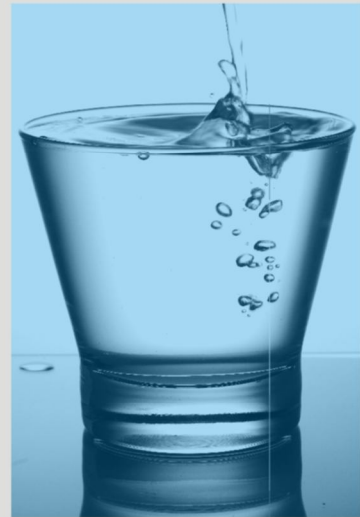


Promoting Household Water Treatment Systems, Safe Storage and Safe Handling Among Urban Poor


Programme & Policy Note



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List of Acronyms

Acronym	Full Form
AUWSP	Accelerated Urban Water Supply Programme
AIDS	Acquired Immunodeficiency Syndrome
BCC	Behavior Change Communication
CPHEEO	Central Public Health and Environmental Engineering Organisation
DJB	Delhi Jal Board
DDWSS	Department of Drinking Water Supply and Sanitation
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DA	Development Alternatives
Gol	Government of India
HWTS	Household Water Treatment Systems & Safe Storage
HIV	Human immunodeficiency virus
IEC	Information Education and Communication
JNNURM	Jawaharlal Nehru National Urban Renewal Mission
JJ	Jhuggi jhopari
LPG	Liquefied petroleum gas
MLA	Member of Legislative Assembly
MoH	Ministry of Health
MoHUPA	Ministry of Housing and Urban Poverty Alleviation
MoUD	Ministry of Urban Development
MCD	Municipal Corporation of Delhi
NIPCED	National Institute for Public Cooperation and Child Development
NGO	Non-government Organisation
RO	Reverse Osmosis
SODIS	Solar disinfection
TDS	Total Dissolved Solids
UV	Ultra Violet
UN	United Nations
US	United States
ULBs	Urban Local Bodies
WASH	Water Sanitation and Hygiene
WHO	World Health Organisation

Executive Summary

THE POLICY NOTE IS PREPARED WITH THE OBJECTIVE OF ADDRESSING THE RISK OF WATERBORNE DISEASES FROM UNSAFE DRINKING WATER IN URBAN INFORMAL SETTLEMENTS. THE NOTE RECOMMENDS SETTING UP OF A NATIONAL MISSION ON HOUSEHOLD WATER TREATMENT, SAFE HANDLING AND STORAGE, AS A MAJOR POLICY AND PROGRAMME THRUST OF GOVERNMENT OF INDIA AND STATE GOVERNMENTS.

Introduction

Health is universally recognised as a Public Good. Access to water and sanitation is recognised as a Human Right as per the UN Declaration of 2010, and a state responsibility. Providing safe, reliable, piped-in water to every household is an essential goal of all countries and civic bodies in charge of water and sanitation. The Policy note **reaffirms the commitment of the government for provision of safe drinking water and sanitation for all. It makes a case for promotion of Household Water Treatment as an interim solution by all civic agencies and government departments**, which is urgently needed but is not a substitute for safe drinking water for all.

Point of Use drinking water safety is a key priority for all stakeholders under the prevalent complex water supply regimes and varied socio-economics contexts of urban settlements. **Linkage of water and sanitation to health** outcomes has been a major determinant of policy and financial assistance to WASH sector.

Prevailing Practice

Global evidence shows that boiling of water is the most prevalent means of treating water in the home in most parts of the world.

Other measures of HWTS besides boiling water include;

- Chlorination
- Solar disinfection(SODIS)
- Filtration – ceramic filters and bio-sand filters
- RO and UV systems
- Sachets combining flocculent and disinfectant

Assuring 24x7 piped water supply in India is a distant reality; bacterial contamination exists even in piped water supply. Hence the need for a market which is currently flooded with Filtration, UV and RO based household water treatment systems and a growing formal and informal sector treated water supply business.

Water quality issues vary from one slum settlement to the other. **People's priorities determine their behaviours and influences success of any behaviour change intervention.** What is often missing is an understanding of the specific type of water quality issues in each slum area, what options they can exercise that are required to treat the water quality problems and actions to promote adoption and practice of low cost methods. Understanding why people prefer to continue with their behaviours is therefore important, instead of pushing an improved behaviour change intervention without first trying to understand what makes them do what they do.

Water Quality-Health Linkage

The health status of an inhabitant of a poor urban settlement cannot be statistically correlated to one specific WASH attribute. The health of the urban poor is related to the living conditions (sanitary) that includes clean air and water and free from disease spreading agents, safe hygienic food and personal hygiene. WASH research and advocacy initiatives often draw attention to hand washing hygiene as the most significant contributor to reducing incidence of diarrhoea. Drinking water quality is also an important factor. It is a combination of all the critical WASH factors and not one aspect alone, that needs to be addressed. A recent World Bank Study has shown that hygiene education and water quality improvements are more effective (42% and 39%) respectively at reducing diarrhoeal incidence than simply providing toilets/sanitation and drinking water supply.

Lack of sanitation/toilets and sewerage leads to open defecation and high private investments to build septic tanks as base tanks on 12 square meter housing plots in the resettlement colonies of Delhi. Open defecation, poor disposal of solid waste and overflowing septic tanks in streets without adequate drainage poses the greatest health risk.

Status of Drinking Water Access of the Urban Poor

It is observed that **awareness of need for safe drinking water and the correlation of contaminated drinking water and diarrhoea** is there among most residents of slums settlements. Behaviour change and practice however does not match this awareness level. **Knowledge and awareness** of the most appropriate and an effective Household Water Treatment Systems (HWTS) option is limited. **Convenience and affordability** determine the choice of HWTS option by a household. **Drinking water from Delhi Jal Board (DJB) tanker supply is considered safe.** Risk of contamination of water on the way (transit from tankers to home) and in the containers used, is not recognised as a problem. **Boiling of water, one of the oldest HWTS behavioural practice, is not a regular feature.** People mention boiling in times of emergency disease outbreaks only.

Existing Programme and Policy Frameworks for Safe Drinking Water in India

MoUD, through its technical wing CPHEEO, suggests indicators benchmarks for quality of water supply including 100% piped supply, 24X7 supply, 135 litres per capita day and quality of water supplied is 100% to allocate performance based grants to ULBs (MoUD website, 2012). The central JNNURM scheme, started in 2005, promotes reforms at state and city levels by making the funding for its projects conditional to bring a shift in focus from infrastructure creation to delivery of service outcomes. Several other initiatives followed to incentivise cities to upgrade their water and sanitation infrastructure: the City Development Plans, the City and State Sanitation Plans, Service Level Benchmarking for Urban Bodies.

Despite massive investments in expanding urban water supply and sewerage, slums and unauthorised colonies are still denied piped water and sewerage connectivity. Lack of water availability and not lack of finance, is emerging as a major problem in ensuring drinking water security in urban India.

The water supplied in urban areas should meet the BIS 10500: 2012 drinking water specifications. However, the water supplied doesn't meet acceptable limits (refer MoUD manual, 1999) of drinking water quality standards and urban population has to content with the permissible limits of water quality in absence of an alternate source. In the slums the per capita supply is around 40 LPCD as per CPHEEO norms.

HWTS Options and Safe Storage Practices

HWTS systems were developed to provide a first or extra barrier of protection to ensure safe drinking water quality. They have gained increasing recognition and are implemented in the developing world as a means of safe drinking water at the point-of-use. The idea is simple – to treat water at the point of use, preferably using effective but low-cost treatment technologies that could be developed using locally available raw materials.

The market for HWTS products is very competitive. There is aggressive marketing and promotional work done by the private sector and a large number of economically better off residents of Delhi and many other Indian cities have been effectively reached through this advertising. It is not uncommon to see middle class families installing expensive RO based water treatment systems on DJB supplied water in Delhi. The uptake of Filtration and RO systems remains low in the poorest urban settlements, among people who perhaps need safe drinking water the most. Increasing cost of LPG and electricity makes boiling as a treatment option expensive.

