



A TOOLKIT FOR MONITORING AND EVALUATING HOUSEHOLD WATER TREATMENT AND SAFE STORAGE PROGRAMMES

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A toolkit for monitoring and evaluating household water treatment and safe storage programmes.

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ANNEX A: SUMMARY OF HWTS METHODS¹

METHOD	REMOVAL PERFORMANCE (LOG REMOVAL) ^a	ADVANTAGES	LIMITATIONS
Filtration (ceramic)	Bacteria: 2–6 Protozoa: 4–6 Viruses: 1–4	<ul style="list-style-type: none"> Simple to use Visual improvement in treated water Possibility of local production benefits economy One-time capital cost 	<ul style="list-style-type: none"> Lack of residual protection presents potential for recontamination (although products increasingly address this through attached safe storage containers) Variability in quality of locally produced filters Filter breakage requires reliable supply chain Need to regularly clean filters and receptacles Low flow rate of 1–3 litres per hour (slower in turbid waters) Potential user taste objections
Filtration (slow sand filtration, i.e. biosand)	Bacteria: 1–3 Protozoa: 2–4 Viruses: 0.5–2	<ul style="list-style-type: none"> High flow rate (~20 litres per hour) Simple to use Visual improvement in treated water Production from locally available materials Longer life One-time capital cost 	<ul style="list-style-type: none"> Lack of residual protection presents potential for recontamination Difficulty in producing and transporting heavy concrete and plastic (45–160 kg) filter housing and sand Need for periodic cleaning and difficulty in assessing when cleaning is needed
Filtration (microfiltration [MF], ultrafiltration [UF], nanofiltration [NF], reverse osmosis [RO])	Bacteria: 2 MF; 3 UF, NF or RO – 4 MF; 6 UF, NF or RO Protozoa: 2 MF; 3 UF, NF or RO – 6 MF, UF, NF or RO Viruses: 0 MF; 3 UF, NF or RO – 4 MF; 6 UF, NF or RO	<ul style="list-style-type: none"> Visual improvement in treated water Potential longer life if spare parts are accessible One-time capital cost 	<ul style="list-style-type: none"> Lack of residual protection presents potential for recontamination (although methods increasingly address this through attached safe storage containers) Need for multiple steps to use the product, requires additional user support Requires reliable supply chain for spare parts
Combined flocculant/ disinfectant powders	Bacteria: 7–9 Protozoa: 3–5 Viruses: 4.5–6	<ul style="list-style-type: none"> Reduction of some heavy metals (e.g. arsenic) and pesticides Residual protection against recontamination Visual improvement in treated water Small sachets are easily transported due to size, non-hazardous classification, long shelf life 	<ul style="list-style-type: none"> Need for multiple steps to use the product, requires additional user support Requires reliable supply chain Most appropriate in areas with high turbidity Higher relative cost per litre treated

¹ Adapted from Lantagne & Clasen (2009); WHO (2011c).

METHOD	REMOVAL PERFORMANCE (LOG REMOVAL) ^a	ADVANTAGES	LIMITATIONS
Thermal (boiling and pasteurization)	Bacteria: 6–9+ Protozoa: 6–9+ Viruses: 6–9+	<ul style="list-style-type: none"> Existing presence in many households of materials needed to boil water Sociocultural acceptance of boiling for water treatment in many cultures Potential user taste objections 	<ul style="list-style-type: none"> Lack of residual protection presents potential for recontamination Potential for burn injuries and increased risk of respiratory infections from indoor stoves or fires Potentially high cost of carbon-based fuel source (with concurrent deforestation risk) and the opportunity cost of collecting fuel
Solar disinfection (solar disinfection + thermal effect)	Bacteria: 3–5+ Protozoa: 2–4+ Viruses: 2–4+	<ul style="list-style-type: none"> Simple to use No cost to the user after obtaining the plastic bottles Minimal change in taste of the water Minimal likelihood of recontamination because of safe storage 	<ul style="list-style-type: none"> Need for pretreatment (filtration or flocculation) of waters of higher turbidity Volume to treat dependent on availability of clean, intact plastic bottles Lack of visual improvement in water aesthetics to reinforce benefits of treatment Relatively longer time to treat water and variability depending on sun intensity [12–48 hours]
Chlorination	Bacteria: 3–6 Protozoa: 3–5 (non- <i>Cryptosporidium</i>) Protozoa: 0–1 (<i>Cryptosporidium</i>) Viruses: 3–6	<ul style="list-style-type: none"> Residual protection against recontamination Simple to use Possibility of local production benefits economy Low cost 	<ul style="list-style-type: none"> Lower removals in turbid waters Potential user taste and odour objections Requires reliable supply chain Necessity of ensuring quality control of product Misunderstanding about the effects of chlorination by-products

^a The range of removals represents baseline [i.e. in the field by a relatively unskilled operator] to maximum documented removals. Removal may also be expressed in terms of per cent reduction: 90% = 1 log, 99% = 2 log, 99.9% = 3 log, 99.99% = 4 log, 99.999% = 5 log, 99.9999% = 6 log, etc.