

# Safe water for all

## Household water treatment

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WOT Juli 2017



# Situation worldwide

**3-4 Billion unsafe water**

- Unimproved sources
- “Safe ” sources unsafe
- Recontamination Transport, storage at the house
- Old piped systems



# Example Ethiopia

Recent data WHO

- 31% of boreholes unsafe
- 57% of improved dug wells unsafe
- 80% of water in jerrycans recontaminated

# Major causes of child mortality GEMS study 2013

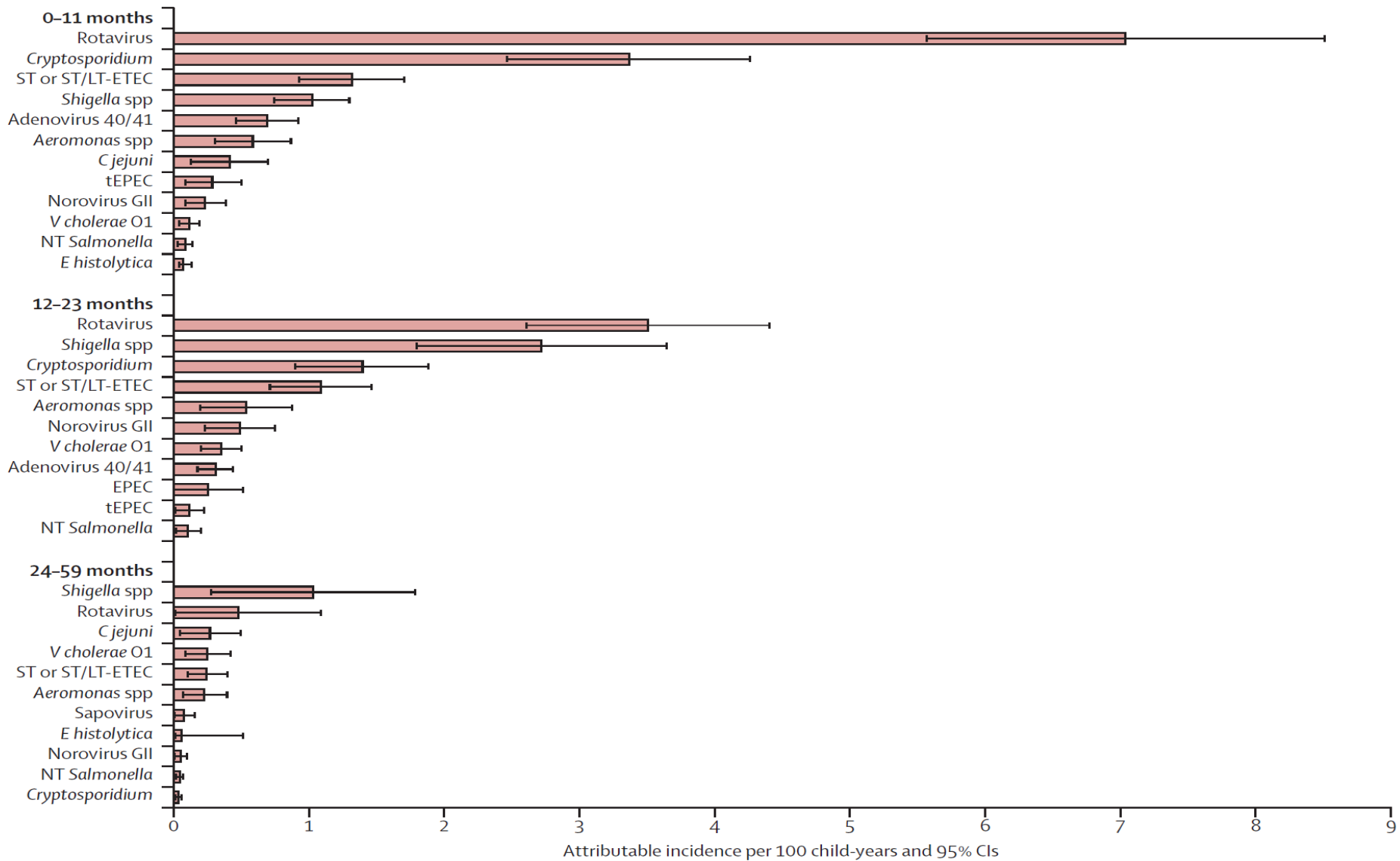


Figure 4: Attributable incidence of pathogen-specific moderate-to-severe diarrhoea per 100 child-years by age stratum, all sites combined