Factors inhibiting HWTS scaling up

- Low cost Filters, Chlorine and Flocculants not available locally and on a regular basis
- Perceived poor taste of water, temperature and additional effort required
- SODIS and Chlorination require regular follow up and face to face communication and persuasion to encourage people to use these HWTS methods.
- Low cost HWTS and safe storage is not promoted as an aspirational social and individual behaviour change ideal in a creative way
- Water stored in homes is never tested for quality/contamination.
- Absence of any programme or campaign that promotes HWTS and safe storage. Where this is promoted by ASHA workers who also supply chlorine tablets, it leads to positive behaviour change.

Behaviour Change Priorities for HWTS Promotion

Awareness of need for safe drinking water and the correlation of contaminated drinking water and diarrhoea is there among most residents. Behaviour change and practice does not match this awareness level. However, **knowledge and awareness** of the most appropriate and effective HWTS options are limited. **Convenience and affordability** determine the choice of HWTS option by a household.

Drinking water from DJB tanker supply is considered safe. Boiling of water, one of the oldest HWTS behavioural practice, is not a regular feature. People mention boiling in times of emergency disease outbreaks only. The increasing cost of LNG/LPG cooking gas, free DJB water availability for some and affordable RO water for others, is restricting Boiling Water as a HWTS option in most settlements. The quality of RO water supplied, its conveyance, safe storage and hygienic usage is an issue.

Sanitation and drainage remain major health risks. Many residents are making large investments in toilets that do not deliver hygienic sanitation. Absence of well maintained and clean public toilets, lack of open spaces for defecation, as well as convenience and security issues for women and children – are driving many residents who can afford the money, to build individual toilets.

Recommendations

Low cost simple household water treatment can work and people will adopt SODIS and Chlorination. This requires awareness generation about low cost solutions and understanding that low cost treatments are as effective as high cost HWTS solutions, consistent follow up on behaviour change, explaining how SODIS bottles should be used and placed, dosage of chlorination and safe water storage at home, and provision of regular supply of low cost items like Chlorine.

Lack of demand for low cost HWTS is a behavioural issue resulting from low social and individual priority for water safety. Aggressive commercial advertising and promotion of high cost HWTS as aspirational symbols, makes low cost solutions look unsafe and inferior and suppress their demand. Marketing of commercial products requires subsidising the cost through attractive sales promotion pricing and rebates for consumers. Promoting low cost or no cost behaviours and practices that do not have product selling as its aim (SODIS and Boiling of Water), is not possible by employing commercial marketing approaches.

No NGO can compete with the big advertising and promotional budgets of the commercial sector for promoting HWTS. It is therefore imperative that the state supports the promotion of low cost



household water treatment options and behaviour change promotion on a regular and sustained basis. Not as one off posters and advertising campaigns on TV and Radio. **Promoting Household Water Treatment Systems (HWTS) could be seen as a Public Health Good and a responsibility of the state** (till everyone gets adequate and safe piped drinking water). The principles of using public funding will dictate that the **options promoted should be such that the government can promote them for all the people and not just a few**. Promoting low cost HWTS options (Flocculent, SODIS, Chlorination and Boiling) and awareness for Behavior Change in place of product promotion may be the best strategy for national and state governments. In addition to household based water treatment systems, public funding can also be used for promoting low cost community (slums and unauthorized colonies) based water treatment systems where the water utility is not providing piped treated water to residents.

People's perception of low self-worth (arising out of their poverty and social status in slums) generates resistance to pay for treated water or to even make an effort to promote low cost and costless HWTS. It propels them to believe that nothing will happen to them if they consume untreated water. Awareness generation for the need of HWTS must consider specific problems and constraints related to ground water and other sources of water supply, as well as deep seated self perceptions and psychological barriers.

The Policy Note makes the following recommendations;

1. **Reaffirm the commitment of the government for provision of safe drinking water.** Recognise HWTS as interim solutions that are urgently needed but are not substitutes for safe drinking water for all. Declare HWTS as a public good and a health priority
2. **Set up a HWTS Mission as a high priority National Initiative** within a Govt of India Ministry (preferably under the MoUD/MoHUPA or Health Ministry) for a 10 year time period. Designate a central Ministry as the Nodal Agency for **promoting HWTS and Community level water treatment systems**.
 - The primary Role of the HWTS Mission could be **Recommendatory, Promotional and Coordination**
 - The Mission could work as an **Inter Ministerial Convergence Mission at the Central level**. Having representatives from different Ministries, the Mission acts as a clearing house for prioritising HWTS across all Ministries
 - The Mission develops **frameworks for promoting and certification of best technical solutions** for drinking water treatment at the household level and at decentralised community level initiatives
 - **Convergence with other ministries and government departments**
3. **Set up State level Nodal Agency/Unit.** Under a state government agency to implement BCC interventions, water quality testing and monitoring and HWTS promotional activities.
4. **Programming priorities for HWTS**
 - **Prioritise awareness** of the need for Treatment of Water and safe Storage, as a Campaign on regular basis.
 - **Promote simple HWTS solutions** of Boiling water, Chlorination and SODIS. Boiling water is among the most microbiologically effective HWTS methods and it is the only approach that has achieved scale. Potential for boiling water should not be ignored in favour of more commercial approaches to HWTS.
 - **Promote community level Water Treatment solutions.** Where possible and where public infrastructure including community parks and toilets exist, efforts should be made to promote community level water treatment systems. Promoting solar heated/boiled water supply and chlorination can done from such facilities.
 - **Create awareness/literacy of the types of water pollution** (bacteriological and chemical) and the awareness for an appropriate HWTS response. Backed by regular water quality checks at point of use of households. Give choice to the citizens to adopt a water treatment solution based on sufficient information of the problem.
 - **Develop collaborative approach with Private sector- NGOs-Government** for longer term HWTS awareness and promotional work.

Purpose of this Policy Note

THE POLICY NOTE IS PREPARED WITH THE OBJECTIVE OF ADDRESSING THE RISK OF WATERBORNE DISEASES FROM UNSAFE DRINKING WATER IN URBAN INFORMAL SETTLEMENTS. THE NOTE RECOMMENDS SETTING UP OF A NATIONAL MISSION ON HOUSEHOLD WATER TREATMENT, SAFE HANDLING AND STORAGE, AS A MAJOR POLICY AND PROGRAMME THRUST OF GOVERNMENT OF INDIA AND STATE GOVERNMENTS.

This Note is about Point of Use water safety in complex regimes of water supply, social and economic contexts of urban informal settlements and slums of our cities. It is based on the project findings of Development Alternatives in 26 slums of Delhi, working with 20,000 families since 2009. The Note has been prepared through a year long consultative process and inputs from the project, from a consortium of coalition member organizations and experts and a National Consultation held in July 2013.

1. Introduction

Concerns about water quality are rising despite increasing coverage of populations with access to drinking water. Unfortunately there is a dearth of political will, donor and private sector interest in highlighting and addressing water quality problems at the household level in a meaningful way. Securing piped water supply 24x7 in slums and unauthorised colonies may not be feasible in the immediate future in Delhi and other urban areas. What is therefore needed urgently is Programme and Policy initiatives by the Central and State governments to promote simple low cost solutions for household treatment of water and safe storage that can be implemented at scale in collaboration with all stakeholders.

WHO Water Quality and Health Strategy 2013-20;

- Contaminated water serves as a mechanism to transmit communicable diseases such as diarrhoea, cholera, dysentery, typhoid and guinea worm infection. WHO estimates that in 2008 diarrhoeal disease claimed the lives of 2.5 million people. For children under five, this burden is greater than the combined burden of HIV/AIDS and malaria.
- A total of 58 countries from all continents reported a cumulative total of 589,854 cholera cases in 2011, representing an increase of 85% from 2014. The greatest proportion of cases was reported from the island of Hispaniola and the African continent. These trends reflect the need to shift from basic responsiveness to a comprehensive, multidisciplinary approach that works with communities to improve access to safe drinking-water and sanitation, encourages behavioural change and promotes the targeted use of oral cholera vaccines where the disease is endemic.
- Millions of people are exposed to dangerous levels of biological contaminants and chemical pollutants in their drinking-water due to inadequate management of urban, industrial or agricultural wastewater. In addition, dangerously high concentrations of chemical hazards, such as arsenic and fluoride, originating from natural sources affect millions and cause conditions such as cancer and fluorosis. Inorganic arsenic is present at high levels in the groundwater of a number of countries, including Argentina, Chile, China, India (West Bengal), Mexico, the United States of America, and particularly Bangladesh where 20 million and 45 million people are at risk of being exposed to arsenic concentrations that are greater than the national standard of 50 µg/L and the WHO guideline value of 10 µg/L, respectively.
- In many parts of the world, insects that live or breed in water serve as vectors of disease. Water quality is not a major determinant, although anopheline vectors of malaria breed only in clean water and culicine vectors of lymphatic filariasis prefer organically polluted water. However, an immediate link exists between household water storage and vector breeding. Dengue fever outbreaks have increased fourfold since 1995, with 2.5 billion people at risk today. WHO estimates that 50-100 million dengue infections occur worldwide each year.

