

## Technical Brief

# Household Water Treatment and Safe Storage (HWTS) in Emergencies

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### The Role of HWTS in Emergencies

Safe drinking water is an immediate priority in emergencies when normal drinking water supplies are interrupted or compromised. Household water treatment and safe storage (HWTS), also known as point of use water treatment (PoU WT), can be an effective alternative to centrally operated water treatment systems in an emergency situation. Household water treatment options include sedimentation (e.g. settling, coagulants), filtration (e.g. ceramic filters, biosand filters) and disinfection (e.g. boiling, chlorine, solar disinfection).

Emergencies can be divided into the following three categories:

1. *Natural disasters* – Catastrophic events that include earthquakes, volcanic eruptions, landslides, tsunamis, floods and drought (Watson, 2007). In 2010, 385 natural disasters killed over 297,000 people, affecting nearly 217 million others and costing nearly US\$124 billion (CRED, 2011). Unfortunately, natural disasters and their impacts have been increasing due to unplanned urbanization, environmental degradation, and climate change, which is causing more intense hurricanes, higher rainfall intensities, and heat waves (UNISDR, 2011).
2. *Complex emergencies* – A humanitarian crisis in a country, region or society where there is total or considerable breakdown of authority resulting from internal or external conflict. The crisis requires an international response that goes beyond the mandate or capacity of any single agency and/or the ongoing United Nations country program (IASC, 1994).
3. *Disease outbreaks* – The occurrence of cases of disease, in excess of what would normally be expected in a defined community, geographical area or season (WHO, 2008). Common waterborne disease outbreaks include cholera, typhoid fever, shigellosis, dysentery and hepatitis A and E.

Not all emergencies result in contaminated water or outbreaks of waterborne diseases. However, research has shown that diarrheal disease outbreaks are more likely to occur in certain situations. Aside from emergencies due to waterborne disease outbreaks, diarrheal diseases are more likely to occur in situations that involve flooding or large-scale population displacement (Lantagne and Clasen, 2011). In such situations, HWTS could be an effective and suitable option for providing safe water.

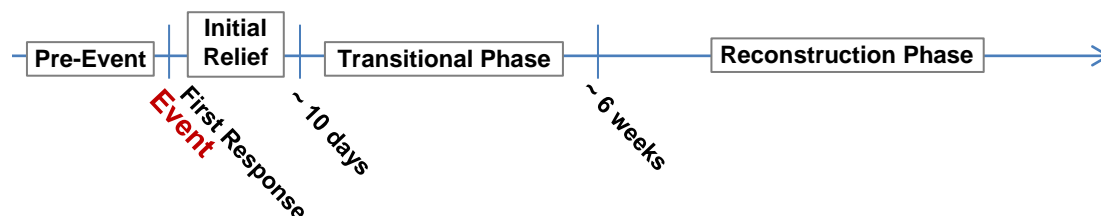
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The potential role of HWTS in an emergency depends on the specific circumstances. For example, it may have no role in the first few days after a natural disaster. It may have a different role during a cholera outbreak than in a newly established refugee or internally displaced persons camp. Populations that may be more appropriate for HWTS include those with no access to alternate sources of safe water, such as rural households using unimproved sources of drinking water, and geographically dispersed households outside of any other water distribution network (Lantagne and Clasen, 2011). Whether or not HWTS is appropriate in a given context depends on a variety of factors, including:

- Water quantity and quality available
- Cultural makeup, norms and preferences of the population
- History of WASH implementation in the region previously
- Number, time commitment and expertise of the responding organization's staff
- Type of WASH initiatives being implemented by other responding organizations

The role of HWTS also depends on the specific time at which it is being implemented within the emergency. It may be that HWTS is logistically too difficult to implement during the first few days or weeks of an emergency, but fits more appropriately once the population is resettled. The timeline or phases of an emergency, and when HWTS may be appropriate, depend largely on the type of emergency. The following timeline defines some general phases of an emergency, however, these phases and when they occur will vary between emergencies.