# Causes child mortality

- 1<sup>e</sup> Cause = Rota virus but this virus is not often water borne
- 2<sup>e</sup> Cause = Crypto.; is often water borne  
Crypto is Not eliminated by Chlorine

Good filters do eliminate Cryptosporidium + bacteria + virus

# Improve ?

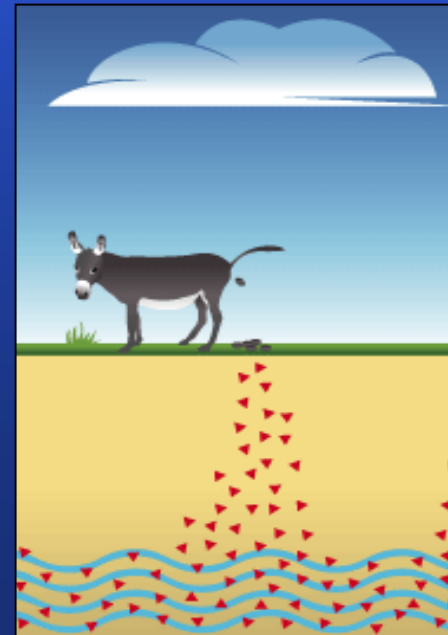
Household Water Treatment and Safe storage (HWTS) in all cases where water is not always safe

# Other reasons for HWTS

- Diarrhoea kills more children than AIDS + malaria + measles (UNICEF 2009)
- Only way to reach the unserved
- Safe water most effective single action to reduce poverty (UN University 2008)
- High benefits; 5-60 x investment (WHO 2008)