Health is universally recognised as a public good. **Providing safe, reliable, piped-in water to every household is an essential goal of all countries and civic bodies in charge of water and sanitation.** Access to water and sanitation is recognised as a Human Right as per the UN Declaration of 2010, and a state responsibility. Safe drinking water yields optimal health gains while contributing to poverty reduction, nutrition, childhood survival, school attendance, gender equity and environmental sustainability. While strongly committed to this goal and to incremental improvements in water supplies wherever possible, the **World Health Organization (WHO) and others have called for targeted, interim approaches that will accelerate the health gains associated with safe drinking-water for those who are using unsafe water.** HWTS offers an opportunity to provide the most needy populations with a tool to take charge of improving their own water security while they patiently wait for the pipe to finally reach them.

2. Prevailing Practice

Global evidence shows that boiling of water is the most prevalent means of treating water in the home in most parts of the world. It is practised by hundreds of millions of people, perhaps because the necessary hardware are already available in most cases resulting in becoming part of the culture and practice.

Other measures of HWTS besides boiling water, include;

- Chlorination
- Solar disinfection(SODIS)
- Filtration – ceramic filters and bio-sand filters
- RO and UV systems
- Sachets combining flocculent and disinfectant

Emergencies and disasters see the most use of low cost water treatment options.

In certain Asian countries, boiling is practised by more than 90% of the population. Boiling is among the most effective methods of improving the microbiological quality of water, even under a variety of conditions that challenge other methods. This combination of scalability and effectiveness renders boiling the benchmark by which other methods must be measured. At the same time, boiling presents potential disadvantages in actual practice that raise questions about whether it should continue to be promoted over other HWTS options. These include relatively high cost compared with certain alternatives, susceptibility of boiled water to recontamination, contribution to poor indoor air quality and adverse environmental impact. Unless and until alternatives to boiling have demonstrated higher performance at scale, boiling should continue to be encouraged. In 2007, the combined efforts of all HWTS products—exclusive of boiling and emergency applications—produced approximately 15.5 billion litres of treated water. This represents an average annual growth of 25.5% over 2005 and 2006 levels of 9.9 billion and 12.2 billion litres treated, respectively. These figures do not include boiling, which is practised by more than 350 million people, a figure that does not include large populations in China. *Given that 884 million people rely on unimproved water supplies and many more whose water is not consistently safe for drinking, the results to date for HWTS methods other than boiling provide a perspective that is more sobering.* Except for the sodium hypochlorite product in Zambia and, arguably, Madagascar and some promising ceramic filter coverage in Cambodia, no HWTS method other than boiling can be said to have achieved scale in coverage. This is due in part to some of the same challenges facing novel public health interventions among low-income populations—creating awareness, securing acceptance, ensuring access and affordability, establishing political commitment, addressing sustainability, etc. *There is evidence from countries that uptake (of chlorination) is greatest among urban, higher-income and better educated populations, which may not be most vulnerable to waterborne diseases.* These same disparities may be even greater for HWTS products other than the sodium hypochlorite, which benefits from its low cost of entry and overall cost of use, high awareness and widespread availability.¹

There have been very few studies of a representative scale in India that have highlighted the practice, barriers and motivation for adopting one or more types of household water treatment systems. Dealing with what works in terms of adoption and why. Water treatment is now a big business. Public

¹ Scaling Up Household Water Treatment among Low Income Households; WHO; 2009

perception that piped water is unsafe for drinking, has even made western European and US consumers of bottled and treated water. In the Indian context, we are here only discussing the urban drinking water sector and that too for low income settlements. Unlike in Europe and US, assured 24x7 piped water supply in India is a distant reality, bacterial contamination exists even in piped water supply. Hence the need for and a market that is flooded with Filtration, UV and RO based household water treatment systems on the one hand and a growing informal and formal sector treated water supply business.

DA Project on HWTS in the informal settlements of Delhi

Objectives of the HWTS pilot project of DA;

- Scaling up promotion of safe, affordable and environmentally appropriate options for HWTS systems and improved hygiene practices within the broader Government strategy for water systems and supply and diarrhoea prevention.
- Increase visibility of appropriate HWTS options (especially low cost options like SODIS) for the urban and rural poor in India with a focus in the Delhi National Capital Region of India.

Key Lessons

The 26 locations in Delhi where a pilot project has been implemented by DA, offers useful insights to the problems of drinking water quality at point of use, including type of water supply and sanitation. Despite its national capital status, Delhi does not offer a significantly better drinking water source security for slum dwellers, as compared to other towns and cities of India. Urban poor are serviced by;

- Water tankers of DJB providing free water
- RO Plants by Private operators
- Individual household borewells
- Common borewells providing piped water supply to individual residents and to public standposts

Diversity in the prioritisation of HWTS options at household level. The location of the settlements, ground water availability, size of the settlement and economic status of the residents, reliability of DJB free tanker water supply, cost of alternative treated water supply – influence the choices people make. Where ground water table provides potable water and where the relative economic status of the people living in informal settlements is better, they manage to install piped water supply to each household (Rangpur pahari area, Vasant Kunj). Smaller settlements with good ground water but poorer economic status, manage to secure piped water supply at some common public standposts, with support of political patronage (BhawarSingh Camp, Vasant Vihar). New resettlement colonies have not been provided with piped water systems (Savda Ghevra and Madanpur Khaddar). It is reported that people buy water from local water mafia in some slums of Delhi.

Affordability vs. Behaviour change. Poor peoples reluctance to purchase treated drinking water is related with the recent increase in living costs including electricity charges¹. Affordability and behavioural factors have a bearing on options for water treatment. **In some instances availability** of chlorine (liquid and tablets) and other cheaper water treatment options, also influences the preference of households and specially the women members, in adopting a particular water treatment.

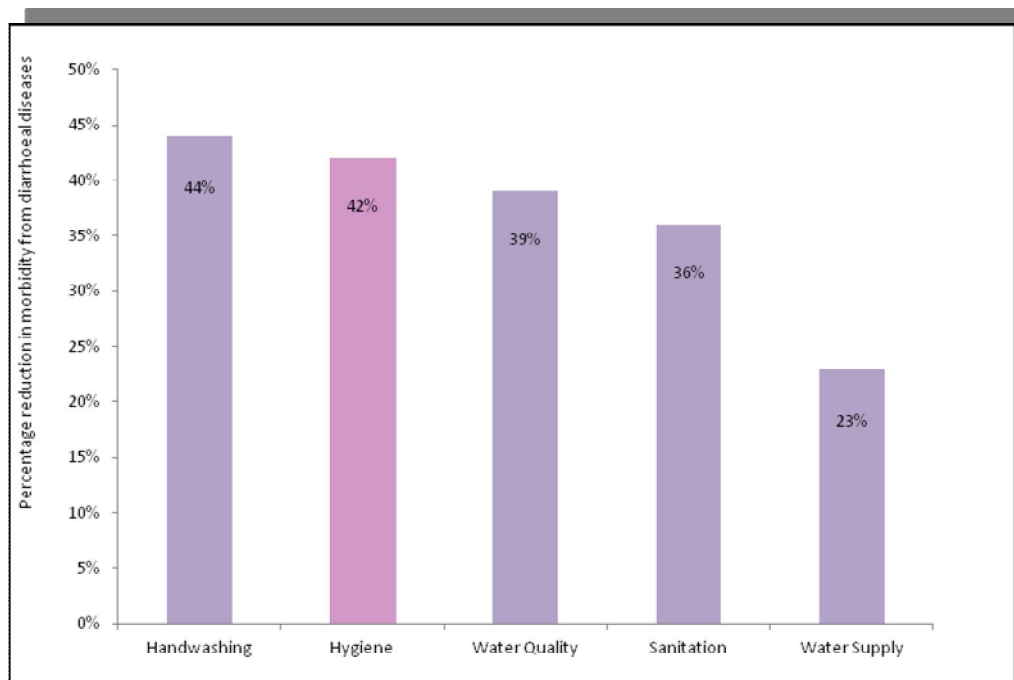
Water requirements and storage. Water requirements in informal settlements are for many purposes including water coolers in summer months, for bathing and washing requirements that are more than that of an average middle class urban family. It is therefore not uncommon to see many cans and buckets of water stored in front of each house. Cans are the preferred water carrying and storage options, safety of water storage at home remains a challenge. Use of refrigerators for drinking water storage is common. Use of earthen pots is not significant.