- **Pre-Event** or Preparedness Phase: there may be warning that a crisis situation is developing, such as in the case of a complex emergency or a cyclone. This warning period may range on the scale of hours to days. Organizations that respond in such emergencies often begin to stockpile supplies and make preparations during this phase. Stocks of HWTS materials and information on the local HWTS capacity (user awareness and availability of local implementers or trainers) could be gathered at this time. Promotion activities could occur at this time to begin to build awareness among the population.
- **EVENT**
- **First Response**: in the first few days after an emergency, efforts are concentrated on rescue and saving lives.
- **Initial Relief** (1 to 10 days): recovery and resettlement. Logistics and communication may be difficult at this time. People are generally focused on locating family and providing for their basic needs. They may not be receptive to messages or new behaviour at this time. The number of people affected may be fluctuating or steadily increasing during this time. Priority for responding organizations is often getting and treating large quantities of water

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quickly. If prepared, it may be possible at this time for organizations to get HWTS supplies to those already accustomed to using them prior to the emergency.

- **Transitional Phase** (10 days to 6 weeks+): the start and duration of this phase will vary considerably. As the situation stabilizes, the focus is on assisting the population until reconstruction can begin. Often at this point in an organization's emergency response (around 6 weeks), the initial responding aid personnel leave, and a new team arrives to continue activities. It may be possible to introduce HWTS during the transitional phase, especially if there is prior knowledge of HWTS in the population. Although it might take longer than 6 weeks in some cases, by this time people have usually resettled in camps, transitional shelters, in or nearby their own damaged homes, or with neighbours. Providing a source of income through a HWTS program will offer a source of stability for families during this time and into the reconstruction phase (e.g. for distributors, trainers, community health workers, product manufacturers).
- **Reconstruction Phase:** reconstruction will happen at different times for different infrastructure elements. The situation will become increasingly stable with a slow return to normalcy. The beginning of this phase is another feasible entry point for HWTS, especially if water supply such as tanker truck water will not be continued after this time. If HWTS is intended to be used beyond the reconstruction phase, it should be ensured that it is feasible for households obtain and use the product after the implementing organization has left and/or the reconstruction is over. During this time, HWTS implementation could be handed over to the community, a local organization or a local business, who will continue to conduct activities, supply products and maintain services and monitoring.

The term “**acute emergency**” refers to up to the first eight weeks following an event.

The long-term goal for HWTS in the community should be considered before implementing HWTS during any phase of the emergency. If HWTS forms a part of the long-term local water safety plan, the HWTS method implemented during the emergency should be feasible for continuation after the responding organization has left. If HWTS will not be a long-term solution for the population, such as in developed urban areas where piped treated drinking water infrastructure was damaged and will be repaired during reconstruction, HWTS need not be considered a long-term solution. In both situations, however, the preferences and previous experience of the population must be taken into account when selecting the HWTS method to be implemented during the emergency.

## Creating Demand

In both development and emergency contexts, many organizations simply want to be told the “best” option for HWTS. Each option has advantages and limitations which need to be considered for the local circumstances. The “best” option ought to be driven by a number of factors, including treatment effectiveness (based on the source water quality and local contaminants), appropriateness, affordability, and acceptability for sustainable use.

The criteria used to select a HWTS option are often different between emergencies and development situations. Due to the pressure to respond as soon as possible to an emergency, many organizations tend to choose a HWTS option based only on factors such as:

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- Availability
- Cost (e.g. product, distribution, training)
- Distribution requirements (e.g. personnel, transport)
- Time for distribution to the target population
- Time for demonstration and training
- Synergy with other emergency response activities (e.g. distribution of other supplies, hygiene promotion)

End user appropriateness and acceptability are frequently not considered in emergencies, even though these factors are critical to ensuring the population actually uses the HWTS option. There are cases where local knowledge and practices were ignored in the emergency and an inappropriate HWTS option was used with limited success. For example, many organizations responding to a tsunami in Indonesia distributed chlorine even though they knew that people did not like the taste and smell, and boiling was the locally preferred option (Lantagne and Clasen, 2011). This type of information can be obtained during the pre-event phase, if possible, and by working with local partners familiar with HWTS. There may also be a pre-existing local or national WASH cluster group comprised of organizations involved in the WASH sector in the region. This group may be able to provide information and contacts, and may have developed guidelines or recommendations for implementing HWTS locally.

