices.

French Red Cross

6 *Literature review – Ceramic Water Filters, May 2008. Bolleurs, M., for American Red Cross.*

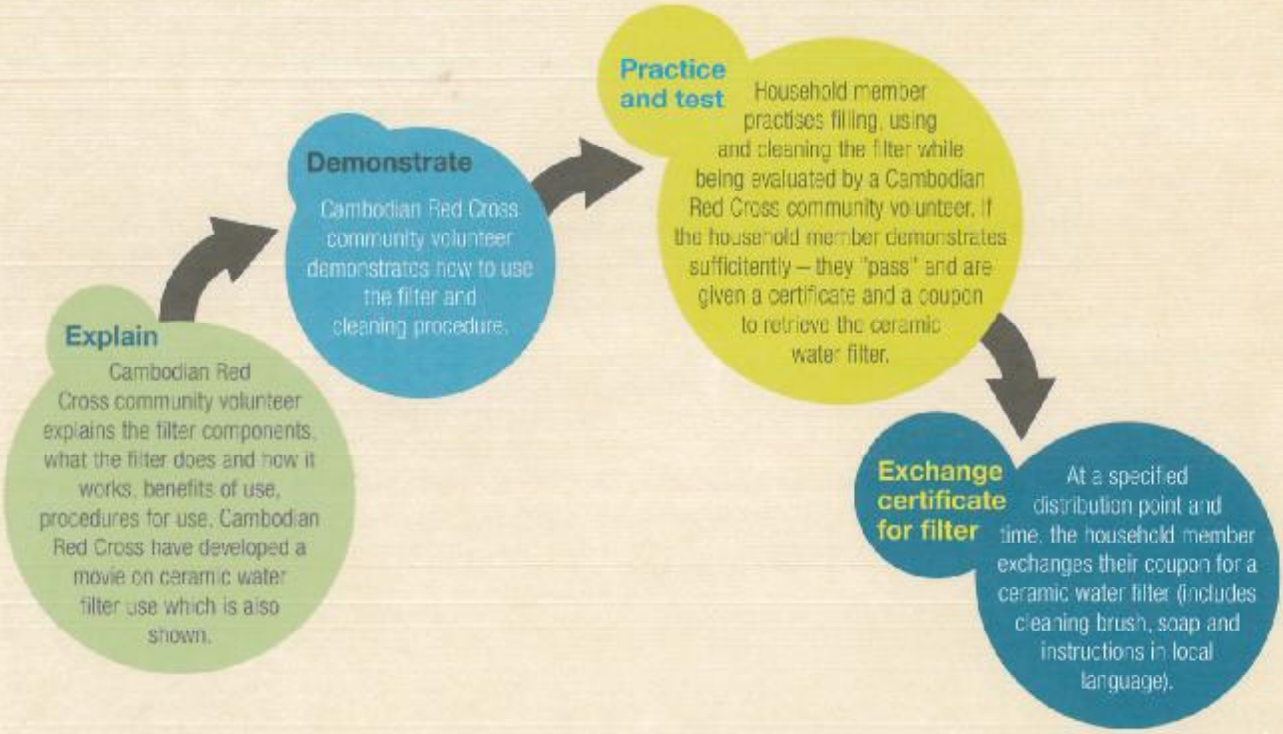
Ceramic water filters in emergencies: Distribution approach and experiences

The critical approach of "no training - no distribution" for household water treatment interventions in emergencies is equally applicable to ceramic water filters.

Sufficient resources (time, money and people) for hygiene promotion activities, follow-up trainings and monitoring and evaluation visits must be included in all emergency and recovery programme budgets from the outset. Monitoring of ceramic water filter use can be integrated with ongoing community based development programmes, particularly those which may be implementing community based health and first aid or participatory hygiene and sanitation transformation (PHAST).

Extra emphasis should be placed on quality control mechanisms if a large number of ceramic water filters are produced in a relatively short timeframe. Poor quality control may mean that filters break easily; people may start to believe the filters are not effective and then they gain a reputation of low quality.