Sanitation and drainage conditions in informal settlements of Delhi are a major cause of concern. In the absence of clean usable public toilets and household sewerage connections, most households are either defecating in the open or building septic tanks as the base of their tiny plots of land. State of public toilets in Delhi is very bad. Many are lying defunct or are handed over to NGOs for O&M and charge high user fees. The defunct toilets are still used in times of need. They present a health and security hazard specially for girls, women and old and unfit people who cannot go far away to defecate in the open. Unsafe disposal of septage perhaps contributes to a major health hazard for these residents. Paving of streets with cement concrete has happened recently in many slums and has provided much relief from water logging and related

3. Water Quality-Health Linkage

Linkage water and sanitation to health outcomes has been a major determinant of policy and financial assistance to WASH sector.

The health status of an inhabitant of a poor urban settlement, cannot be statistically correlated to one specific WASH attribute. The health of the urban poor is related to the living conditions (sanitary) that includes clean air and water and free from disease spreading agents, safe hygienic food and personal hygiene. WASH research and advocacy initiatives often draw attention to hand washing hygiene as the most significant contributor to reducing incidence of diarrhoea. Drinking water quality is also an important factor. It is a combination of all the critical WASH factors and not one aspect alone, that needs to be addressed. A recent World Bank Study has shown that hygiene education and water quality improvements are more effective(42% and 39%) respectively at reducing diarrhoeal incidence than simply providing toilets/sanitation and drinking water supply.²



Water quality relates to the physical, chemical and biological characteristics of water. Waterborne diseases such as diarrhoeas, gastroenteritis and dysentery are caused by infection with pathogens (germs) including waterborne viruses, bacteria, protozoa, helminths (worms) which are invisible to the naked eye may lead to morbidity and mortalities if persons are not immediately provided with medical care.

Unsafe drinking-water, along with inadequate hygiene and sanitation contributes to an estimated 1.9 million annual deaths caused by diarrhoea, primarily in children under five (WHO, 2012) and approx 88% of all infections are WASH related. The Planning Commission of India (2002) has estimated that each year, between 0.4 million and 0.5 million Indian children, under age five, die of diarrhoeal disease while 1000 children die every day due to Acute Diarrhoeal Diseases. In Delhi alone, the incidence of acute diarrhoeal diseases over the last 7 years is shown in Figure 1 (source: Indian Stats: Health Information of India).

² L Fetrell and J Colford; Water, Sanitation and Hygiene : Interventions and Diarrhea; 2004

Water and Sanitation Status in Unplanned Settlements of Delhi as per Slum Department MCD, 2004³

Service Provision in Unplanned settlements	Piped water supply		Sewerage Facility	
	Number	Percentage	Number	Percentage
Regularised Unauthorised colonies	557	98.2	458	80.7
Resettlement colonies	44	100	44	100
JJ clusters	158	21.7	72	9.8

The data available and presented in the above table is very inadequate and inconsistent with today's Delhi and highlights the absence of credible data on informal settlements of Delhi and their water and sanitation status. There has been a massive relocation of slums in Delhi in the past decade. Many new resettlement colonies established in the last decade do not have piped water supply and/or sewerage facilities. Among the DA project areas itself, Madanpur Khaddar, Savda Ghevra are without piped water and sewerage connections. Rangpurpahari settlement has a private pipeline water distribution and no sewerage facilities.

A recent study conducted by Centre for Study of Developing Societies (CSDS) on Slums, State and Citizens of Delhi, noted the inadequate access to sanitation and drinking water in slums.

The study found that 70% of the slum households source their water from outside their homes (meaning they are not connected with piped water supply or in house ground water supply). Similarly for sanitation, it was observed that majority of the households go out and defecate in the open.

CSDS Lokniti Study Findings⁴

	Where do women go for using daily toilet facility (Women respondents only)	Where do men go for using daily toilet facility (Men respondents only)
Toilet inside the house	27	25
Toilet outside the house	21	19
Open space outside the house	15	16
Public toilets	35	37

Lack of sanitation/toilets and sewerage leads to open defecation and high private investments to build septic tanks as base tanks on 12 square meter housing plots.

Open defecation, poor disposal of solid waste and overflowing septic tanks in streets without adequate drainage poses the greatest health risk in the informal settlements of Delhi.

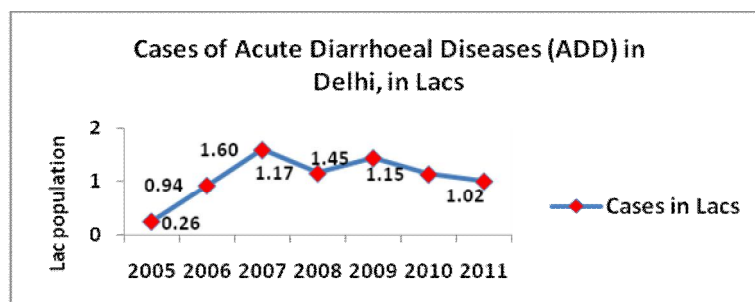
Addressing microbiological (bacteriological) contamination of water is thus of paramount importance. The water-health linkage is also highlighted in the report of the Working Group on Urban and Industrial Water Supply and Sanitation for the XII five year plan (2012-2017) that noted "*The public health implications of unclean water are enormous and unacceptable. The*

³ City Development Plan, Delhi;

⁴ CSDS website : <http://www.lokniti.org/baseline-study-attitude.html>

country is on a deadly spiral – on the one hand, water scarcity is growing and on the other, water is getting increasingly polluted, which is further increasing the cost of treatment or leading to increasing deaths and illnesses. It is shocking to note that diarrhoea and other water borne diseases are one of the most common causes of death among children under age five.”

Figure 1: Incidence of Acute Diarrhoeal Diseases in Delhi



A study by the Ministry of Urban Development, Government of India (2009) finds that 23 million children below the age of 14 in urban India are at risk from poor sanitation. The same study finds that 8 million children in urban areas are at risk from poor water supply. Infant mortality at 42 deaths per 1000 live births, though lower than in rural areas, continues to be unacceptably high.⁵

4. Status of drinking water access for urban poor in Delhi

Most urban areas of India source water from nearby and far away rivers. Ground water provides a limited source that is increasingly mined and polluted. Large parts of our cities are inhabited by slum settlements and unauthorised colonies with their population more than that of formal planned colonies. Owing to their “illegal” status, they are denied piped water and sewerage connectivity. Re-settlement colonies like Savda Ghevra in west Delhi and Madanpur Khaddar in East Delhi, even though these colonies were developed by the Delhi government, the residents are not provided with piped water supply and sewerage by the DJB. Public toilets and tanker water supply is provided instead. In this situation, people have invested in handpumps and borewells to secure water for bathing and washing needs. In some settlements where there is good ground water, individual shallow borewells are visible in front of each house. This water is not fit for drinking and people are aware of this. Dependence on free tanker water from the DJB is high. Those who can afford, purchase water from private contractors (including treated water options from private operators). Affordability constraint is also evident in open defecation by men and children, in settlements with functional public toilets.

Dependence on political patronage for temporary measures of borewells and community stand posts for water supply in some areas (Bhawarsingh Camp in Vasant Vihar) is noticed. Water mafias controlling water supply in some slums and unauthorised colonies charging very high rates, diversion of DJB tankers by the powerful and refilling of tankers with poor quality of water are also recorded in some parts of Delhi.