Many responding organizations report difficulties in trying to change behaviour in the acute emergency context. While there is active research and discussion on how to change behaviour and encourage the use of HWTS in the development context, there is no significant research on behaviour change strategies for HWTS in emergencies. There is debate as to whether people might be more willing to adopt HWTS during an emergency due to perceived increased risk, or less willing because they are overwhelmed and traumatized (IFRC, 2008; Lantagne and Clasen, 2011). However, it appears that people who know about HWTS before an emergency have fewer barriers to behaviour change and are more likely to use HWTS during an emergency to treat their own water. As a result, responding organizations should implement programs that build on pre-existing, local knowledge of HWTS, or even try to pre-position HWTS in emergency-prone areas. It is not recommended to introduce a HWTS product unknown to the implementing organization or to the community during an emergency without extensive training (both for the community and implementing staff), follow-up and evaluation (Lantagne and Clasen, 2011).

Promotion of HWTS can be done both in the pre-event phase and after the event. Local promotion methods such as public displays, advertising through loud speakers, radio interviews or advertisements, banners and posters, free training sessions, visibility at distribution centres, public dramas and other locally accepted methods can be used. Promotion through clinics and/or through active local Community Health Promoters can also be effective.

## Supplying Products and Services

In the development context, 20 litres per person per day is the recommended minimum amount of water needed for drinking, cooking and personal hygiene. In the acute emergency stage, the priority is to initially have enough treated water to meet the immediate needs for drinking and

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cooking – about 5 litres per person per day (WHO, 2011). After this volume is achieved, efforts should be directed towards ensuring 15 to 20 litres per person, per day.

The Sphere Project was initiated in 1997 by a group of NGOs and the Red Cross and Red Crescent Movement to develop a set of universal minimum standards in core areas of humanitarian response. The Sphere Handbook provides standards, key indicators, and guidance notes for water supply, sanitation and hygiene promotion (WASH). The standards for water supply and the key indicators, which include HWTS, are listed in the following table.

**Table 1: Sphere Water Supply Standards and Key Indicators**

Water Supply Standard	Indicator
1. Access and water quantity	<ul style="list-style-type: none"> <li>• <b>Average water use for drinking, cooking and personal hygiene in any household is at least 15 litres per person per day*</b></li> <li>• The maximum distance from any household to the nearest water point is 500 metres</li> <li>• Queueing time at a water source is no more than 30 minutes</li> </ul>
2. Water quality	<ul style="list-style-type: none"> <li>• There are no faecal (thermotolerant) coliforms per 100ml of water at the point of delivery and use</li> <li>• <b>Any household-level water treatment options used are effective in improving microbiological water quality and are accompanied by appropriate training, promotion and monitoring</b></li> <li>• There is no negative effect on health due to short-term use of water contaminated by chemicals (including carry-over of treatment chemicals) or radiological sources, and assessment shows no significant probability of such an effect</li> <li>• All affected people drink water from a protected or treated source in preference to other readily available water sources</li> <li>• There is no outbreak of water-borne or water-related diseases</li> </ul>
3. Water facilities	<ul style="list-style-type: none"> <li>• <b>Each household has at least two clean water collecting containers of 10–20 litres, one for storage and one for transportation</b></li> <li>• <b>Water collection and storage containers have narrow necks and/or covers for buckets or other safe means of storage, for safe drawing and handling, and are demonstrably used</b></li> <li>• There is at least one washing basin per 100 people and private laundering and bathing areas available for women. Enough water is made available for bathing and laundry</li> <li>• Water at household level is free from contamination at all times</li> <li>• All people are satisfied with the adequate facilities they have for water collection, storage, bathing, hand washing and laundry</li> <li>• Regular maintenance of the installed systems and facilities is ensured and users are involved in this where possible</li> </ul>

(The Sphere Project, 2011)

\* UNHCR recommends a minimum of 20 litres of water per person per day in emergency situations, compared to the Sphere recommendation of 15 litres per person per day (UNHCR, 2009). The WHO recommends initially focusing on providing at least 5 litres per person, per day for drinking and preparing food in the acute emergency stage (2011).