# Contaminant

- Physical. Clay, plants,..
- Chemical, Arseen, Fluor
- Biological, Feaces





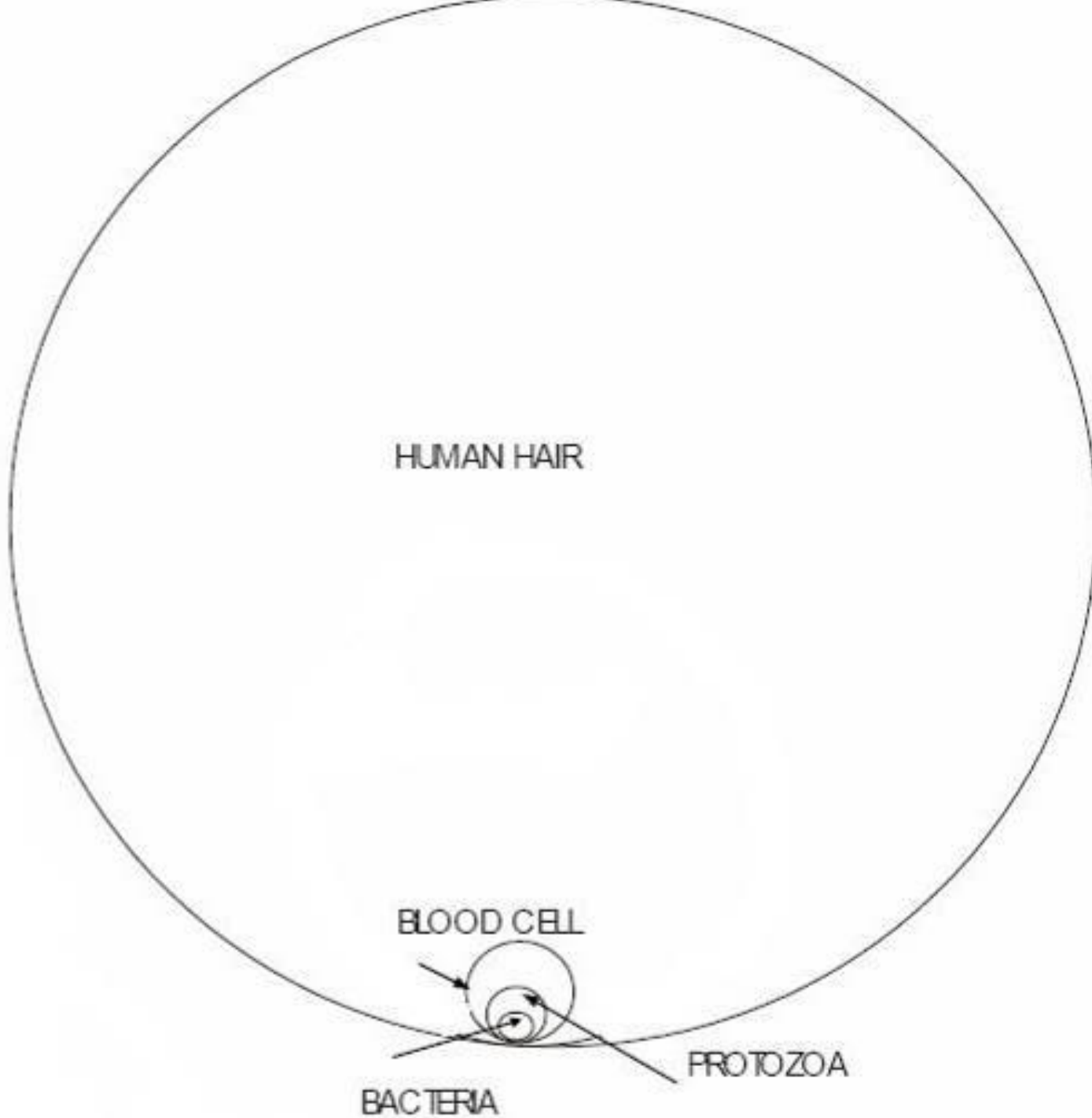
# Biological

Protozoa	Giardia	8-12 micron
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Bacteria	E. Coli,	0.5 micron
	Cholera	0.5 micron
	Salmonella	0.6 micron

Virus	Polio	0.02 micron
	Hepatitis	0,03 micron
	Rota virus	0.07 micron

1000 micron = 1 millimetre



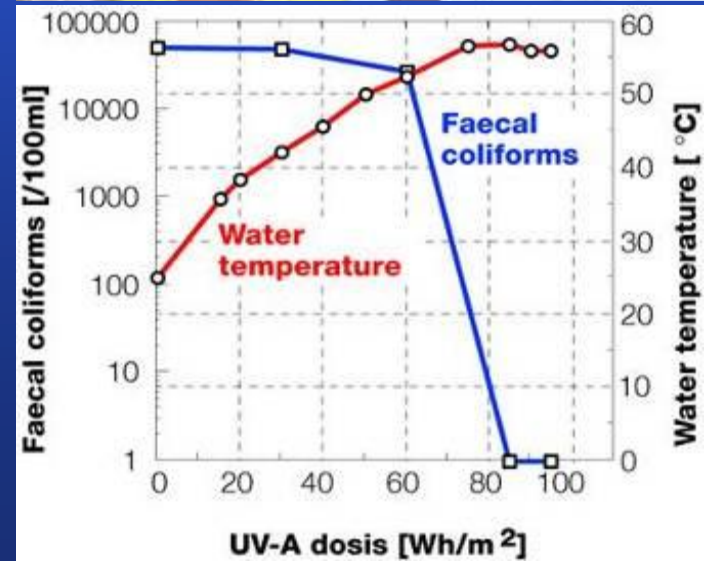
# Treatment options

- Boiling
- UV
- Chemicals
- Filters

# SODIS

Bacteria eliminated in 6 hours

- Users: 1 – 2 mln.
- Cost: \$0 - \$..
- +
  - - Low cost
  - - Second use of bottles
  - - Bottles available in many places
- - - Requires much social marketing (most stop 3 months after training)
  - - Not a market product
  - (Nobody earns money)



# Chlorine

Water guard, Aguatabs, PUR

New: Chlorine dioxide, (Dutrion)



# Chlorine dispenser

## Point of Tap treatment

- Users; Million
- Price; \$0.3 - \$ 1.0
- Cost; \$0.1 - \$ 0.5
- +
  - - Extremely low costs
  - - User friendly
  - - Residual Chlorine avoids recontamination
- -
  - - Management of dispenser can be a problem