Given the dependence on tanker water supply and public standpost that deliver intermittent supply and the unsafe manner in which this is harvested and carried, the long distances covered to carry the water back to the homes, the buckets and cans used and their cleanliness, and the fights that break out while collecting water – all pose serious risk of contamination of water.

Drinking water is usually stored in buckets inside their houses and in refrigerators of people who can afford it. Preference for earthen pot storage is dwindling. Preference for cold water in summer months leads to people not wanting to boil water. The rising cost of LPG gas also prevents people from boiling water.

⁵ High Powered Committee Report on Urban Infrastructure, 2011. <http://www.niua.org/projects/hpec/finalreport-hpec.pdf>

Demand for water rises in summer months as more water is needed for washing and bathing and for water coolers that are a necessity in the hot small cramped housing spaces. Most people store water in large buckets and cans that are parked in front of their houses. This water is for general purpose use and perhaps also for drinking. Water stored like this is also a potential health hazard for breeding of Dengue, Malaria, Chickengunia and other vector borne diseases. These have seen a marked increase in Delhi in the recent years.

Convenience factor of making the extra effort to secure safe drinking water through some household level water treatment options(SODIS, Chlorination and Filtration) – **is very often cited as a barrier to adoption of HWTS options.**

Affordability is an important determinant of the options that people exercise for securing safe drinking water. The options range from preference for DJB supplied free water to HWTS through filtration and purchase of RO treated water.

5. Existing Programme and Policy Frameworks for provision of safe drinking water

During the very first Five Year plan (1951-1956) itself, the national water supply programme was launched in 1954. Progressively larger allocations were made for water supply in the succeeding five year plans. The importance of providing safe water supply as a basic minimum need was reiterated in the Fifth Five Year plan (1975-79). In 1993-94, central government launched Accelerated Urban Water Supply Programme (AUWSP) scheme in partnership with state governments to provide safe and adequate water supply facilities to the entire population of selected 1244 towns, out of a total of 2151 towns, having population less than 20,000 as per 1991 Census. The funds couldn't be utilised fully and the objective remained unfulfilled (MoUD, CPHEEO website, 2012).

In April 2005, the group of ministers asked the Department of Drinking Water Supply and Sanitation (DDWSS) to initiate the drafting of a model law providing for enforceable drinking water quality in the country. The model legislation was duly prepared in September 2007 and circulated to central, state and international agencies. However, it is yet to be finalised.

MoUD, through its technical wing CPHEEO, suggests indicators benchmarks for quality and quantity of water supply including 100% piped supply, 24X7 supply, 135 litres per capita day and quality of water supplied is 100% to allocate performance based grants to ULBs (MoUD website, 2012). The central JNNURM scheme, started in 2005, promotes reforms at state and city levels by making the funding for its projects conditional to bring a shift in focus from infrastructure creation to delivery of service outcomes. Several other initiatives followed to incentivise cities to upgrade their water and sanitation infrastructure: the City Development Plans, the City and State Sanitation Plans, Service Level Benchmarking for Urban Bodies.

Despite massive investments in expanding urban water supply and sewerage, slums and unauthorised colonies are still denied piped water and sewerage connectivity. Large metro cities like Bangalore have run out of water from Cauvery river. Cities and towns in the semi arid and arid regions of India suffer from chronic water shortages. 24x7 water supply projects being implemented in some cities are facing the challenge of securing enough water from limited sources. Lack of water availability and not lack of finance, is emerging as a major problem in ensuring drinking water security in urban India.

The exhaustive drinking water quality standards that exist in the country are merely recommendatory in nature, except for the bottled drinking water industry, and not mandated or implemented through a statutory framework (Report on UIWSS, 2011). The water supplied in urban areas should meet the BIS 10500: 2012 drinking water specifications. However, the water supplied doesn't meet acceptable

limits (refer MoUD manual, 1999) of drinking water quality standards and urban population has to content with the permissible limits of water quality in absence of an alternate source. In the slums the per capita supply is around 40 LPCD as per CPHEEO norms.

6. Household Water Treatment and Safe Storage (HWTS) Options

HWTS systems were developed to provide a first or extra barrier of protection to ensure safe drinking water quality. They have gained increasing recognition and are implemented in the developing world as a means of safe drinking water at the point-of-use. The idea is simple – to treat water at the point of use, preferably using effective but low-cost treatment technologies that could be developed using locally available raw materials.

The market for HWTS products is very competitive. There is aggressive marketing and promotional work done by the private sector and a large number of economically better off residents of Delhi and many other Indian cities have been effectively reached through this advertising. It is not uncommon to see middle class families installing expensive RO based water treatment systems on DJB supplied water in Delhi. The uptake of Filtration and RO systems remains low in the poorest urban settlements, among people who perhaps need safe drinking water the most. Increasing cost of LPG and electricity makes boiling as a treatment option expensive.

There is intense competition among the private sector, between manufacturer and sellers of Filtration Systems and RO and UV Systems. Filtration Systems are promoted as not requiring electricity and have a much lower capital investment and operational cost as compared to the RO and UV systems.

Aggressive advertising and promotion of household based water treatment solutions – RO, UV and Filtration Systems contributes to crowding out of low cost HWTS solutions including Flocculants, SODIS, Chlorination and Boiling. In some instances Hard Water makes Filtration an unsuitable option to RO treatment. Yet we found in some settlements of Delhi where TDS levels and Hard Water was not high, yet Filtration Systems were not being adopted by low income families as HWTS in the DA project areas in Delhi.

Better off households preference for RO treated water supplied from a private vendor and not adoption of household water treatment systems could be correlated to;

- Status of available ground water - polluted with chemical contaminants, high Iron content⁶ - that cannot be treated by Filtration
- Hardness in ground water(high TDS content), that cannot be remedied with Filtration⁷
- Cheaper availability of RO treated water (perhaps costs lower than Filtration based HWTS at home⁸, requires no investments and recurring costs, and does not inconvenience the consumer).

Table 1: HWTS Options, Costs and Barriers to Adoption

HWTS	Initial cost(IC) and running cost(RC) in Rs	Requirement for its effective use	Key barriers to its use for urban poor
1. Boiling	Electric heater, LPG Initial cost varies from Rs.200 to Rs,1000 Recurring cost: Electric heater: Rs 200 LPG: Rs 60	2 minute of boiling	Water doesn't taste good, inconvenience involved in boiling, cooling and storage, cost of boiling water is high
2. SODIS (Solar disinfection)	IC – Rs 60 RC- Rs 60/ four months	6 hours of constant and continuous	Inconvenience involved in space constraint, not effective in rainy and

⁶ Iron content is visible in Madanpur Khaddar resettlement colony ground water.

⁷ TDS is high in Savda Ghevra. In Rangpuri pahari settlement no water testing is being done on ground water

⁸ Cost of Pureit Filter treatment of Unilever is cited as Rs.0.33/Litre that is higher than the Rs.0.25/liter for RO water in the resettlement colony of Madanpur Khaddar.

	(One 1.5 litre pet bottle costs Rs 2 and it lasts on an average 4 months)	exposure to solar radiation	winter season
3. Chlorine Tablet	RC – Rs 150 (Rs 1.30 for disinfecting 10 litre water by 2ppm)	Usage of right dose and observing shelf life properly	Change in taste, use of right dosages, have to wait for the effect to take place before consuming, regular availability and awareness on dosage
4. Liquid Chlorine	RC- Rs 20 (Rs 20 for 50 ml solution for 40 litres of water)	Usage of right dose and observing shelf life of 45 days properly	Change in taste, use of right dosages, have to wait for the effect to take place before consuming, regular availability and awareness on dosage
5. Bio sand Filters	Not available		
6. Flocculent treatment	Not available	Usage of right dose and observing shelf life properly	Lack of availability, fear of application of a treatment that is not popular and concerns on residual matter
7. Ceramic Candle	IC – Rs 750	Periodic cleaning to remove scum left on the candle	Removes turbidity and large impurities only
8. Filter combinations - Micro filter + Resin filter + Organic filter	IC – Rs 4000 RC – filter change every six month + Rs 800 Annual Maintenance Cost	Changing of filter every six months	High up-front cost
9. Pureit Filters	IC – Rs 2200 RC – Rs 400 candle replacement costs every three months	Changing candle every 6-12 months	High up-front cost
10. UV- Filters	IC – Rs 6000-7500 RC – Rs 800 Annual Maintenance Cost	Annual maintenance or changing filter	Very high up-front cost
11. Reverse Osmosis	IC – Rs 7000-15,000 RC – Rs 800-2000 Annual Maintenance Cost	Annual maintenance or changing filter	Very high up-front cost, Water wastage during cleaning process and issues of safe disposal of cleaning agents, removes essential minerals and WHO does not recommend that unless water has chemical toxins such as Arsenic and Fluoride

Source: DA's field experience and market survey

Assumption: a family of five members consumes 40 litres water per day for drinking and cooking purpose.