Logistics are generally more challenging in an emergency situation, and being pre-prepared is essential. For responses in the very initial stages of an emergency, there is usually not time to import and distribute HWTS options if the organization is not already established and prepared to conduct an emergency HWTS response. It is recommended that responding organizations identify local partner organizations that could distribute HWTS options in an emergency and

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train their own staff in advance. Due to the logistics of providing safe water to a large number of people quickly, large volume tanks or bladders and batch chlorine treatment, or tanker truck water, are commonly used in the first days or weeks of an emergency. It may be possible to implement HWTS within the first few weeks after an event if the following conditions are met:

- A large supply of HWTS products are available locally or can be ordered and delivered quickly
- Enough product can be obtained or produced to meet demand in the subsequent weeks
- Products can be transported to target populations
- Staff or community workers can be enrolled to distribute, train households and monitor the product

Distribution of HWTS products will depend on the situation, including the availability and state of transportation in the region. Products may be distributed house to house, which can lead to the effective establishment of a household follow-up and monitoring program. Products may also be distributed at non-food distribution points in camps or transitional settlements. Using local modes of transportation such as donkeys and selecting easy-to-transport HWTS products may aid distribution to remote or rural areas.

In the development context, organizations are encouraged to offer various HWTS options to households to meet different needs and motivations. However, in an emergency situation, responding organizations are advised to select only one HWTS to distribute, even if people are using different sources of water. This reduces confusion between households and eliminates the need to have different distribution and training strategies. Exceptions may be distributing different HWTS options to different regions based on accessibility, preference or familiarity, or distributing different products to households already familiar with the product prior to the emergency.

It is also recommended that organizations distribute safe storage containers to use with the HWTS option. This is particularly important if the local container size is not appropriate for the HWTS product being distributed. When using chlorine, users often do not understand that different products (e.g. liquids, tablets) are meant to treat different volumes of water. As well, organizations need to ensure that people have all the materials needed to use the HWTS option properly. For example, households using Purifier of Water (previously “PuR”) packets will require two buckets, a stir stick and a cloth for proper use (Lantagne and Clasen, 2011).