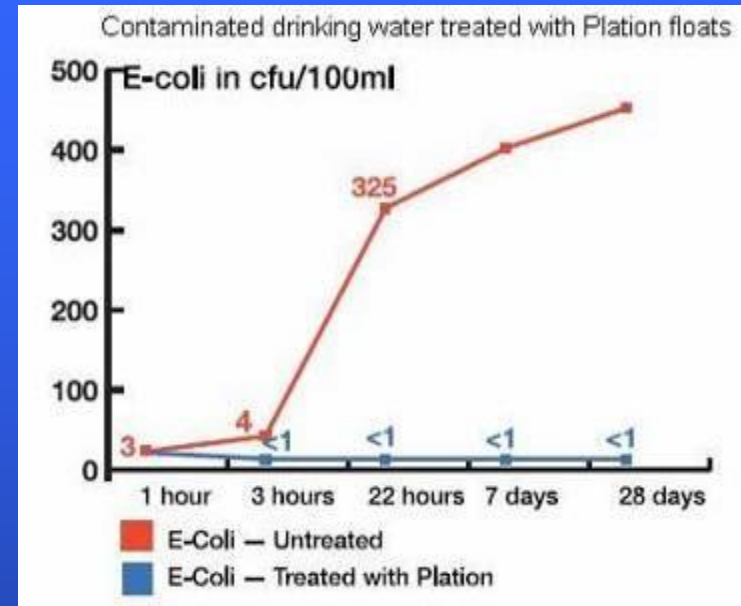
# New; Silver float

Safe storage

Cost; 5 US\$

Simple

Use 1 year



# Water filters

Candle, Pot, Biosand

New; Siphon, Tabletop, Membrane

Candle



CWP



Life straw



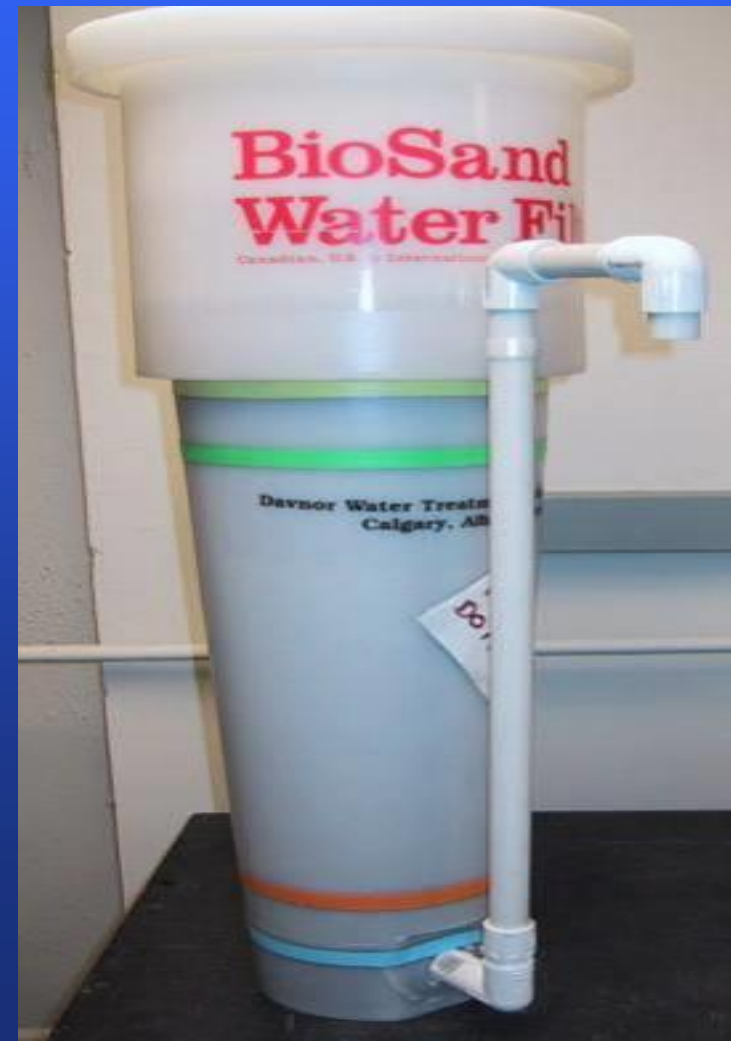
Siphon





# Biosand filter

- Users; 1-2 mln.
- Price; \$20- \$30
- Cost; \$1- \$ 2
- +
- - 60 -200 liters/day
- - Local production
- 
- - Big, heavy to transport
- - Not an off-the-shelf product  
less attractive for shops
- - Needs additional disinfection