HWTS can work and people will adopt SODIS and Chlorination. This requires awareness generation about low cost solutions and understanding that low cost treatments are as effective as high cost HWTS solutions, consistent follow up on behaviour change, explaining how SODIS bottles should be used and placed, dosage of chlorination and safe water storage at home, and provision of regular supply of low cost items like Chlorine.

Packaging and branding of treated water in attractive plastic cans, door to door delivery are other contributing factors that push acceptability of RO water. An issue of behaviour change translates into an act of consumer behaviour. Advertising and marketing succeeds in conveying to the people that when they buy the RO water they are improving their behaviours and commitment to safety of their children and families. This is akin to selling so many consumer products targeted at parents with children as target audience. In securing private education at nursery and primary school levels,

parents assume that by sending their children to private schools they will receive better education and as parents they are acting responsibly.

For SODIS and Boiling as HWTS options, there is no marketing based product purchase consumer behaviour associated. Even Chlorination and Flocculent based low cost HWTS options cannot compete with the high promotion and advertising budgets that RO, UV and Filtration Systems businesses invest in marketing and building consumer demand.

Promotion of low cost HWTS options will require alternative source of funding. Low cost HWTS solutions often indirectly compete with the more visible, socially aspirational high cost HWTS options. Including local informal and formal sector treated water supply businesses (often RO treatment). Promoting low cost HWTS options requires much more investment of effort through regular face to face awareness raising and motivation.

It is also reported that consuming RO water over time leads to people developing a taste in favour of RO water and increases demand for RO water. Although scientific evidence shows that RO water devoid of all mineral content may actually be harmful for human health.

NGOs are being roped in to promote Filtration based HWTS. Unilever has been promoting this for a long time. "For five years, Jain and his team worked on a solution that would be cost-effective and would work as well as a \$200 dollar product. By the time the first Pureit water systems entered the Indian market in 2005, the Unilever crew was able to price them at ₹18 (\$24). Furthermore, these systems are well-designed, sleek and appeal to consumers of all income levels. For lower-income consumers, the system is an easy sell: the cost of using a Pureit product ends up less than 1/3 of a rupee (less than one U.S. cent) per liter, far cheaper than boiling."⁹

7. Barriers and Motivation to Adoption of HWTS

Middle and high income residents of slum settlements have better affordability and are willing to purchase treated water that they store in their refrigerators. Most of low income households in the slums authorised and unauthorised settlement of Delhi use the water supplied in homes or accessed from tankers and other sources for drinking and cooking purpose without using any HWTS technology.

In the DA project in 26 settlements of Delhi provides important lessons to the prevailing HWTS options and preferences in urban settlement. The project has worked towards increasing awareness of water quality problems and advocating low cost solutions. Most people are aware of the water quality issues yet in terms of practice, adopting measures of water treatment and willingness to pay the following is witnessed;

- Few people undertake chlorination of water as a treatment option.
- SODIS treatment works well in poorest jhugi jhompri colonies where it is easy to place and retrieve plastic bottles from the roofs.
- Filter based treatment systems are not very popular and are being purchased by those who are willing to pay for purchase and replacement of filters.
- Availability of RO and UV treated water (not verifiable if it actually is treated and is safe) and the aggressive advertising that this is the safest treated drinking water sources, has created a demand for RO treated water. Where RO treated water is available at cheaper rates owing to competitive pricing and bottling within the slums, it is competing with household water treatment filter systems.
- Boling of water is not a preferred water treatment option in most slums of Delhi, it is practiced only in winters and when there is a scare of an outbreak of a water problem.

This does not imply that people do not appreciate the need for safe drinking water or are not aware of the need for consuming safe water.

⁹ Safe Drinking Water in India; How Smart Design Positioned Unilever as Leader in India, 21st Feb 2013
<http://greengopost.com/safe-drinking-water-india-smart-design-positioned-unilever-leader/>

Barriers to adoption of HWTS technology in poor urban settlements;

From field observations, it is evident that the problem of low adoption of HWTS options is not a result of low awareness of the issues of water contamination at point of use or low awareness levels of the importance and benefits of treating water. It is not a question of illiteracy among people, as is normally assumed. There is an evident lack of effort and priority among people to undertake one or more options consistently, to make their drinking water safe all through the year.

The following perhaps explain this situation in informal settlements of Delhi;

- Awareness of drinking water pollution and preference for securing safe treated water is high in those slum areas where ground water is visibly polluted, smelling, contains high TDS or Iron content. These are easy to identify by the inhabitants and they make the effort to secure safe water from elsewhere.
- Availability of alternate piped water supply and treated RO water supply by private operators has a high correlation to affordability and income levels. Even where income levels are relatively higher, there is a lack of demand for household water treatment options and a readiness to buy RO treated water (if that is easily available) The existing business operation of private RO plants and delivery of RO treated in many slum areas shows that people who can afford to buy RO water, see this as a convenient option instead of water treatment systems including Filtration, Chlorination, Flocculent and SODIS treatment.
- Those who cannot afford to buy treated water and those with access to free tanker water supply by the DJB, exercise this option and end up storing large quantities of water for drinking water purposes inside and outside their houses. The DJB tanker water comes at irregular timing and requires one family member who stays at home, to collect water. It becomes the responsibility of women of the households to secure water from tankers.
- SODIS and Chlorination are seen as time consuming treatment options and are not sustained. Convenience of operation, time spent in treating the water, is often cited as a major barrier to simple water treatment options like SODIS. Many people who have adopted SODIS also reported an improvement in water quality and health outcomes (citing reduced joint pains as an example).
- Availability of cheap RO treated water supply by private entrepreneurs in some slums (as low as Rs.5/20KL water cans¹⁰) and exposure to middle and upper class colonies treating water – are powerful drivers for transforming a behaviour change option into an affordability issue. Status and aspiration for a better quality of life, leading to a situation of both purchase of RO water as well as water treatment systems¹¹
- Less preference for chlorination, on account of change in taste and irregular availability of chlorine tablets and solution.
- A perception that heated SODIS water will damage the refrigerator
- Easy access to roofs for placing and retrieving SODIS water treated bottles facilitates adoption of this practice. Not everyone has ease of access.
- Health consciousness and beliefs that SODIS and other water treatment reduces joint pains and illness
- Support of local medical practitioners and involvement of ASHA workers of the settlements. This is required to promote low cost HWTS options and greatly contributes to adoption.

Factors inhibiting adoption of HWTS at SCLAE are;

- Low cost Filters, Chlorine and Flocculants not available locally and on a regular basis
- Perceived poor taste of water, temperature and additional effort required
- SODIS and Chlorination require regular follow up and face to face communication and persuasion to encourage people to use these HWTS methods.
- Low cost HWTS and safe storage is not promoted as an aspirational social and individual behaviour change ideal in a creative way
- Water stored in homes is never tested for quality/contamination.

¹⁰ Found in Madanpur Khaddar resettlement colony East Delhi

¹¹ Observed in the slum settlement (Bhawar Singh Camp), in the heart the high income Vasant Vihar colony



- Absence of any programme or campaign that promotes HWTS and safe storage. Where this is promoted by ASHA workers who also supply chlorine tablets, it leads to positive behaviour change.

Behaviour change communication (BCC) discourse in WASH sector is heavily influenced by practical programmatic considerations. Behaviour change challenges are reduced to simplistic understanding of the problem and reduced to knowledge and awareness generation interventions. In sanitation, CLTS programmatic approach tends to overshadow any serious attempt to understand why different sections of the rural and urban communities behave and practice open defecation. A programmatic approach of triggering (including name and shame and negative peer pressure) is used as a BCC input. A BCC research in rural Bihar found that rural poor do not practice hand washing with soap because of their self worth perception that only the upper caste and well off people can be seen to be neat and clean.¹²

People's real life context, their perceptions of low self worth and belief among urban poor that nothing will happen to them if they consume untreated water¹³ are often ignored. Awareness generation for the need of HWTS must consider specific problems and constraints as well as deep seated self perceptions.