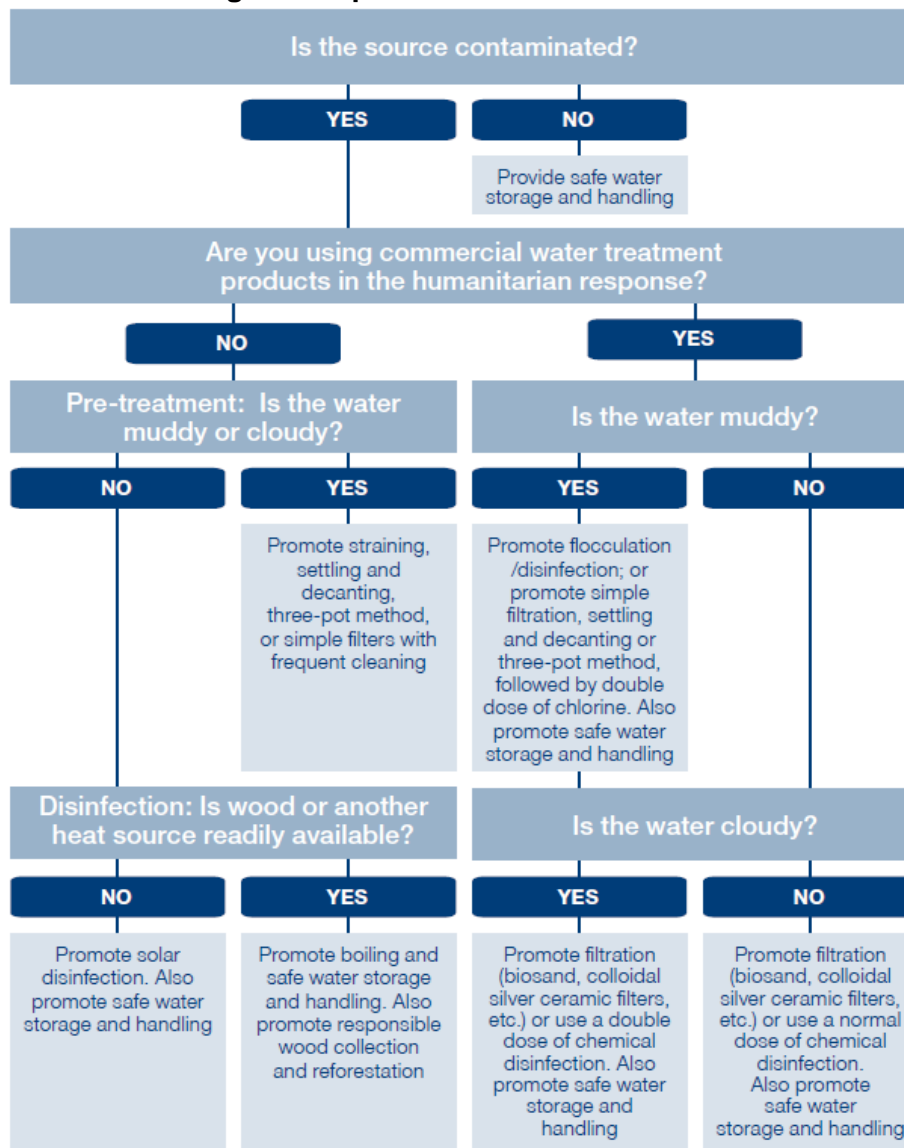
If the HWTS is to be used long-term (i.e. throughout and after the reconstruction phase), the HWTS method selected should be one that can be implemented locally once the organization responding to the emergency has left. If consumable products such as chlorine or ceramic candle filters are used, which require frequent purchase or replacing, a local supply chain for the products must exist or be set up. This supply chain must include production and distribution, and may involve local organizations, clinics, and/or small businesses and kiosks. If durable options such as biosand filters or ceramic pot filters are used, which only need to be purchased once or infrequently, an ongoing production and distribution centre must also exist or be set up, especially if new households are to be reached. In all cases, there must be someone locally who can provide follow-up and monitoring, acting as a local source of expertise and contact for families using the product.

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The following figure from the SPHERE Handbook provides some guidance on selecting a HWTS option during emergencies. The handbook includes chlorine double-dosing as one option, although caution must be used if advising this method. The handbook provides the following guidance about selecting this method: “Double-dose chlorination can be considered for higher turbidity where there is no alternative water source. This should be attempted only for short periods of time and after educating users to reduce turbidity by filtering, settling and decanting before treatment.”

**Figure 1: Sphere HWTS Decision Tree**



(The Sphere Project, 2011)

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## Building Human Capacity

In both development and emergency situations, training is essential for HWTS uptake and its correct and continued use. This also applies to the safe storage container. Training needs to be planned by the organization before promoting and distributing any HWTS options. However, the capacity and time to deliver training is often limited in emergencies. A minimum of one training session should be conducted when distributing HWTS options in an emergency, and where possible, follow up training and monitoring should be carried out (IFRC, 2008; Lantagne and Clasen, 2011). Different HWTS options may require different training procedures. Special consideration must be given to products that come in various sizes or doses, such as chlorine products. These may require a standardized selection so that the same training can be delivered to all recipients, or may require more user training.

Some HWTS options, like liquid and tablet chlorine with standardized doses, may only need one training to ensure its correct use. However, other HWTS options, such as Purifier of Water packets and filters, usually require additional training and follow-up to ensure that they are being used and maintained correctly. These HWTS options may not be appropriate to distribute in the acute emergency stage when organizations have limited capacity for logistics, training and follow-up and when displaced people are living in temporary shelters. These HWTS options are generally more suitable when households are moving to a more stable situation and living in transitional or permanent shelters (Oxfam, 2008; Lantagne and Clasen, 2011). Almost all HWTS options require follow-up to encourage use, remind users of correct use and safe water storage and handling practices, and to monitor results.