# Membrane Sawyer

- Users; 2 - 3 ? mln.
- Price; \$30 - \$100
- Cost; \$1- \$2
- +
  - - High filter capacity
  - - 20.000 - 100.000 ltr./ filter
  - - 100 - 500 ltr / day
  - - Reduction bact. 99,999%
- - Also version with virus removal
- -
- - Backwash with syringe
- - User has to buy/adapt the container



# Siphon

Users; 2-3 mln.

Price; \$12 - \$22

Cost; \$1- \$1.5

+

- Small, easy transport
- 7000 ltr / element
- 60-120 ltr / day
- Reduction bact. 99,99%

-

- Not widely known
- Backwash not easy



# Table top

## Nazava, Safi,..

Users; 0.2 – 0.3 mln.

Price; \$10 - \$22

Cost; \$1- \$2

+

- Complete. Incl. safe st. contain.

- 5000 - 7000 ltr / element

- 30- 40 ltr / day

- Reduction bact. 99,99%

- Local assembly

-

- Not yet widely known



# Proposition

**To reduce water borne diseases it is more cost-effective to invest in household water treatment than in new water pipelines**

# Efficiency of measures against diarrhoea

(source: SIE 2009)

## Reduction in Diarrhoea Morbidity in children under 5 per intervention type



# Summary of Effectiveness—All ages

Intervention Type (no. trials)	Estimate (random)	% $\Delta$ (1-RR)	95% CI of Estimate	Heterogeneity* (Chi-square)
Source (6)	0.73	27%	0.53 to 1.01	p<0.00001
Household (32)	0.53	47%	0.39 to 0.73	p<0.00001
<b>Filtration (6)</b>	<b>0.37</b>	<b>63%</b>	<b>0.28 to 0.49</b>	<b>p=0.56</b>
Chlorination (16)	0.63	37%	0.52 to 0.75	p<0.00001
Solar Disinfection (2)	0.69	31%	0.63 to 0.74	p=0.73
Flocc/Disinfection (7)	0.48	52%	0.20 to 1.16	p<0.0001
Flocc/Disinf (ex Doocy)	0.69	31%	0.58 to 0.82	p=0.08
Improved Storage (1)	0.79	21%	0.61 to 1.03	n.a.

\*Note that in a test for heterogeneity, a low p-value (eg <0.10) suggests an actual underlying difference in effect between studies that is unlikely to be attributable to chance.

# Conclusions

- Of all HWT options new water filters seem most effective;

- Remove bacteria, protozoa, (virus)
- Used all the time (adherance)
- New Table top models are userfriendly attractive and.... affordable



# Lessons

- Make HWT attractive

Chlorine, boiling is not attractive

- Have affordable HWT options

nice filters are /were not affordable

- Health is not a motivator

Motivators to invest in e.j a water filter are;

Aspiration, Peer pressure, Trust, Money saving

# Scaling up?

## Awareness;

Causes disease. Safe water = money,  
filter paid in 3 months (Role NGOs, Gov.)  
NGOs, Governments: info on new options

## Supply chain.

Product range so people can choose.  
Support / train private sector

## Payment options.

Group loans. Support the poorest, use  
vouchers to support supply chains

# Cost safe water \$4 /person

HWT for the unserved seems possible with a one-time investment of \$4 / person, a one time investment of 3 billion US\$

Used for:

- Awareness
- Supply chain creation
- Support for real poor

# Safe water for all?

Invest in education & HWTS



# Informatie

[www.who.hwts](http://www.who.hwts)

HWTS Manual

[www.CAWST.org](http://www.CAWST.org)