Lack of demand for low cost HWTS and Practice is a behavioural issue resulting from low social and individual priority for HWTS promotion, lack of incentives and promotion. Coupled with aggressive promotion of high cost HWTS as aspirational symbols that make low cost solutions look unsafe and inferior.

8. Behaviour Change Priorities for HWTS

Awareness of need for safe drinking water and the correlation of contaminated drinking water and diarrhea is there among most residents. Behaviour change and practice does not match this awareness level. However, **knowledge and awareness** of the most appropriate and effective HWTS options is limited. **Convenience and affordability** determine the choice of HWTS option by a household.

Drinking water from DJB tanker supply is considered safe. Risk of contamination of water on the way (transit from tankers to home) and in the containers used, is not recognised as a problem.

Boiling of water, one of the oldest HWTS behavioural practice, is not a regular feature. People mention boiling in times of emergency disease outbreaks only. The increasing cost of LNG/LPG cooking gas, free DJB water availability for some and affordable RO water for others, is restricting Boiling Water as a HWTS option in most settlements. The quality of RO water supplied, its conveyance, safe storage and hygienic usage is an issue.

Plastic cans, buckets and bottles placed in refrigerator, are replacing traditional water storage methods of earthen pots, ladles and covers.

Sanitation and drainage remain major health risks. Many residents are making large investments in toilets that do not deliver hygienic sanitation. Absence of well maintained and clean public toilets, lack of open spaces for defecation, as well as convenience and security issues for women and children – are driving many residents who can afford the money, to build individual toilets.

Perceived convenience and security issues override cost and affordability factors when it comes to household toilets with expensive septage tanks. Insecurity is not a factor hindering adoption of HWTS for safe drinking water. HWTS requires constant extension work by local NGOs and Health workers and is not sustained.

¹² Formative Research on BCC in Sanitation and Hygiene; 2011 <http://www.irc.nl/page/68626>

¹³ Response given by people – “if we have loved so long without the need to consume treated water, so will our children”



Boiling and SODIS are pure behaviour change interventions in HWTS. These do not require investments at the household level and any product marketing by businesses. Hence promoting simple HWTS is not done through commercial marketing. RO and UV treatment, Chlorination, Filtration and Flocculent treatment requires awareness generation and promoting the product and its right usage, operation and maintenance and support services. Among the various water treatment products, some get more commercial advertising coverage than others, depending on the advertising and promotion budgets of different businesses. **There is therefore a need on part of public agencies to raise awareness and knowledge about different water treatment options among the urban poor to enable them to make the right choice and is not biased for its attractive marketing and packaging.**

Challenges to up-scaling of HWTS technologies (from WHO Report on Scaling up HWTS among low income households);

- **Belief that diarrhoea is not a disease:** community report diarrhoea to be a natural and even desirable condition, especially in young children, not worthy of special preventive measures.
- **Scepticism about the effectiveness of water quality interventions:** perception among governments, donors and experts in water and sanitation that to achieve broad health impact, greater attention should be given to safe excreta disposal and proper use of water for personal and domestic hygiene rather than to drinking-water quality.
- **Special challenges associated with uptake:** scaling up HWTS requires not only reaching the target population with effective water treatment solutions, but also securing their uptake. Behaviour change present special challenges such as aspirational appeal, high up-front cost, increase in daily burden, competing priorities and an uncertain risk of the consequences of non-compliance, and health benefits may not be convincing.
- **Public health suspicion of commercial agenda and lack of standards governing HWTS products:** due to lack of widely recognized standards or certification procedures with respect to HWTS products
- **Orphan status of HWTS at public sector level:** Government agencies give priority to increasing the quantity and access to water over improving its quality.
- **Minimal public sector participation:** most of the coverage of HWTS has been generated by NGOs and the private sector and public sector role limited to help set standards.
- **Lack of focused international effort and commitment:** While water generally attracts significant attention, much of the focus lies outside of waterborne diseases, attaching instead to water resource management, water scarcity, environmental contamination, water rights, fishing and agricultural uses of water.
- **Perceived policy conflict with efforts to promote piped-in water supplies:** This arises from the fact that point-of-use water treatment addresses only water quality, offering potential health gains but few other benefits that are associated with piped-in water supplies.

Considering water shortages, access and availability of drinking water always precedes the water quality concerns – both by authorities and the urban poor. Government agencies tasked with drinking water supply are defensive about admitting water contamination in the tanker water supply and the people are defensive about admitting contamination during conveyance from the tankers to their homes. Other government agencies in charge of urban poverty, health and development works, may be better positioned to raise awareness of and promote HWTS and safe water storage.

9. Recommendations

Recommendations for programme and policy actions have been developed through a consultative process of engagement of experts and agencies and through a National Consultation on the 10th July 2013 that whetted the recommendations and suggested improvements. List of Experts who contributed to the Policy Paper is enclosed as an annexure.

Barriers to HWTS and safe water usage in urban areas are perhaps different in different social, cultural, economic and geographic settings, for a country of the size of India.

The following conclusions were drawn by the recent 3ie study¹⁴ on household water treatment systems, when the reviewed the issue of scaling up from the perspective of willingness to pay;

- Many people are not willing to pay for safe drinking water. Even paying a small fee puts people off using water treatment technologies.
- Understanding why people are not keen to pay and how much they might pay if they had the right information could help overcome these barriers.
- Subsidising the costs of water treatment technologies can improve their uptake, but large subsidies are required.
- Cheaper and innovative technologies and distribution models may encourage people to change their behaviour and start using water treatment technologies which would improve their health.

The leading role of incentives and subsidies from the government is therefore recognised in this research.

Quality of water and not quantity of water for drinking water needs of the urban poor is a priority. Provision of safe drinking water from public water supply looks unlikely in the short term for majority of residents of urban slum settlements in India. Promoting safe water treatment options at household level must become the responsibility of state agencies, alongwith with NGOs and private sector. There is an urgent need to accord Policy and Programme priority to promoting water treatment at household level and also promoting safe handling of water at home, at schools and in the urban poor settlements.

9.1 Programming Recommendations

All existing programmes of health and water safety should promote household water treatment and safe water handling. It is not enough to simply create awareness of the need for water treatment since we found that awareness of need is already there.

People's perceptions of low self worth (arising out of their poverty and social status in slums) generates resistance to pay for treated water or to even make an effort to promote low cost and costless HWTS. It propels them to believe that nothing will happen to them if they consume untreated water.

Awareness generation for the need of HWTS must consider specific problems and constraints related to ground water and other sources of water supply, as well as deep seated self perceptions and psychological barriers.

Water quality issues vary from one slum to another, within a city and across cities. **Peoples priorities determines their behaviours and influences success of any behaviour change intervention.** Different economic status of slum inhabitants, influences different options for household water treatment option uptake. What is missing is an understanding of the specific type of water quality issues in each slum area, what options they can exercise that are required to treat the water quality

¹⁴ Safe Drinking Water, Who is Willing to pay the Price; 3ie Study 2012

<http://www.3ieimpact.org/en/evidence/policy-briefs/evidence-matters/details/safe-drinking-water-who-is-willing-to-pay-the-price/>

problems and actions to promote adoption and practice of low cost methods. Understanding why people prefer to continue with their behaviours is therefore important, instead of pushing an improved behaviour change intervention without first trying to understand what makes them do what they do.

With an increasing penetration of private informal sector treated water supply, there is also a need to increase awareness and to **address the issues of minimum standards and disposal of waste water and chemicals from such water treatment plants**. This should not indirectly benefit the formal treated water business that come in with high capital investments.