Key messages and training need to be designed about how to use the HWTS option and recognize symptoms of waterborne illness. It is critical that messages and training are appropriate for the target population. They must be in the local language and use illustrations for illiterate or low literacy populations. There are examples where organizations have distributed HWTS products which only had written English directions on the product, resulting in low levels of use. Having such training materials prepared in advance or having partner organizations that can translate or provide local materials quickly is critical to an effective HWTS response.

There are different strategies for delivering training, ranging from using dedicated organizational staff to hiring pre-existing local Community Health Promoters, or recruiting new ones (often happening later in the emergency). The choice of training and communication method depends on the target audience and the resources available. In an emergency, mass media is the most commonly used method for the rapid spread of messages to the widest audience at the lowest cost. However, mass media alone is generally not effective in teaching people how to use a HWTS option and should be reinforced with small group demonstrations or house-to-house visits. These face-to-face activities could be conducted in parallel with other distribution activities. People also spend a great deal of the time waiting at distribution points – this can be another opportunity to deliver messages and hold demonstrations conveniently for a large number of people (IFRC, 2008). The HWTS products can also be distributed at such points. Mobile demonstrations and training is another option, using a loudspeaker or other means to attract a crowd. This can be an effective way of delivering the message along with information such as where to get the HWTS product to the surrounding crowd, and then moving to a new location.



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## Monitoring and Improvement

The use of HWTS must be monitored. Households generally require more follow-up support to use the product correctly and consistently if the product is new to them. Random household visits can be done to evaluate whether people are using the product and if they are using it correctly. If chlorine is being used, there are simple tests that can be conducted for Free Residual Chlorine in the stored household water. If local organizations and/or local community health promoters have been involved in the emergency HWTS response, they would be ideal personnel to do the monitoring. They may already be doing household visits, and may also be able to continue the program after the responding organization has left.

It is also important to document implementation of HWTS in emergencies, along with its effectiveness. Only if the results are monitored and the implementation is documented can organizations learn from one emergency to the next, both internally and from one another.

## Program Financing

During an emergency response, products are often provided to households for free, and cost is not a consideration. However, there are some financial considerations that should be taken into account when implementing a HWTS response:

- The HWTS option distributed should be affordable to the local population if it will continue to be used after the free distribution ends
- Determining when free distribution will end should be based on access to alternate sources of safe water, state of local livelihoods, and local experience with the product
- Establishing a price for the products should be based on local market factors such as willingness to pay, the price of competing products, and the local cost of production and distribution
- Organizations continuing the HWTS implementation after the emergency has ended will require a source of financing to sustain their operations and follow-up if product sales do not generate enough income to cover all program costs

These points will be discussed further in the following section on transition to stable situations and exit strategy.

## Transition to Stable Situations and Exit Strategy

Ideally, as the emergency transitions to a more stable situation, people would continue to use HWTS to treat their drinking water. If use of HWTS can be continued, it can be a more sustainable solution during the emergency than, for example, water deliveries that may end when the emergency response ends. After the situation transitions out of the emergency stage, HWTS may continue to provide the benefits that it provides in a development context: individual ownership, simple maintenance, opportunity for people to use the most convenient/preferred water source, and the empowerment of individuals to improve their own water, sanitation and hygiene situation.

Access to HWTS products after the emergency depends on the responding organization's goals and the type of emergency. In some cases, the goal will be to provide immediate relief only, and in others the goal will be to provide relief that transitions into long-term use of HWTS. It should

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be established at the beginning whether the organization wants to promote long-term use of HWTS, and if so, select an appropriate option (Lantagne and Clasen, 2009).