Myanmar Red Cross Society and Cambodian Red Cross, both supported by the French Red Cross, distributed ceramic pot filters to vulnerable households following cyclones Nargis in 2008 (10,614 filters) and Ketsana in 2009 (1,000 filters) respectively. In Cambodia, once targeted households were identified, a four step method for training and distribution was used:



Additional information and resources

Hagan, J.M., Harley, N., Pointing, D., Sampson, M., Smith, K. and Soam, V. (2009), Resource Development International – Cambodia Ceramic Water Filter Handbook, Version 1.1, Phnom Penh, Cambodia:
http://www.rdic.org/water-ceramic-filtration.php

The Ceramics Manufacturing Working Group (2011), Best Practice Recommendations for Local Manufacturing of Ceramic Pot Filters for Household Water Treatment, Ed. 1. Atlanta, GA, USA: http://s189535770.onlinehome.us/pottersforpeace/wp-content/uploads/best-practice-recommendations-for-manufacturing-ceramic-pot-filters-june2011.pdf

Key lessons learned and recommendations

These key lessons and recommendations from the Red Cross Red Crescent experience across several countries in South-East and South Asia are applicable in both development and emergency contexts.

- **'Software' aspects and long-term commitment are essential for success**

  Training before distribution and ongoing follow-up through household visits are critical. These aspects, as well as hygiene promotion activities aimed at improving personal and domestic hygiene and sanitation practices, should accompany any ceramic water filter distribution. National Societies and donors need to realize the critical importance of a long-term commitment when supporting ceramic water filter projects and hygiene behaviour change. Sufficient technical expertise (in both hardware and software aspects), along with a sufficient number of trained and motivated staff and volunteers, are required for success.

  Regular follow-up visits can be used to monitor filter use, assess filter cleanliness and to encourage and monitor improved hygiene practices. In Cambodia, volunteers would award each household with a gold or silver sticker depending on whether the filter was being used and in good condition, which provided positive encouragement and motivation. Ceramic water filter distribution can also be integrated into ongoing community based water and sanitation programmes which are implementing PHAST .

- **Create demand for ceramic water filters (and safe drinking water) through social marketing**

  People will be motivated to change behaviour for reasons other than health benefits; status, convenience and pride can all be very strong motivators. Social marketing campaigns in Cambodia and Sri Lanka now focus on the appearance, attractiveness and desirability of owning a ceramic water filter.

  One example from Cambodia is Hydrologic's Super Tunsai (Super Rabbit) filter – designed to be aesthetically appealing to consumers and advertized on television using a catchy jingle and an 'attractive' or 'enviable' family using the filter. Drivers for behaviour change in each different context should be investigated in the project planning stages to guide activities and efforts.

- **Increase accessibility and affordability of replacement parts: improve local supply chain**

  Access to and affordability of replacement filter parts has been identified as a major barrier to continued ceramic water filter use. This directly hinders scaling-up, sustainability and long-term impact.

  Local suppliers of ceramic water filter components (taps, ceramic filters, cleaning brushes etc.) need to be established or supported so that replacement parts are easily accessible and affordable to households when they need them. This can be linked to development of community based income-generating activities or livelihoods programmes. Social marketing and hygiene promotion complement supply chain development, to generate long-term consumer demand for ceramic water filter products.

- **Need to account for household size compared to filter output**

  For large families, one ceramic water filter may not produce enough safe drinking water for one day, given the slow filter rate. Demand at one time of the day, for example in the morning, may also exceed the filter production rate. For large families, two ceramic water filters should be provided, instead of one.

  There are also issues with the varying yield (low/"slow" or high/"fast") of filters – different yield filters should be distributed to households of different sizes, and how to communicate this factor to households so they are not disappointed or left without enough drinking water if they purchase a replacement filter.

- **Accountability to beneficiaries on water quality**

  During programme implementation, simple water quality tests (such as the H2S test) are good ways to trigger filter use and to demonstrate an improvement in water quality due to the ceramic water filter. However, there are issues with the cost and availability of such tests, as well as implications if the tests do not work.

- **Targeting schools: great potential for scaling-up**

  Schools should be increasingly included in future ceramic water filter projects (where relevant). Providing ceramic water filters for classrooms has a lot of potential – children are often seen as "agents of change" as they pick up positive hygiene and health practices rapidly, and spread key messages to their families and wider communities. Explanation of the use of ceramic water filters can be implemented through CHAST programmes.

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