Priority programming actions recommended are;

- **Prioritise awareness** of the need for Treatment of Water and safe Storage, as a Campaign on regular basis. Based on the local water quality problems that are demonstrated from practical water testing methods and are understood by people. This awareness should be an all the year round initiative, perhaps as a strengthened national and local level diarrhoea control initiative.
- **Promote simple HWTS solutions** of Boiling water, Chlorination and SODIS. Boiling water is among the most microbiologically effective HWTS methods and it is the only approach that has achieved scale. Potential for boiling water should not be ignored in favour of more commercial approaches to HWTS. Since boiling and SODIS as behaviour change interventions do not require any product marketing, it is often neglected in large scale advertising promoting various commercial products(that also advertise their product to be superior and cost effective as compared to boiling water).
- **Promote community level Water Treatment solutions**. Where possible and where public infrastructure including community parks and toilets exist, efforts should be made to promote community level water treatment systems. Promoting solar heated/boiled water supply and chlorination can done from such facilities.
- **Create awareness/literacy of the types of water pollution** (bacteriological and chemical) and the awareness for an appropriate HWTS response. Backed by regular water quality checks at point of use of households. Give choice to the citizens to adopt a water treatment solution based on sufficient information of the problem. **Develop collaborative approach with Private sector-NGOs-Government** for longer term HWTS awareness and promotional work.
- **BCC Strategy for HWTS should prioritise the following;**
 - **Invest in face to face communication and awareness generation** work through community workers. It was observed that SODIS adoption is higher when done through a longer term community engagement.
 - **Undertake campaigns, engage cultural and educational troupes**. Campaigns like the Polio – do boond campaign – can be done to creatively urge people to undertake water treatment, safe storage and usage.
 - **Demand creation for HWTS should be prioritised**. Using all means including free distribution of water treatment products, credit and subsidies.
- **Awareness generation and motivation for local leaders and youth** – all informal settlements have their informal leaders and religious heads who can be motivated to promote HWTS
- **Support initiatives of for profit and non profit agencies to market HWTS** with innovative packages and service provision for operations and maintenance
- **Promote institutional (schools) water treatment measures** and promotion activities.
- **Learn from and influence informal sector RO systems based HWTS to adhere to reducing wastage of water and safe disposal of chemicals and sludge**. Recommend from practice, standards of operation for informal RO Plants that are operational in the informal sector, with guidance on the water saving membrane technology, electricity saving and disposal of waste water.
- **Engage champions within the government sector, to promote HWTS**. Raise the profile. There are many brand ambassadors for Sanitation products and behaviour change today in India but hardly any for promoting HWTS and Hygiene. Celebrate World Water Day and other events – to highlight importance of HWTS.

9.2 Policy Recommendations

Addressing microbiological contamination of drinking water should be a national priority. Water quality problems are aggravating for urban poor settlements with fast depleting and polluting ground water sources, unavailability of piped water supply and sewerage, issues of affordability and convenience.



Political will is needed to highlight this issue and to sensitise the bureaucracy and the people to take urgent steps to address water quality problems at household level.

Treatment and safe storage of household drinking water is a priority and investments made in promoting HWTS and Storage as a Behaviour Change intervention needs to be seen as a Public Good.

1. **Reaffirm the commitment of the government for provision of safe drinking water and sanitation for all. Promote Household Water Treatment, safe handling and storage as an interim solution by all civic agencies and government departments** that is urgently needed, but is not a substitute for safe piped drinking water for all. **Declare HWTS as a public good and a health priority.**
2. **What should the government promote in terms of HWTS options.** The challenge for NGOs and governments will be what to HWTS options should they be promote. If safe water is recognized as a Right of all citizens and given the low quality and quantitative reach of piped water supply to informal settlements, HWTS could be seen as a public good(promoting public health), requiring the government to play a leading role in promoting water treatment and safe water storage. Then the principles of using public funding will dictate that the options promoted should be such that the government can promote them for all the people and not just a few. Promoting low cost HWTS options (Flocculent, SODIS, Chlorination and Boiling) and awareness for Behavior Change in place of product promotion, may be the best strategy for national and state governments. In addition to household based water treatment systems, public funding can also be used for promoting low cost community (slums and unauthorized colonies) based water treatment systems where the water utility is not providing piped treated water to residents.
3. **Set up a HWTS Mission as a high priority National Initiative** within a Govt of India Ministry(preferably under the MoUD/MoHUPA or Health Ministry) for a 10 year time period. Designate a central Ministry as the Nodal Agency for **promoting HWTS and Community level water treatment systems.**
 - The primary roles of the HWTS Mission could be **Recommendatory, Promotional and Coordination.**
 - The Mission could work as an **Inter Ministerial Convergence Mission at the Central level.** Having representatives from different Ministries, the Mission acts as a clearing house for prioritising HWTS across all Ministries and support ground level initiatives to promote and monitor work on HWTS.
 - The Mission develops **frameworks for promoting and certification of best technical solutions** for drinking water treatment at the household level and at decentralised community level initiatives
 - **Convergence with other ministries and government departments** such as Ministry of Women & Child Development and NIPCED (National Institute for Public Cooperation and Child Development for awareness generation through its programmes, schemes and promotional campaigns, and with Ministry of Human Resource Development to include HWTS in school curriculum and in adult education and Ministry of Health.
 - **HWTS Mission supports the state agency/unit.** A 50:50 GoI-State govt financing with contribution from donors and private sector.

The **HWTS Mission** will need to do the following;

- a. **Dedicated Budget Line and Staff** in the HWTS Mission in the Nodal Ministry
- b. **Secure technical expertise by engaging with NGOs, Universities and Private Sector**
- c. **Support State/City level HWTS cells and initiatives**
- d. **Develop BCC Strategy and Materials** to promote awareness and HWTS. Focus of the BCC Strategy and Action Plan should be on awareness generation through direct face to face communication and public contact, water testing and demonstrations and dissemination of low cost solutions. Develop appropriate BCC material and approaches with inputs from the cities/states and with help of WASH experts and community leaders.
- e. **Issues Guidelines on Usage of HWTS.** Given the plethora of options available, the Mission identifies the best options for local areas and promotes these HWTS options.

- f. **Monitors usage and studies uptake of different HWTS options.** This is important to build knowledge base and seek peoples inputs to what works.
 - g. **Engage NGOs and University students in BCC implementation, research and monitoring, for HWTS.**
 - h. **Recommend norms and standards for HWTS products** and Nano Technologies(filters, membranes, flocculants, etc.) health impact assessments,
 - i. **Securing collaboration** from different stakeholders (different government departments, NGOs, experts and private sector) in joint planning and monitoring of HWTS initiative.
 - j. **Integrate promotion of HWTS in MoUHPA, CPHEEO, MoUD and MoH interventions** and regular monitoring and follow up.
 - k. **Recommend and secure resources and budgets from other government of India Ministries for the HWTS initiative.** Including Health and Education Sectors and the National Rural Drinking Water Programme IEC budget and field staff (Block Resource Centres and District and State level Water Missions), to promote HWTS.
4. **Set up State level Nodal Agency/Unit.** Under a state government agency that can implement BCC interventions, water quality testing and monitoring and HWTS promotional activities.
- a. **Adequately staffed at the state and city levels** for BCC promotion.
 - b. **Engages with one or more nodal departments at City and State level** that can promote HWTS across all urban areas in a state.
 - c. **As part of the national HWTS Mission, develops and implements BCC initiatives for HWTS and Safe water storage.**
 - d. **Awareness generation of the problem and different low cost solutions.**
 - e. **Undertakes random water quality testing at point of source and point of use on a regular basis,** as part of a campaign and awareness generation.
 - f. **Undertakes simple participatory monitoring and learning** to measure results and impacts, lessons and learning from the campaign.
 - g. **Engages NGOs, Experts and students from Universities and Schools.** Supports them in conduction awareness work and monitoring.
 - h. **Pursues non commercial strategies** including mass distribution of water HWTS products free of cost or at highly subsidised prices among the poorest communities.
 - i. **Feeds into the national HWTS Mission planning and learning**
5. **Norms for water safety**
- a. Till such times acceptable limits of water quality standards (IS 10500:2012) become a norm, **MoUD (CPHEEO) should issue guidelines to water supplying entities** (for ULBs, Private and public Utilities and state agencies) to promote HWTS through awareness campaigns, IEC materials and trainings programmes.
6. **Recognise local leadership at the settlements level. Initiate rewards and recognition.**

Mission Convergence department of Delhi Government can become **the Nodal HWTS Mission agency at state level.** It is already working on health, education and empowerment issues in all informal settlements of Delhi. Promoting sanitation and HWTS can be easily integrated.

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