If an organization wants to continue with HWTS after the emergency, then it is recommended they initially select locally made or locally available products with low cost so that households can have continued access afterwards. In some cases, the logistics and higher cost of imported HWTS products, like Purifier of Water packets and Aquatabs, have limited their continued use after the emergency (Lantagne and Clasen, 2011).

If the demand for HWTS created during the emergency is sustained after transition to a stable situation, it may allow small businesses to develop within the community that address the on-going need for HWTS and other WASH services. These may include manufacture and provision of ceramic filters, biosand filters or chlorine, vendors of chlorine tablets, ceramic products or safe storage containers, and employment of community health promoters and other roles from within the community.

If possible, working with local partners to implement HWTS during the emergency will not only help ensure a timely and locally-appropriate response, but will also help build rapport between the community and the local organization. This will create a relationship through which on-going contact, support, provision of products and services, and follow-up can be provided to the community after the responding organization is gone. In some cases, the financial support provided to such local organizations to promote and distribute their HWTS product during an emergency will help create awareness and increase demand for the product after the emergency has ended. In this way, implementing HWTS during an emergency can increase the ongoing access to safe drinking water locally.

## Recommendations for HWTS in Emergencies

In summary, whether or not the use of HWTS is appropriate in a given emergency depends on several factors, including:

- Type of emergency, amount of damage to homes, condition of local HWTS product manufacturing facilities, state of general livelihoods, condition of transportation and communications, lead-up time to prepare stockpiles of product (if any)
- Access to alternate safe water supplies
- Previous local experience with HWTS – including experience in previous emergencies
- Ability to procure HWTS products, including safe storage containers
- Ability to distribute HWTS products to urban, rural and remote locations

Recommendations for implementing HWTS in an emergency:

1. HWTS should be considered as a strategy for providing safe drinking water in emergencies where there is a risk of waterborne disease. If the risk of waterborne disease is low, efforts can be focused on other basic needs.
2. HWTS should be targeted at populations that will be receptive. This may mean that they are familiar with HWTS, or have no other access to a safe drinking water supply.
3. Determine local experience and preference before selecting a HWTS option.

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4. Do not introduce a HWTS option that is completely unfamiliar to the population, to the implementing organization, or that has not been tested and proven to be effective at reducing pathogen load.
5. If HWTS is to be used as a long-term safe water strategy in the region, select an appropriate HWTS option based on local preference, availability, and affordability.
6. To reduce user confusion, distribute only one HWTS option and deliver consistent training messages. To further reduce confusion among households, coordinate product selection and messaging with other implementing organizations, and agree on product pricing in the region if applicable.
7. Supply a safe water storage container and other required equipment with the HWTS product. Ensure the water storage container being used is the appropriate size for the HWTS product being distributed.
8. If possible, begin promotion and training on the HWTS option within the community during the pre-event period. Also use this time to identify and contact local organizations who could provide information on the local context of HWTS in the region, or who could begin implementing the project immediately after the crisis event.
9. Provide at least one user training and conduct follow-up to ensure correct use of the HWTS product. If the product packaging does not include instructions in the local language, include an instruction sheet, sticker or brochure in the local language.
10. Plan to conduct follow-up household visits to monitor correct use and to provide support to users.
11. Partner with a local organization that will be the local contact for users for follow-up and ongoing support. A local partner will also be able to provide information on local preferences, logistics and communication.
12. Coordinate the WASH response, including HWTS, with the local WASH Cluster to achieve consensus on products distributed, dosing, and instructions given to the population.
13. Document the project monitoring and evaluation, and, if possible, make results available to the global WASH and emergency response community.

## Further Resources

CAWST Introduction to Household Water Treatment and Safe Storage (2012). Available online: <http://www.cawst.org/en/resources/pubs>

Lantagne, D. and T. Clasen (2011). Assessing the Implementation of Selected Household Water Treatment and Safe Storage (HWTS) Methods in Emergency Settings. London School of Hygiene and Tropical Medicine. London, UK. Available online at: <http://blogs.washplus.org/drinkingwaterupdates/2012/01/assessing-the-implementation-of-selected-hwts-methods-in-emergency-settings/>

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